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Assessing the Level and Impact of Interest Rates in Less Developed Countries

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There has been a considerable amount of research in recent years on the nature and significance of interest rate policies in less developed countries (LDCs). There still remains disagreement on the possible effects of interest rate policies on such macroeconomic variables as saving, investment, and the rate of growth of output, mainly because empirical work has sometimes yielded conflicting results. In some LDCs, a relatively high growth rate of output can coexist with negative real interest rates (Lanyi and Saracoglu, 1983, R.K. Agarwala, 1983). Though it is recognized that the stimulus for growth can emanate from exogenous factors, significantly negative real interest rates do not always appear to have the adverse effect on economic growth suggested by much of conventional theory. Also, several studies have found no direct relation between the level of saving and the interest rate (Chandavarkar, 1971; R. Mikesell and J. Zinzer, 1972; G. Brown, 1973; and several other studies cited in Khatkhate, 1980) Similarly inconclusive results have been encountered in studies of investment (V. Sundararajan and S.Thakur, 1980; A. Roe, 1982).

The question of why some empirical evidence fails to support received economic theory is of particular importance in the context of interest rate policies in LDCs. The conflicting findings of empirical work may perhaps be attributed to two major factors--(1) the difficulties entailed in measuring current and expected real interest rate and

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in choosing a particular interest rate series from available series; and (2) the fact that the impact of interest rate policies on LDC economies is often viewed in isolation from the effects of other policies pursued concurrently. Considering the first factor, the problems of appropriate measurement, while always inescapable in empirical investigations, assume particular importance in deriving time series for real interest rates from nominal interest rates. Some economists have been skeptical about any price index being suitable for deflating nominal interest rates to arrive at a measure of current or expected real interest rates. Even if one accepts that it is in principle appropriate to use a price index as a deflator for the estimation of real interest rates, there is a further question: which of the available price series--Wholesale Price Index (WPI), Consumer Price Index (CPI) or the Gross Domestic Product (GDP) deflator--should be used for the purpose. As empirical results may depend on which measure of the expected real interest rate is used, it seems necessary to understand, even if not to resolve, the conceptual problems involved in measuring real interest rates.

The second problem, the tendency to view interest rate policies in isolation is relatively less intractable. Interest rates are among many sets of prices--exchange rates, wage rates, prices of public utilities and a host of others that have an important bearing on the macroeconomic situation. The impact of interest rates on, say, saving, the rate of growth or investment, is predicated on what happens to other prices and variables (Lanyi and Saracoglu 1983). If for instance, an appropriate interest rate policy, in some sense, is accompanied by a distortion of the exchange rate, the favorable effects of the interest rate policy may well be washed away. These and related issues are addressed in this paper with the purpose of cautioning that what is observed in narrowly focused studies may not necessarily provide meaningful evidence on the effectiveness or otherwise of interest rate policies.

The rest of the paper is divided as follows: Section II explains the complexities involved in measuring real interest rate by using various price deflators. This discussion has relevance for all economies, developed as well as less developed. For illustrative purposes, alternative indicators are compared to the commonly used indicators for a few LDCs to underscore the limitations to which the latter are subject. Keeping in view the caveats mentioned in Section II, Section III will present a series of real interest rates in LDCs over the period from 1971 to 1980 derived in a conventional manner and will also suggest an alternative way of judging the appropriateness of the level of nominal interest rates. Section IV presents a cross section analysis of the impact of interest rate policies on certain macro-economic variables, such as the growth rate of output, rate of growth of real financial assets, saving/income and investment/income ratios, rates of return to capital, etc. This analysis will be followed in Section V by a brief discussion of the role of interest rates in certain Fund programs for LDCs during the period, 1978-81 to demonstrate that when

judging the economic performance of such countries, individual components of the programs, like interest rate policy, should be viewed as an integral part of a policy package rather than in isolation. The final section presents a summary and broad conclusions of the paper.

II. 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 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 (I. 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 identifying what the real interest rate is, particularly when, as in a large number of LDCs, nominal interest rates are fixed through government intervention.

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

1. Meaning and 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. (I. 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 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

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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 chance." (Irving Fisher as quoted in Santoni and Stone, 1982).

It is also to be recognized that the relevant expected rate of interest being discussed is the rate of interest net of tax. However, inclusion or exclusion of tax does not materially affect the main analysis of the real interest rate except that it introduces a great many complications in identifying the real interest rate as a guide to policy. Issues relating to tax treatment of interest rates and its impact on monetary policy are comprehensively discussed in V. Tanzi (1984).

and to the same extent as the rate of change in prices. 1/ However, 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 (J. Hirschleifer, 1977). 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 (Fisher, 1930, p. 423). 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" (Fisher, 1930, p. 415).

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

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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" (I. Fisher, 1930, p. 42). It is this distinction which is of strategic importance in estimating real expected long-term 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.

2. Measuring the 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; Elliot, 1977; Brown and Santoni, 1981; Santoni and Stone, 1982). 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 (Brown and Santoni, 1981). If the real interest rate rises, 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. 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, 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, 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 as Fama (1975) and Elliot (1977) have done with respect to the United States during the 1970s may perhaps have exaggerated the extent to which real interest rates became negative during that period. 1/

The next question that should be addressed is how one should go about estimating changes in real interest rates, if the prevailing price indices are considered to be inadequate for the purpose. Brown and Santoni (1981) suggest that it is possible to draw some inferences, however tentative, about changes in the real interest rate from the behavior of "prices of long-lived assets relative to the prices of short-lived assets" as reflected in the markets for these assets. They refer, in this connection, to the market for nondurable and durable goods, the stock market and the commodity market in the United States, and then proceed to compare this evidence with the expected real interest rate series derived on the basis of the CPI. Following their procedure, an attempt is made here to present illustrative evidence for three developing countries--India, Brazil, and Korea. The choice of countries is dictated by the availability of information similar to that obtained by Brown and Santoni for the United States. Admittedly, the data for these countries are not as refined or comprehensive as for the U.S.A. For these reasons, the conclusions that emerge should be taken as suggestive, and as a check on the usual indicators. The evidence for these three countries is presented in Tables 1 and 2. The market for spot and future commodities is not considered for lack of data.

1/ A recent study by R. Saracoglu (1982) has also shown that the real interest rates did not remain unchanged in five industrial countries, France, West Germany, Japan, the U.K., and the U.S.A. during the period 1968-82.

First the market for durable and nondurable goods. Durable goods provide a stream of future services. If there is a rise in the expected real interest rate, the prices of durable goods should be expected to decline in relation to the price of nondurable goods, and vice-versa if there is a decline in the expected real interest rate.

In respect of Brazil (Table 1), the ratio of nondurable to durable goods prices recorded a rise in all years between 1970 and 1974, and 1975 to 1980. (There was a change in the base year of the index in 1975.) This suggests that the expected real interest rate, assuming other things remained constant, rose continually during that period. Juxtaposing this trend to that revealed in the expected real interestrate series, estimated on the basis of the CPI, congruence is found in seven years, the exceptions being 1973, 1974, and 1979.

For India, it is evident from Table 1 that the ratio of prices of nondurable goods to those of durable goods fell in the years 1971-72, 1975-76, and 1978-80 implying a decline in the real interest rate in those years. However, the real interest rate based on the CPI increased in 1975-76 and again in 1978. The ratio rose in three years, i.e., 1973, 1974 and 1977, implying an increase in the real interest rate, but the expected real interest rate, derived by using CPI, decreased in two of those years, 1973-74.

For Korea (Table 1), the index of nondurable to durable goods prices increased continuously between 1970 and 1976 (which is the latest year for which the data are available). But the real interest rate series estimated from the CPI showed a decline in 1972 and 1974-76.

The second market considered for drawing supportive evidence is the stock market. The most important indicators from this market for judging the trend in expected real interest rate are the ratio of current earnings to stock prices and the ratio of prices of nondurable goods to stock prices. Since stock prices reflect the current value of expected future earnings, an increase in the price of shares relative to current earnings would indicate a decrease in the ex ante real rate of interest, and vice-versa, if the reverse were true. Similarly, a decrease in the ex ante or expected real interest rate will be represented by a fall in the price of consumption goods relative to stock prices. Unfortunately, the information on the first of these ratios, i.e., the ratio of earnings to stock prices, is not available for any of the three countries and hence reliance is placed on the other ratio.

In the case of Brazil, the ratio of nondurable goods prices to stock prices declined in three years (Table 2), 1971, 1975, and 1980, indicating that the expected real interest rate declined in those years. But in 1971 and 1980 the expected real interest rate, based on the CPI, increased. Likewise, the ratio of prices of nondurable goods

Table 1. Expected Real Interest Rates* and Prices of Nondurable and Durable Goods, 1970-1980

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Brazil											
Expected real interest rates 1/	6.2	8.4	9.0	8.8	0.5	-1.2	-5.6	2.7	8.3	-16.5	-4.4
Index of nondurable goods prices	36.4	45.8	54.2	63.4	79.9	100.0	145.3	207.0	298.1	462.7	948.4
Index of durable goods prices	46.2	52.2	59.7	67.2	80.3	100.0	135.3	192.7	261.7	375.5	717.0
Ratio of nondurable to durable goods prices	0.79	0.88	0.91	0.94	1.00	1.00	1.08	1.08	1.14	1.23	1.32
	(--)	(11.39)	(3.40)	(3.29)	(6.38)	(--)	(8.00)	(--)	(5.55)	(7.90)	(7.40)
India											
Expected real interest rates 2/	--	4.0	2.4	-8.1	-16.4	-0.1	13.9	3.4	6.1	4.1	-0.3
Index of nondurable goods prices	57.2	58.2	63.3	80.1	103.6	100.0	101.8	110.0	109.9	125.5	147.3
Index of durable goods prices	58.4	64.0	71.2	81.5	98.6	100.0	102.3	104.7	104.8	126.1	150.1
Ratio of nondurable to durable goods prices	0.98	0.91	0.89	0.98	1.05	1.00	1.00	1.05	1.05	1.00	0.98
	(--)	(-7.14)	(-2.19)	(10.11)	(7.14)	(-4.76)	(--)	(5.00)	(--)	(-4.76)	(-2.00)
Korea											
Expected real interest rates 3/	--	6.5	-1.0	1.9	1.4	-1.3	0.5	0.5	4.8	3.9	6.2
Index of nondurable goods prices	46.1	51.0	58.7	60.4	76.8	100.0	115.8	--	--	--	--
Index of durable goods prices	69.8	70.9	70.7	70.9	89.6	100.0	103.0	--	--	--	--
Ratio of nondurable to durable goods prices	0.66	0.72	0.83	0.85	0.86	1.00	1.2	--	--	--	--
	(--)	(9.09)	(15.28)	(2.40)	(1.17)	(16.27)	(2.00)				

*Expected rate of inflation for adjusting nominal interest rate is estimated only for illustrative purposes, using following equations: $\pi = \beta\Delta \log P + (1 - \beta)\, \pi_{t-1}$ where π = expected rate of inflation and P = CPI. Actual and expected rates of inflation are assumed to be equal in the initial period. An iterative procedure is used to determine the weights ( ) attached to the actual inflation and its previous expectations.

Sources: Tables 1, 2 and 3; IMF, International Financial Statistics; Anuario Estatistico do Brasil; Ministry of Planning (India), Basic Statistics Relating to Indian Economy and Statistical Abstract; and Bank of Korea, Price Statistics Summary, 1977 and Economic Statistics Yearbook.

1/ Interest rate till 1974 is on saving deposit and thereafter on three-month Treasury bill.
2/ Fixed Deposit rate (over five years).
3/ 1-2 years time deposit rate.
Note: The price index used for all the countries is that for consumer prices. Figures in parentheses represent percentage changes over the preceding year.

to stock prices rose in 1972-74 and again in 1976-79, but the real interest rate, based on the CPI increased in three out of seven years viz., 1972, 1977, and 1978.

In India, the ratio of nondurable goods prices to stock prices increased during all years except in 1975 and 1978 (Table 2). This implies that expected real interest rates may have risen during most of the 1970s. It may be noted, however, that the real interest rates based on the CPI index rose in precisely those years, 1975 and 1978, when it should have declined on the basis of stock market information.

Since the relevant stock market information for Korea is available for a shorter period, i.e., 1973 to 1976, no meaningful conclusions can be drawn.

Alternative indices of real interest rates are used here in order to focus on the limitations of price indices and to caution that the real interest rate series estimated from price indices should not be taken as precise magnitudes. In practice, however, since these alternatives and price indices both suffer from limitations, the only plausible conclusion that can be derived is that the level of real interest rates is difficult to determine and therefore any series representing it should be interpreted with due caution.

3. Estimating real interest rates in LDCs

The conceptual issues involved in estimating real interest rates are crucial for LDCs from the policymakers' point of view. If the identification of the expected real interest rate is difficult in market-oriented economies where adjustment in its level is self-propelled except when it is indirectly influenced by changes in monetary and fiscal policies, it is even more so in regard to LDCs where the level of real interest rates is often sought to be approximated by controlling nominal interest rates. Regulated interest rates in many LDCs have led to severe repression in financial markets because of a tendency in these countries to keep interest rates on saving instruments unduly low, and the conditions prevailing in these countries tend to impose constraints on freeing interest rates. The size of financial markets is relatively small and their structure less diversified, both of which tend to impede effective market competitiveness. This is evident from the high concentration that characterizes the financial system of most of the LDCs (B. Short, 1977). Furthermore, in several LDCs, particularly in Latin America, financial institutions have a holding company structure and in the absence of antitrust policies, the oligopolistic power of banks remains strong (V. Galbis, 1981).

A pertinent question is how the authorities in LDCs should go about adjusting nominal interest rates in order to approximate a desired level of real interest rates. There is no unanimity of views about which of the available price indices should be chosen in the context of LDCs.

Table 2. Ratio of Nondurable Goods Prices to Stock Prices, 1970-1980

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	Mean	S.D.
Brazil													
Stock price index	33.3	113.0	85.5	66.7	63.8	100.0	123.2	144.9	176.8	184.1	391.3	134.8	97.1
Ratio of nondurable goods to stock prices	1.09	0.41	0.63	0.95	1.25	1.00	1.18	1.43	1.69	2.51	2.42	1.32	0.664
India													
Stock price index	103.7	102.3	102.3	102.5	100.8	100.0	100.6	101.2	101.3	102.3	100.6	101.6	1.09
Ratio of nondurable goods to stock prices	0.55	0.57	0.62	0.78	1.03	1.00	1.01	1.09	1.08	1.23	1.46	0.95	0.28
Korea													
Stock price index	--	--	--	91.5	90.0	100.0	122.7	--	--	--	--	101.1	15.1
Ratio of nondurable goods to stock prices	--	--	--	0.66	0.85	1.00	0.94	--	--	--	--	0.86	0.15

Sources: Anuario Estatistico do Brasil; Ministry of Planning (India), Basic Statistics Relating to Indian Economy and Statistical Abstract, Bank of Korea, Economic Statistics Yearbook.

There are two objections generally raised to the use of CPI in LDCs--one theoretical and the other practical. McKinnon (1973) has been a strong opponent of using the CPI on the ground that it gives more weight to services component than to goods which are an alternative to holding money. The assumption here is that wealth owners hold either commodities, the rate of return on which is given by the rate of change in their prices, or financial assets, the rate of return on which is denoted by the nominal interest rate. It follows from this that the prices relevant to the allocation of savings by individuals are of necessity those of commodities and not services. In economies where labor productivity as well as real wages are rising, prices of services tend to rise in relation to the prices of commodities,--an outcome that can be traced to relatively slow technical change in the production of services. Thus, the use of the CPI for computing the real interest rate will lead to its underestimation to the extent that the CPI increase is dominated by services. McKinnon therefore suggests the employment of a wholesale price index (WPI) for calculating the real interest rate.

In addition to McKinnon's theoretical case against the CPI, there is a practical difficulty associated with the use of the CPI for the purpose of estimating real interest rates as it does not reflect the actual changes in prices because of the pervasiveness of administered prices and other related controls in most LDCs. For one thing, the commodities whose prices are controlled often constitute a large proportion of commodities included in the CPI. For instance, in Egypt the proportion of commodities under centralized price controls formed, on average, 27 percent of the commodities included in the CPI during the period 1977-82. For Mali, the weight given to the controlled prices was around 25 percent during a period 1976-80.

A second problem is that in most LDCs like India, Pakistan, and Sudan, the CPI's geographical coverage is limited to only a few cities so that it may not measure changes in purchasing power in a country as a whole. Third, even when the CPI is for a particular city or a region, there is a further differentiation according to the income brackets of the earning population. For example, in Sudan, there are separate cost-of-living indices for high-salaried employees and low-salaried employees, the distinction between the two being rather vague. Fourth, the consumption pattern assumed in the calculation of the CPI tends to become outdated. In Ethopia, for instance, the CPI for the period 1979-80 uses the weights derived from a 1963 consumption survey in only one city. Likewise, in Burma, until 1982 weights derived from the 1972 consumption pattern of 528 households in Rangoon were used. Finally, the way in which the CPI is constructed is not always consistent. In Venezuela, for instance, until 1979 a large number of commodities were subject to price controls which were subsequently loosened. Since 1981, however,the policy of price liberalization has been reversed. The same holds true broadly for Sri Lanka since 1977. As a consequence, the CPI in these countries has become a poor and an inconsistent indicator of inflation rates.

In practical terms, however, it seems that the significance of the choice between CPI and WPI is greatly exaggerated. Table 3 presents a correlation matrix for changes in CPI, WPI and GDP deflator for selected LDCs. Only three of the selected LDCs, i.e. Sri Lanka, Singapore, and Ecuador for which the WPI index is available have a correlation coefficient between changes in CPI and those in WPI which is less than 0.75; of these Ecuador has a negative coefficient. In a large number of LDCs, the value of the coefficient is above 0.9. In contrast, the corresponding coefficient for a sample of industrial countries is often less than 0.9; in countries like Japan, Germany, Belgium, France, Italy, it is below 0.75 (Table 4).

A relatively high coefficient of correlation between rates of change in CPI-WPI in LDCs may perhaps be explained by two factors. First, services are likely to be less important in the public's consumption pattern in LDCs or at least not measured because of the relative underdevelopment of their economies, which means that commodities enter into both the CPI and WPI with more or less the same weights. Second, controls on prices of commodities entering the CPI may spill back to the WPI sooner or later, so that percentage changes in both follow similar patterns. In his arguments for the use of the WPI in LDCs, McKinnon may have been influenced too much by his experience in Japan and Germany (McKinnon, 1972, pp. 96-98). 1/

However, the choice between GDP deflator and CPI or GDP deflator and WPI does remain critical for LDCs as it is for the developed countries. 2/ It is seen from Tables 3 and 4 that the coefficient of correlation between changes in GDP deflator and changes in CPI is above 0.75 in only 10 out of 55 countries. Similarly, the coefficient of correlation between changes in GDP-WPI is above 0.75 for 15 out of 24 countries for which the WPI is available.

1/ On the ground that depositors consider holding of financial assets as alternative to goods, while prices of other goods, particularly capital goods, are of relevance mainly to borrowers, it is suggested by some (Lanyi and Saracoglu, 1983) that the CPI should be used for calculating real interest rates for lenders and the WPI for borrowers. However, the use of different deflators will in fact make little difference because of the high correlation between the rates of change in WPI and CPI in LDCs.

2/ It may be mentioned in passing that similar problems are also faced in measuring real money balances. The CPI and WPI are both widely used in estimating real money balances. However, these indices, or for that matter any indices with fixed weights will be misleading as they, while measuring only the changes in prices, fail to give an indication as to the purchasing power of money balances. McKinnon (1979) prefers to use a GDP deflator but better still is the Gross Supplies Deflator (GSD) based on variable weights. (See Khatkhate, Coats and Riechel, 1978.)

Table 3. Correlation Matrix for Selected LDCs, 1970-80*

Country	CPI-WPI	Country	CPI-GDP	Country	WPI-GDP
Argentina	0.99	Argentina	0.99	Argentina	0.98
Brazil	0.99	Brazil	0.99	Brazil	0.98
Uruguay	0.99	Mexico	0.98	Uruguay	0.97
Chile	0.99	Chile	0.97	Chile	0.97
Philippines	0.99	Guatemala	0.95	Philippines	0.96
Mexico	0.99	Philippines	0.94	Thailand	0.96
Guatemala	0.99	Uruguay	0.93	Indonesia	0.93
Colombia	0.99	Colombia	0.92	Mexico	0.91
Panama	0.99	Singapore	0.91	Zambia	0.91
Korea	0.99	Indonesia	0.89	Costa Rica	0.90
India	0.99	Thailand	0.88	Korea	0.88
Congo	0.99	Paraguay	0.86	Guatemala	0.87
Pakistan	0.99	Costa Rica	0.85	Colombia	0.83
Venezuela	0.99	Panama	0.79	El Salvador	0.81
Costa Rica	0.98	Korea	0.78	Panama	0.76
Zambia	0.98	Congo	0.61	India	0.75
Tunisia	0.98	India	0.60	Tunisia	0.75
Thailand	0.97	Sri Lanka	0.59	Paraguay	0.72
Paraguay	0.97	Pakistan	0.56	Sri lanka	0.71
El Salvador	0.89	Venezuela	0.35	Congo	0.62
Indonesia	0.78	El Salvador	0.28	Singapore	0.62
Sri Lanka	0.66	Zambia	0.13	Pakistan	0.58
Singapore	0.34	Tunisia	0.10	Venezuela	0.58
Peru	--		0.97		--
Bolivia	--		0.95		--
Morocco	--		0.90		--
Fiji	--		0.90		--
Burma	--		0.87		--
Barbados	--		0.87		--
Ecuador	-0.23		0.84		-0.84
Jamaica	--		0.81		--
Antigua	--		0.79		--
Trinidad & Tobago	--		0.79		--
Mauritius	--		0.76		--
Zimbabwe	--		0.72		--
Kenya	--		0.63		--
Ghana	--		0.61		--
Haiti	--		0.50		--
Sierra Leone	--		0.48		--
Liberia	--		0.40		--
Malawi	--		0.36		--
Honduras	--		0.33		--
Senegal	--		0.32		--
Jordan	--		0.31		--
Nigeria	--		0.31		--
Yemen Arab Republic	--		0.29		--
Dominica	--		0.28		--
Togo	--		0.27		--
Cameroon	--		0.22		--
Nepal	--		0.21		--
Dominican Republic	--		0.11		--
St. Vincent	--		-0.59		--

Source: IMF, International Financial Statistics, 1984; and its supplement on prices, 1981.

This matrix is based on changes in all the indices and not on their levels.

Table 4. Correlation Matrix for Some Industrial Countries, 1970-1980*

Country	CPI-WPI	CPI-GDP	GDP-WPI
U.S.A.	0.80	0.93	0.73
U.K.	0.82	0.94	0.71
Netherlands	0.79	0.93	0.54
Italy	0.73	0.98	0.70
Japan	0.64	0.93	0.78
Germany	0.74	0.73	0.48
Denmark	0.79	0.54	0.36
France	0.57	0.91	0.37
Belgium	0.46	0.82	0.34
Sweden	0.82	0.30	-0.21

Source: IMF, International Financial Statistics, 1984; and its supplement on prices, 1981.

*This matrix is based on changes in all the indices and not on their levels.

Given that each of the three available price indices is different in several respects, it would appear that the one to be preferred in LDCs is the GDP deflator not only because it is more comprehensive in coverage but also because being a flexible-weight index (unlike CPI or WPI which have fixed weights) it reflects shift effects in the pattern of expenditure, and is thus a better indicator of purchasing power of money. Therefore, GDP deflator is used (when that index is not available, CPI is used) in constructing a real interest rate series for selected LDCs during 1971-80 1/ (see Table 7, section III).

III. Approximating 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. 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 currency and foreign financial assets or gold for domestic currency and domestic financial assets can and does take place when the 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 a following rule:

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

1/ A gross national product (GNP) deflator is even superior to GDP deflator as it includes imported goods. However, for want of information on GNP deflator for most LDCs, GDP is preferred.

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.

In a few LDCs, where no GDP deflator is available, the CPI is used. The London interbank rate on one-year U.S. dollar deposit or the U.S. Treasury bill rate is chosen as a benchmark.

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 nominal interest rate adjusted for percentage change in GDP deflator of LDCs are presented in Tables 5, 6 and 7.

Some explanation is necessary about how the actual nominal interest rate series is constructed. Empirical work on LDCs is often beset by either lack of relevant data or a high degree of unreliability of available data. This is perhaps most evident in regard to the statistics on nominal interest rates. The International Financial Statistics (IFS) provides consistent information only on discount or bank rates, interbank call money rates (that too for a very small number of LDCs) and short-term Treasury bill rates where they exist. None of these can be considered to be useful in the study of interest rate policies in LDCs. What is required is a time series of interest rates on term deposits of commercial banks which constitute a relatively large segment of the LDC's financial system. Series on time deposits is to be preferred for two reasons. For one thing, time deposits are a more common medium for holding saving in LDCs; saving deposits in many LDCs are analogous to demand deposits and are used as a means of payment. For another, rates paid on time deposits are almost always higher than on savings deposits and are therefore considered to be a more representative return on saving in LDCs.

Even these statistics on interest rates presented have severe limitations which need to be borne in mind. In some cases, interest rates used are the ceilings prescribed by the monetary authorities. Where there is a range, the higher end of the range is used although the actual level may not necessarily correspond to the maximum. On the

Table 5. Nominal Interest Rates (Rd_1) on Bank Deposits in Selected LDCs, 1971-1980

(In percent per annum)

Country	Type of Deposit	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
AFRICA											
Benin	Savings deposit	--	3.25	4.75	4.75	5.50	5.50	5.50	5.50	5.50	7.50
Botswana	Time deposit of 12 months	--	--	--	--	--	8.00	8.50	7.50	6.50	6.50
Cameroon 1/	Time deposit	--	4.50	4.50	4.50	4.50	5.50	5.50	5.50	5.50	7.00
Congo 2/	Time deposit of 12 months	--	--	--	--	--	--	4.65	4.65	5.70	5.70
Gabon	Savings bond of 6 months to 5 years	5.00	5.00	5.00	5.00	5.00	5.20	5.20	5.20	4.80	4.80
Ghana	Savings deposit	--	--	--	5.00	7.50	7.50	7.50	12.00	12.00	12.00
Ivory Coast	Savings deposit	--	3.25	4.75	4.75	5.50	5.50	5.50	5.50	5.50	7.50
Kenya	Savings deposit	--	3.00	3.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00
Liberia	Time deposit	--	--	--	--	6.80	6.50	6.30	7.70	8.70	10.30
Malawi 1/	Time deposit of 6-11 months	5.00	5.00	5.50	5.50	5.00	7.50	7.50	7.50	8.70	11.70
Mauritius	Time deposit	6.30	5.30	5.30	6.00	6.20	6.20	8.00	7.50	8.50	10.00
Mauritania 2/	Time deposit	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	8.50
Morocco	Time deposit of 12 months	--	2.70	2.70	5.50	6.50	6.50	6.50	7.70	7.00	8.50
Niger	Saving deposit	--	3.25	4.75	4.75	5.50	5.50	5.50	5.50	5.50	7.50
Nigeria 3/	Time deposit	6.00	6.00	6.00	6.00	--	--	3.00	3.00	4.00	6.00
Senegal	Saving deposit	--	3.25	4.75	4.75	5.50	5.50	5.50	5.50	5.50	7.50
Sierra Leone	Saving deposit	--	--	--	4.00	5.50	7.00	7.00	7.00	8.00	10.00
Somalia	Time deposit over 24 months	5.00	5.00	5.00	5.00	6.50	6.50	6.50	6.50	6.50	8.50
Tanzania 1/	Time deposit of 1 year	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50
The Gambia 1/	Time deposit of 12 months	6.00	6.00	6.00	6.00	6.00	6.00	7.00	7.00	9.00	12.00
Togo	Savings deposit	--	3.25	4.75	4.75	5.50	5.50	5.50	5.50	7.50	--
Tunisia 1/	Time deposit of 12 months	--	5.00	4.50	4.50	4.50	4.50	4.00	4.00	4.00	4.00
Upper Volta	Savings deposit	--	3.25	4.75	4.75	5.50	5.50	5.50	5.50	5.50	7.50
Zambia 3/	Time deposit of 12 months	--	--	--	5.00	5.00	7.20	7.20	8.20	8.20	8.20
Zimbabwe	Time deposit of 12 months	4.50	4.50	4.50	4.50	4.50	5.10	5.10	5.10	5.50	6.10
ASIA											
Bangladesh 1/	Time deposit of 12 months	--	5.00	5.00	7.00	7.00	7.00	8.25	8.25	8.25	14.0
Burma	Savings deposit	1.50	1.50	--	3.50	9.00	9.00	9.00	9.00	9.00	9.00
Fiji	Time deposit of 12 months	--	--	5.50	6.50	6.50	6.75	6.75	6.50	6.50	7.00
India	Time deposit of 12 months	6.50	6.50	6.50	6.50	6.50	6.50	8.00	6.00	7.00	7.00
Indonesia	Time deposit of 12 months	17.00	18.00	16.80	18.00	12.00	12.00	12.00	9.00	9.00	9.00
Korea	Time deposit of 12 months and over	21.60	15.00	12.00	14.80	15.00	16.20	14.40	18.60	18.60	22.00
Malaysia	Time deposit of 12 months	6.00	5.75	6.50	9.00	8.50	8.50	6.50	6.50	7.00	7.50
Nepal	Time deposit	--	8.50	15.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Pakistan	Time deposit of 3-6 months	5.72	5.72	7.27	8.00	8.50	8.50	9.50	9.50	9.50	9.50
Philippines	Time deposit of 3 months	6.50	6.50	6.50	8.00	8.00	8.00	8.50	8.50	10.90	14.00
Singapore	Time deposit of 12 months	6.00	5.75	7.25	9.00	5.79	5.31	5.32	5.32	7.65	10.55
Sri Lanka	Savings certificate	5.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Thailand	Time deposit of 12 months	7.00	7.00	12.00	12.00	8.00	8.00	8.00	8.00	9.00	12.00
EUROPE											
Portugal 1/	Time deposit of 12 months	5.25	6.50	--	9.00	9.50	9.50	15.00	19.00	19.00	19.00
Turkey 1/	Savings deposit of 3-12 months up to 1977 and 6-12 months thereafter	--	4.00	6.00	6.00	6.00	6.00	6.00	6.00	14.00	14.00
Yugoslavia	Time deposit	--	10.00	10.00	10.00	10.00	10.00	10.00	10.00	9.50	16.50
LATIN AMERICA											
Antigua 1/	Time deposit of 12 months	--	--	--	--	10.00	4.00	6.50	7.00	7.00	7.50
Argentina 5/	Time deposit of 6 months	17.00	24.00	17.50	16.00	37.00	91.80	93.80	114.00	111.50	76.60
Barbados 1/	Time deposit of 12 months	7.00	6.30	10.00	10.00	9.00	6.00	5.00	6.00	5.50	5.30
Bolivia	Savings deposit	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	15.00	17.00
Brazil 6/	Savings deposit and Treasury bills	27.00	24.60	21.10	23.80	24.00	28.50	38.70	41.30	24.90	54.00

(Continued)

Table 5. (Concluded) Nominal Interest Rates (Rd_1) on Bank Deposits in Selected LDCs, 1971-1980

(In percent per annum)

Country	Type of Deposit	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
LATIN AMERICA (Contd.)											
Chile 7/	Time deposit of 3 months	--	7.50	7.50	115.20	174.00	158.40	88.80	52.40	44.40	36.00
Colombia	Certificate of 6 months deposits	13.00	13.00	13.00	24.00	24.00	24.00	24.00	22.00	23.00	35.50
Costa Rica	Time deposit of 12 months	7.00	7.00	7.00	12.00	14.00	13.00	13.00	18.00	18.00	18.00
Dominica	Time deposit of 12 months	--	--	--	--	7.00	5.50	3.80	5.00	5.00	5.00
Dominican Rep.	Savings deposit	4.00	4.00	4.00	4.00	7.50	7.50	7.50	7.50	7.50	7.50
Ecuador	Time deposit of 12 months	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.50	8.00
El Salvador	Time deposit of 12 months	5.00	5.00	5.00	6.00	6.00	6.50	6.50	12.50	12.50	12.50
Grenada 1/	Time deposit of 12 months	--	--	--	--	10.50	4.30	4.00	3.50	5.00	5.00
Guatemala	Time deposit of 12 months	7.00	7.00	7.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
Haiti	Time deposit of 12 months	5.00	5.00	6.50	8.00	8.00	8.00	8.00	8.00	14.00	14.00
Honduras	Time deposit of 12 months	7.00	7.00	7.00	9.00	9.00	9.00	9.00	11.00	11.00	11.00
Jamaica 1/	Time deposit of 12 months	6.50	9.50	10.10	12.60	12.20	14.00	12.40	12.00	9.40	10.35
Mexico 8/	Time deposit of 12 months until 1974 and 2 years thereafter	11.00	10.00	10.50	11.00	12.00	11.00	14.00	15.00	15.20	22.00
Panama	Savings deposit	5.00	5.00	5.00	5.00	5.00	5.00	5.50	5.50	5.50	5.50
Paraguay	Time deposit of 12 months	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	11.00
Peru	Certificates of deposit of 12 months	9.00	9.00	9.00	9.00	9.00	13.50	13.50	26.50	34.50	34.50
St. Vincent	Time deposit of 12 months	--	--	--	--	9.00	5.50	5.50	5.50	5.00	6.00
Trinidad & Tobago 1/	Time deposit of 12 months and only household deposits from 1973	7.90	6.25	9.50	7.50	6.00	6.00	7.50	7.00	9.00	9.50
Uruguay	Time deposit of 12 months	20.00	20.00	25.00	48.00	48.00	62.00	64.00	48.00	48.00	50.10
Venezuela	Time deposits of 12 months	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	11.50	12.20
MIDDLE EAST											
Jordan 1/	Time deposit of 12 months	6.00	6.00	6.00	6.00	5.50	6.05	6.10	6.10	6.10	6.40
Yemen Arab Republic	Time deposit of 12 months	4.50	5.50	8.00	12.00	7.00	9.00	9.00	8.00	8.00	13.50
Yemen People's Democratic Republic 1/	Time deposit of 12 months	5.00	5.00	5.00	5.00	6.00	6.00	6.00	9.00	--	--

Sources: Most of the Latin American countries interest rates series up to 1976 are from V. Galbis: "Inflation and Interest Rate Policies in Latin America, 1967-76", IMF, Staff Papers, June 1979, and from IMF Recent Economic Development (REDs) and respective Central Bank Bulletins thereafter. For the rest, the sources are REDs, Central Banking Department's Advisory Reports and the central bank bulletins.

1/ Maximum period.
2/ Interest rates on time deposits are minimum and vary according to amounts. Rates here relate to amounts of deposit above 3 million in local currency.
3/ Minimum prescribed.
4/ Maximum rates from 1975.
5/ Market determined from 1976 and maximum until 1974.
6/ Interest rate till 1974 are rates on savings deposits and since 1975 on Treasury bills of three months which are market-determined.
7/ Interest rate is unadjusted and maximum until 1973 and actual.
8/ Time deposits are those at the mortgage banks.

Table 6. Interest Rates* (Rd_2) in Selected LDCs, 1971-1980

(In percent per annum)

Country	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
AFRICA										
Benin	4.45	-4.56	-2.97	18.49	-5.06	16.55	8.33	1.14	5.98	12.76
Botswana	4.79	11.91	-0.99	8.41	14.65	22.63	2.36	7.66	10.11	8.79
Cameroon	3.28	1.83	-6.20	11.00	11.49	28.14	8.56	0.26	2.24	4.56
Congo	3.28	1.83	-6.20	11.00	11.49	28.14	8.56	0.26	2.24	4.56
Gabon	3.28	1.83	-6.20	11.00	11.49	28.14	8.56	0.26	2.24	4.56
Ghana	5.53	33.13	-3.65	9.56	5.82	5.05	5.54	62.65	67.63	13.43
Ivory Coast	3.28	1.83	-6.20	11.00	11.49	28.14	8.56	0.26	2.24	4.56
Kenya	4.66	4.43	6.74	12.52	8.62	18.99	4.45	2.68	8.41	12.69
Liberia	4.66	4.43	8.73	10.50	5.82	5.05	5.54	9.30	11.70	13.43
Malawi	4.36	0.89	10.93	13.17	8.51	10.74	4.43	2.74	8.52	12.84
Mauritius	3.28	1.86	10.67	15.29	11.49	15.91	4.42	2.57	14.05	35.25
Mauritania	4.45	-4.56	-2.97	12.28	0.90	9.49	6.78	10.56	11.14	13.44
Morocco	4.45	-4.56	-1.90	16.90	-1.44	14.10	7.44	1.82	5.28	14.39
Niger	4.45	-4.56	-2.97	18.49	-5.06	16.55	8.33	1.14	5.98	12.76
Nigeria	4.45	-3.27	8.73	6.30	3.47	6.85	8.42	7.83	6.78	3.96
Senegal	3.28	1.83	-6.20	11.00	11.49	28.14	8.56	0.26	2.24	4.56
Sierra Leone	4.24	0.92	10.67	15.24	11.49	28.14	8.56	0.96	12.38	12.65
Somalia	4.45	2.34	-1.27	10.71	5.82	5.05	5.54	9.30	11.70	13.43
Tanzania	4.66	4.43	7.03	12.11	9.06	18.75	4.49	2.33	18.24	13.19
The Gambia	3.28	1.83	-6.20	11.00	11.49	28.14	8.56	0.26	2.24	4.56
Togo	3.28	1.83	-6.20	11.00	11.49	28.14	8.56	0.26	2.24	4.56
Tunisia	3.94	-4.01	-3.27	14.43	-2.02	11.63	5.58	6.32	9.37	13.06
Upper Volta	4.45	-4.56	-2.97	18.49	-5.06	16.55	8.33	1.14	5.98	12.76
Zambia	4.65	-4.43	-0.35	9.58	5.82	17.23	14.94	10.69	10.77	12.86
Zimbabwe	4.36	-2.90	-2.40	9.48	4.57	14.18	5.94	17.12	12.08	7.95
ASIA										
Bangladesh	n.a.	2.28	10.67	15.29	53.96	32.74	5.72	6.96	15.27	12.80
Burma	5.89	17.55	-1.29	9.49	38.68	9.93	10.94	5.50	8.58	12.80
Fiji	3.28	0.51	4.97	11.70	8.34	14.36	7.38	1.59	10.40	11.30
India	4.67	5.67	10.67	15.14	9.20	12.02	3.06	3.05	10.88	10.20
Indonesia	12.44	9.91	8.73	10.50	5.82	5.05	5.54	15.81	52.65	14.06
Korea	16.77	17.26	10.11	11.02	26.69	5.05	5.54	9.30	11.70	38.93
Malaysia	4.36	-3.19	-4.61	9.01	5.59	10.88	2.38	3.39	6.19	12.90
Nepal	4.66	4.43	12.43	11.06	10.01	18.65	5.54	6.18	10.79	13.43
Pakistan	4.66	92.19	20.50	9.55	5.82	5.05	5.54	9.30	11.70	13.43
Philippines	13.59	8.15	10.00	10.97	12.59	7.70	5.03	8.79	11.86	15.24
Singapore	4.22	3.39	-4.28	10.22	3.12	9.24	4.26	2.52	7.33	11.90
Sri Lanka	4.36	5.54	15.45	14.30	11.85	25.03	13.75	79.81	11.45	19.63
Thailand	4.66	4.43	7.86	9.31	5.84	5.15	5.54	8.98	12.11	13.71
EUROPE										
Portugal	3.13	-0.01	-0.07	13.47	6.38	23.35	32.16	24.09	23.04	15.76
Turkey	34.37	-0.70	8.73	8.92	9.51	16.20	17.68	44.18	39.68	158.10
Yugoslavia	24.32	18.07	3.95	8.79	15.07	9.69	6.11	11.19	13.59	43.13
LATIN AMERICA										
Antigua	3.40	1.71	10.70	15.29	11.49	25.55	8.80	9.30	11.70	13.43
Argentina	27.02	81.20	23.27	5.34	318.06	287.77	196.74	104.51	77.20	52.93
Barbados	3.40	1.71	10.70	15.29	4.20	4.24	5.69	9.52	11.70	13.43
Bolivia	4.66	16.33	59.16	10.50	5.82	5.05	5.54	9.30	13.66	33.62
Brazil	19.77	16.65	11.96	21.34	25.50	36.38	38.06	37.05	60.82	109.06
Chile	7.85	61.55	477.42	661.32	496.08	170.89	70.46	56.33	29.36	18.14
Colombia	12.73	14.13	16.83	20.76	24.48	17.22	11.53	15.60	20.54	24.55
Costa Rica	4.67	4.56	8.90	29.80	13.89	5.05	5.54	9.30	11.70	13.43
Dominica	3.40	1.71	10.70	15.19	11.49	25.55	8.80	9.30	11.70	13.43
Dominican Republic	4.66	4.43	8.73	10.50	5.82	5.05	5.54	9.30	11.75	13.43
Ecuador	24.18	4.43	8.72	10.50	5.82	5.05	5.54	9.30	11.70	13.43
El Salvador	4.66	4.43	8.72	10.50	5.82	5.05	5.54	9.30	11.70	13.43
Grenada	3.40	1.71	10.70	15.29	11.49	25.55	8.80	9.30	11.70	13.43
Guatemala	4.66	4.43	8.73	10.50	5.82	5.05	5.54	9.30	11.70	13.43
Haiti	4.66	4.43	8.72	10.49	15.81	5.05	5.54	9.30	11.70	13.43
Honduras	4.66	4.43	8.72	10.49	5.82	5.05	5.54	9.30	11.70	13.43
Jamaica	3.27	1.90	22.21	10.50	5.82	5.05	5.54	65.37	36.23	14.25
Mexico	4.66	4.43	8.72	10.50	5.82	28.45	51.87	10.16	11.87	14.07
Panama	4.66	4.43	8.73	10.50	5.82	5.05	5.54	9.30	11.70	13.43
Paraguay	4.66	4.43	8.73	10.50	5.82	5.05	5.54	9.30	11.70	13.43
Peru	4.66	4.43	8.73	10.50	11.24	45.81	51.47	95.82	55.33	41.98
St. Vincent	3.40	1.71	10.70	15.29	11.49	25.55	8.80	9.30	11.70	13.43
Trinidad & Tobago	3.40	1.71	10.70	15.29	11.49	17.30	4.07	9.30	11.70	13.43
Uruguay	8.66	110.61	70.22	48.66	94.26	53.03	45.78	38.83	41.42	29.18
Venezuela	4.71	2.19	6.55	10.03	5.83	5.16	5.60	9.30	11.70	13.43
MIDDLE EAST										
Jordan	4.66	4.42	0.45	8.81	5.10	8.86	4.72	2.11	9.97	12.63
Yemen Arab Republic	4.04	-9.77	7.26	9.49	5.62	4.97	5.54	9.30	11.70	13.43
Yemen People's Democratic Republic	4.36	-3.19	-0.15	9.27	5.82	5.05	5.54	9.30	11.70	13.43

* Rd_2 is derived, as explained in the text, by adjusting foreign interest rate for the actual change in the exchange rate for the concerned countries.

Table 7. Real Interest Rates (Rd_3) in Selected LDCs, 1971-1980

(In percent per annum)

Country	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
AFRICA										
Benin	-4.23	7.44	-2.37	-5.16	-8.43	-10.72	-20.63	-5.93	--	--
Botswana	--	--	--	--	--	-3.64	-3.93	11.23	-21.49	-12.83
Cameroon	-5.01	1.23	-2.31	-8.12	-5.96	-27.95	-8.23	--	--	--
Congo	--	--	--	--	--	--	-6.26	-3.26	-2.16	-9.13
*Gabon	1.11	1.55	-1.25	-7.01	-23.32	-14.97	-8.65	-5.56	-3.15	-7.54
Ghana	--	--	--	-19.63	-21.95	-20.49	-59.75	-61.32	-27.64	-32.46
*Ivory Coast	1.53	2.91	-6.31	-12.62	-5.93	-6.57	-21.89	-7.51	-11.10	-7.16
Kenya	-4.55	0.25	-5.45	-11.38	-11.46	-10.56	-11.83	1.95	-1.35	-.69
Liberia	--	--	--	--	-34.80	6.85	-6.45	2.31	-0.31	1.02
Malawi	-4.64	2.32	-25.78	-13.00	-3.75	-1.26	-6.51	5.95	3.62	-2.67
*Mauritius	6.04	-0.08	-8.18	-23.11	-8.56	-6.74	-1.18	-1.00	-6.01	-31.95
*Mauritania	-1.76	-2.11	-1.61	-6.22	-5.91	-8.38	-4.31	-1.20	-2.98	-2.26
Morocco	-3.96	-1.19	-3.14	-12.46	2.41	1.28	-7.44	0.47	-0.60	-0.20
*Niger	-4.18	-6.52	-6.98	1.41	-3.64	-18.04	-17.77	-4.56	-1.78	-2.80
Nigeria	-0.64	4.85	-16.02	-62.17	-17.27	-6.87	-0.11	-24.65	-7.72	-1.89
Senegal	-3.07	-0.74	-2.98	-13.13	-5.82	0.75	1.01	-12.41	-1.04	--
Sierra Leone	1.23	-1.33	-7.24	-12.77	-10.86	-3.49	-12.56	-6.87	-4.68	0.99
*Somalia	5.57	7.98	-1.50	-13.24	-12.86	-7.61	-4.06	-3.45	-17.77	-50.34
Tanzania	1.80	-2.15	-9.30	-14.58	-7.96	-11.00	6.25	-10.93	-2.40	-2.61
*The Gambia	3.03	-2.62	-0.91	-3.25	-19.90	-11.07	-5.41	-1.81	2.89	5.30
Togo	-4.74	0.23	-2.96	-33.88	6.67	-1.24	-11.82	1.31	--	--
Tunisia	-5.15	1.72	-3.85	-12.83	1.39	-0.67	-5.09	-2.53	-6.32	-8.80
*Upper Volta	-2.10	6.21	-2.86	-3.95	-13.28	13.90	-24.51	-2.76	-9.41	-4.78
Zambia	6.96	-3.93	-19.18	-6.43	19.25	-6.16	-2.27	-2.60	-20.96	-3.13
Zimbabwe	1.70	0.54	-3.16	-8.05	-3.51	-4.45	-4.73	0.84	-12.40	-7.31
ASIA										
Bangladesh	--	--	--	-33.59	-64.09	30.87	11.48	-6.70	1.77	-0.91
*Burma	-0.30	-5.60	-22.43	--	21.82	-13.15	7.85	12.10	5.20	9.20
*Fiji	-6.55	-8.99	-5.78	-8.45	-6.72	-4.65	0.75	0.48	-0.77	-7.50
India	1.25	-4.71	-12.36	-11.38	9.51	-0.22	4.55	3.90	-8.49	-4.99
Indonesia	14.22	4.42	-16.13	-29.27	-0.48	-2.46	-1.00	-1.95	-23.49	-20.14
Korea	9.41	-0.48	-1.18	-14.70	-9.47	-1.63	-2.09	-2.22	-0.42	-2.95
Malaysia	6.47	5.41	-11.37	-3.70	11.56	-4.22	-0.35	-3.34	-1.91	-0.86
*Nepal	--	10.57	6.42	-15.21	4.58	15.82	2.23	4.82	9.20	-1.92
Pakistan	39.49	-0.91	-8.41	-15.06	-16.65	-3.85	0.23	1.73	0.23	-0.23
Philippines	-6.01	-0.30	-11.31	-23.85	0.07	-1.48	1.18	-0.98	-4.81	-0.98
Singapore	1.55	0.35	-4.93	-6.57	3.36	3.89	3.77	3.53	3.75	4.30
Sri Lanka	2.11	10.34	-5.57	-13.24	4.20	2.18	-5.10	1.89	-4.75	-9.14
Thailand	5.45	-1.63	-8.18	-6.85	5.21	4.06	-0.58	-0.62	-2.60	-4.42
EUROPE										
*Portugal	-6.64	-4.13	-12.86	-13.03	-11.02	-9.31	-12.17	-3.54	-4.75	2.35
*Turkey	-15.69	-7.76	-9.35	-9.87	-13.21	-11.34	-21.08	-39.30	-44.68	-69.08
*Yugoslavia	-15.53	-6.20	-9.28	-12.13	-13.42	-1.22	-4.54	-3.60	-11.82	-13.38
LATIN AMERICA										
Antigua	--	--	--	--	--	--	2.71	-10.27	-4.34	-1.57
Argentina	-33.00	-26.00	-49.16	-10.66	-163.00	-334.51	-64.30	-41.81	-40.16	-24.08
Barbados	7.03	0.22	-1.93	-24.17	-2.13	-4.21	-1.19	-2.03	--	--
Bolivia	5.64	-10.30	-31.55	-48.14	3.45	1.86	-0.86	-3.45	-3.21	-21.92
Brazil	8.19	6.02	0.01	-9.10	-10.61	-17.21	-3.66	0.21	-31.87	-40.70
Chile	--	-192.5	-359.1	-584.8	-227.78	-78.25	-10.56	12.12	-1.88	6.80
Colombia	2.56	-0.39	-9.01	-3.69	3.20	0.33	-4.31	4.92	-1.08	8.28
Costa Rica	4.58	0.55	-7.82	-11.22	-10.52	-3.60	-3.93	10.09	8.85	-0.83
Dominica	--	--	--	--	-14.21	-25.01	-6.45	-7.95	-13.46	-1.62
Dominican Republic	2.81	-26.57	17.53	-13.93	-9.23	4.64	-3.09	6.59	-3.58	-6.27
Ecuador	1.35	6.74	3.03	-31.03	-1.01	-3.93	-8.50	1.10	-6.61	-11.51
El Salvador	4.64	3.94	-5.02	-5.21	-1.56	-16.07	-11.91	11.64	-1.35	-0.93
Grenada	--	--	--	--	--	-6.41	-5.43	-15.14	-9.84	-9.41
Guatemala	8.26	8.33	-7.44	-6.71	-4.09	-2.48	-7.46	3.51	0.40	-1.29
Haiti	1.62	3.73	-22.66	-22.58	-11.19	-10.93	-2.88	9.46	11.82	-9.25
Honduras	5.22	2.68	0.40	-2.70	-0.28	0.55	-4.47	4.08	3.52	0.36
Jamaica	0.27	6.79	-8.76	-17.86	-8.99	3.43	0.28	-14.14	-6.58	-6.71
Mexico	5.10	3.76	-2.37	-11.68	-3.78	-8.57	-16.38	-1.74	-5.02	-6.71
Panama	2.10	--	-3.54	-6.61	-4.39	0.47	0.84	-2.42	-3.73	-4.88
Paraguay	1.94	-0.64	-12.80	-15.76	1.40	2.95	-1.18	-2.44	-12.48	-5.84
Peru	4.58	3.64	-5.70	-7.66	-11.07	-20.94	-25.23	-34.91	-43.25	-20.94
St. Vincent	--	--	--	--	--	-0.80	-5.38	-10.23	-4.37	-2.00
Trinidad & Tobago	-0.31	-4.82	-10.16	-44.08	-16.98	-0.95	-7.70	4.86	-13.29	-24.96
Uruguay	-1.34	-58.70	-85.88	-14.40	-23.86	13.67	9.28	1.89	-23.77	-2.73
Venezuela	0.45	2.78	-5.08	-37.30	7.76	1.46	-0.84	0.80	-10.66	-11.56
MIDDLE EAST										
Jordan	--	90.20	-5.36	-22.56	1.36	-5.38	-8.51	-0.96	-7.95	-4.71
Yemen Arab Republic	3.45	-5.11	-1.73	-7.03	-12.05	-8.69	-16.08	-9.02	-8.15	2.56
*Yemen People's Democratic Republic	-0.33	-0.24	-14.75	-15.30	-5.50	2.25	0.84	6.05	-13.80	-10.04

Source: IMF, International Financial Statistics. Real interest rate is calculated by correcting nominal interest rate for a percentage change in GDP deflator i.e., $r = \frac{1 + i}{1 + P} - 1$ where i is the nominal interest rate and P is the GDP deflator. For the countries with asterisk CPI is used instead of GDP deflator in view of its nonavailability.

other hand, interest rates in some of the LDCs are the minimum prescribed though the actual interest rates prevailing there may in fact be higher than the minimum.

In a few LDCs such as Argentina, interest rates used represent the maximum during a certain part of the period covered in this paper, and the market-determined ones in the other part of the period. Furthermore, in some LDCs interest rates on time deposits vary according to the size of deposits. In such cases, interest rates offered on deposits in the highest size brackets are included.

It should be noted that there is a certain lack of consistency in the choice of financial assets. First, there are several cases where the interest rate on savings deposits is chosen because of nonavailability of statistics on other interest rates. Second, while the effort is made to confine the choice to one-year time deposits, deposits of shorter or longer maturity are considered in certain cases. Likewise, the term of time deposits interest rates on which are selected, is changed in individual years in some LDCs and that too not always consistently. Third, though the interest rate series mainly pertain to bank deposits, use has been made where necessary of comparable assets of comparable financial institutions, such as mortgage banks in the case of Mexico.

At least for some of the LDCs in which the interest rates are prescribed by the monetary authorities, the series used may not necessarily reflect the real situation in the countries. Very often, the legal restrictions on bank deposit rates are circumvented by new financial institutions or new saving instruments not subject to the control of the supervisory authorities; interest rates on such instruments tend to be freely determined in the market (see V. Galbis, 1979; Khatkhate and Villanueva, 1979). Since information on this type of financial asset is not easily available for many countries, only the financial liabilities of commercial banking system in LDCs are considered.

It needs to be stressed that these interest rate series are constructed with respect to the current rate of inflation and exchange rate changes, rather than with respect to the expected rate of inflation and exchange rate, though the latter would be a more appropriate procedure from the point of view of the behavior of economic agents. This is done because of the serious difficulties involved in measuring expected inflation. 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, 1982; 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).

The means of the three interest rate series Rd_1 to Rd_3 for the period 1971-1980 are presented in Table 8. The last column 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 interest rates. This is not surprising because there is a sound economic basis for a close correspondence between internationally competitive interest rates and the positive real interest rates domestically. Existence of internationally competitive interest rates 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. This thus tends to ensure attainment of positive domestic real interest rates (M. Guitian, 1981).

Perhaps, the suggested alternative may not be favored on two counts. For one thing, a level of interest rates, judged as appropriate by this criterion, while being generally conducive to higher domestic saving and increased foreign capital inflow, may adversely react on domestic investment, essential for development. Second, if the level of foreign interest rates remains high, (as actually happened in the industrial countries during the early 1980s, largely as a result of the monetary and fiscal policies followed by them) it will not help LDCs, if they happen to pursue interest rate policies on the basis of prevailing interest rates in the industrial countries. Taking the first of these objections, it should be recognized that what is crucial from the point of view of domestic investment is the differential between the expected

Table 8. Mean of Interest Rates: Rd_1, Rd_2, Rd_3 in LDCs, 1971-1980*

Country	Rd_1	Rd_2	Rd_3	$Rd_1 - Rd_2$
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
Gabon	5.25	12.45	-6.77	-7.2-
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
Mauritius	7.65	14.80	-7.15	-7.15
Morocco	6.00	12.08	-2.55	-6.08
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

(Continued)

Table 8. (Continued) Mean of Interest Rates: Rd_1, Rd_2, Rd_3 in LDCs, 1971-1980*

Country	Rd_1	Rd_2	Rd_3	$Rd_1 - Rd_2$
AFRICA (continued)				
Tanzania	3.79	12.45	-7.31	-8.66
The Gambia	6.91	11.28	-3.22	-4.37
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

(Continued)

Table 8. (Continued) Mean of Interest Rates: Rd_1, Rd_2, Rd_3 in LDCs, 1971-1980*

Country	Rd_1	Rd_2	Rd_3	$Rd_1 - Rd_2$
ASIA (continued)				
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
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

(Continued)

Table 8. (Concluded) Mean of Interest Rates: Rd_1, Rd_2, Rd_3 in LDCs, 1971-1980*

Country	Rd_1	Rd_3	Rd_4	$Rd_4 - Rd_2$
LATIN AMERICA (contd.)				
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	8.67	-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 Democratic Republic	3.91	7.71	-5.08	-3.80

Source: Derived from Tables 5, 6, and 7.

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.

As regards the second objection, foreign interest rates, being determined freely by market forces, generally remain high when inflationary expectations are high. In which case, the interest rate which LDCs will in fact have would tend to be lower than the foreign interest rate to the extent that higher foreign inflation rate than in the concerned LDCs will result in depreciation of the currencies in the industrial countries.

This suggests that the monetary authorities in LDCs can derive useful guidance in determining the desired level of domestic nominal interest rate from the relevant foreign interest rate and the expected change in exchange rate indicated by the 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 elements of a free market mechanism.

IV. Relationship Between Real Interest Rate Level and Certain Macroeconomic Variables in Selected LDCs

It was observed in earlier sections that though there are considerable difficulties in measuring accurately the level of real interest rates, one will not go far wrong, if it is approximated by subtracting the foreign interest rate, adjusted for the expected change in the exchange rate from the prevailing domestic nominal interest rates. Some of the relevant macroeconomic variables which are presumed to be significantly related to the real interest rate level could then be conveniently analyzed. This section focuses on this relationship for

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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.

a number of LDCs which are selected more on the basis of data availability than on any precise statistical criterion.

The real interest rate is a reward for saving, affecting how an income earner allocates his income between present consumption and future consumption. But it is also a price which governs the distribution of saving once it is accumulated--a stock concept--among different assets, financial and real. The interest rate also has as much bearing on the users of savings--that is the investor, as it is through them that savings are put to productive use which eventually contribute to the rate of growth. Thus the interest rate level has an impact, first on the saving-investment processes and through them on the rate of growth of output, development and diversification of financial assets, rate of return on capital, capital intensity and a host of other macroeconomic variables. However, for the purpose of empirical investigation, only seven variables are chosen here, for observing the relationship between them on the one hand and the level of real interest rates on the other, over the period 1971-80.

The macroeconomic variables selected here are: rate of growth of real GDP, rate of growth of real financial assets, gross domestic saving/income ratio, gross investment/income ratio, marginal rate of return to capital, incremental output/capital ratio and rental/wage rate ratio. These macroeconomic variables are interrelated and not independent of each other. But these are separately seen in relation to the level of real interest rates, only for analytical convenience.

Interest rate policy affects the rate of growth of real GDP not directly but indirectly, via its impact on domestic saving, financial assets accumulation, volume of investment, its pattern and efficiency. In this sense, changes in GDP are subsumed in the changes in other performance variables. However, the rate of growth of real GDP is singled out mainly because it is the ultimate target which the authorities aim at, in framing their policies or choosing the policy instruments. Though the stimulus for growth can also emanate from external factors, in the long run it is mainly the right kind of economic policy which assists by preventing distortions in the economy in attaining the objective of rapid growth in real incomes (Lanyi and Saracoglu, 1983; Johnson, 1984).

The rate of growth of real financial assets is the other performance variable. Nominal financial assets are corrected for price changes as reflected in the GDP deflator because in an inflationary environment, there is a ballooning effect on the volume of financial assets. Financial assets are vehicles through which real resources are transferred from those who have them in excess of their own requirements to those who are equipped to invest them more efficiently. This implies that the faster the financial assets accumulation, the larger is likely to be the amount of productive investment and consequently greater is the rate of growth of output. It is conceivable, of course, that causation may run from GDP growth to the growth of real financial

assets, as with the increase in income, the propensity of savers to hold more financial assets increases. But empirical support for the causation to run from financial assets accumulation to growth in LDCs seems to be strong (Lanyi and Saracoglu, 1983). It is therefore reasonable to suppose that an upward change in the real interest rate will tend to lead to the growth of real financial assets.

It has been almost taken as axiomatic that a high positive real interest rate provides an incentive to save more than otherwise by making present consumption more costly than future consumption. However, whether or not saving responds to changes in the rate of interest depends on the relative strength of income and substitution effects. If, between the two, the income effect is stronger, an upward movement in interest rate would tend to lower saving rate rather than raise it. This means that it is necessary to determine empirically whether the substitution effect--the effect of substituting future consumption for present consumption--or the income effect dominates in order to know whether the interest rate would necessarily have a positive impact on the volume of saving. The empirical evidence about the interest elasticity of savings is ambiguous (Thirlwall, 1974; Williamson, J.G., 1968; Sundararajan and Thakur, 1980; Chandavarkar, 1971); Leite and Makonnen, 1984; A. Giovannini, 1983), for a variety of reasons. For one thing, empirical investigation faces difficulties in identifying saving as distinct from investment because of the fact that ex post saving and investment are always equal. Apart from this, decisions to save in LDCs are generally coterminus with decisions to invest as savings tend to increase simultaneously with the opening up of new investment opportunities (Hirschmann, 1958). The consequences of this interdependence are not allowed for in most of the single equation exercises employed in investigating saving functions in LDCs (Leff and Sato, 1975). For another, there are some serious statistical problems involved in calculation of saving. Conventionally, domestic saving is arrived at by deducting foreign inflows as represented by current account deficit in the balance of payments from gross domestic investment. This procedure inevitably results in a large margin of error. Like monetary investment, nonmonetary investment also is generally underestimated in LDCs as it is based often on capital goods imports without adequate allowance for domestic value-added. Furthermore, the errors in calculation of domestic saving are compounded by errors in calculation of foreign resource inflows (Papanek, 1972) as well as national income accounts. Thus domestic saving estimates generally have an unsystematic bias.

Even more importantly, deficiency of saving statistics emanates from the changes, in two opposite directions, in the composition of saving. Much of domestic saving in LDCs consists of inventories of goods. This form of saving tends to decline when real interest rate rises and correspondingly saving in financial assets goes up. Unless the latter effect more than swamps the former effect, the domestic

saving/income ratio may not register a significant upward change with the rise in real interest rate. 1/

The third difficulty in judging responsiveness of savings to interest rate changes is generally attributed to the predominance of the contractual component of saving in total saving in LDCs. Much of saving in LDCs takes the form of contributions to social security, provident funds or pension funds and life insurance or ownership of houses, none of which is likely to be very sensitive to the level of the interest rate. Furthermore, in many LDCs some part of total saving is accumulated by the public sector, either through surpluses generated by tax measures or pricing policies of the public sector enterprises. Notwithstanding these limitations of empirical investigation, a positive relationship between high real interest rates and saving/income ratio should generally prevail.

In regard to the gross investment/income ratio, the relationship between it and the level of the real interest rate is assumed to be positive so that higher the real interest rate, the higher should be the ratio of investment to income. Though this assumption may appear to be contradictory, there need not be necessarily an inverse relationship, in the context of LDCs, between the real rate of interest and the level of investment. A higher real interest rate does not always mean that profitability of investment will be reduced in consequence since it is the difference between the rate of interest and the rate of profit that a producer is most concerned with (Khatkhate, 1980, 1982; Roe, 1982). There is no a priori reason to believe that this differential will necessarily narrow with the higher interest rate. In an economic environment in which the real interest rate is allowed to remain positive and at a relatively high level, not only will domestic saving not flow out but there will be influx of foreign saving, thereby relieving the economy of foreign exchange shortages impeding domestic investment. In that case, the expected rate of return on investment would tend to rise faster than the increase in the real interest rate. Furthermore, in view of the widely felt shortage of capital in these countries thwarting new investment opportunities, any increase in financial saving following a positive level of real interest rate, may well enhance the investment/income ratio. All this implies that the relationship between the level of real interest rate and investment/income ratio, far from being negative, should be expected to remain positive.

For the same reasons, a relationship between the level of real interest rate and the marginal rate of return to capital is expected to be positive. In an attempt to find a reasonable proxy for the marginal rate of return to capital, it is defined as the rate of growth of real

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1/ Apart from this, aggregation of private and public sectors as a homogenous group of life-cycle savers tends to bias the coefficients of the private sector's saving function (A. Giovannini, 1983).

GDP divided by the investment/income ratio and multiplied by the share of profits in GDP. The rate of return so calculated should be taken as a rough approximation, mainly for the purpose of comparing it with the level of real interest rate.

Two complementary measures to judge the efficiency of capital are the incremental output/capital ratio (IOCR) and the rental/wage ratio. The IOCR is calculated by dividing the rate of growth of real GDP by the investment/income ratio. It is assumed that real interest rate is positively correlated with incremental output/capital ratio as capital is more efficiently utilized. The other measure is the rental/wage ratio calculated using the procedure suggested by Sundararajan and Thakur (1980) under which the real interest rate, representing user cost of capital is divided by the real wage rate. A higher value of this ratio implies that capital is more economically used with higher interest rate and therefore it can be taken in a broad sense as a measure of capital intensity. On this reasoning, countries which pursue a higher interest rate policy should have a higher rental/wage ratio. Unfortunately, this measure is very rough even in respect of those countries for which the relevant data could be obtained. For most of them, the information is not available and therefore the trends in this ratio should be seen in conjunction with those in the incremental output/capital ratio for judging the efficiency of capital use.

Cross-country evidence bearing on the average relationship between each of these macroeconomic variables and the level of real interest rate for 64 LDCs selected on the basis of data availability for a period 1971-80 is presented in Table 9. Countries are classified according to the mean of real interest rates prevailing during the period. 1/ In classifying countries according to the level of real interest rates, some judgment had to be inevitably used to decide what should precisely represent the degree of positivity or negativity of real interest rates. It is clear from Table 8 that only 9 out of 69 countries have real interest rates with a plus sign. However, this should not be taken to mean that other countries with real interest rates with a minus sign are necessarily the countries with negative real interest rates. Since analysis in Section II has made it clear that too much should not be read into the estimated real interest rate series derived from the available price indices, be it the CPI, WPI, or GDP deflator, it suggests that real interest rates may perhaps be better viewed in a range. It is accordingly assumed that if real interest rate falls in a range of -2 percent and above, it may be interpreted as non-negative; if it is in the range of -2 and -5.5, it is moderately negative; if it is below -5.5, it is severely negative. On this criterion, the 64 LDCs are

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1/ There will be hardly any change in classification if countries are grouped by the difference between domestic nominal interest rate, i.e., Rd_1 and the foreign interest rate adjusted for exchange rate changes, i.e., Rd_2.

Table 9. LDCs: Growth of Real GDP, Real Financial Assets, Saving/Income Ratio, Investment/Income Ratio, Rate of Return to Capital, Incremental Output/Capital Ratio, Rental/Wage Ratio, Classified by the Level of Real Interest Rates, 1971-80 1/ (Mean)

(In percent per annum)

Country	Rate of Growth of Real GDP (1)	Rate of Growth of Real Financial Assets (2)	Gross Saving/Income Ratio (3)	Gross Investment/Income Ratio (4)	Marginal Rate of Return to Capital (5)	Incremental Output/Capital Ratio (IOCR) (6)	Rental/Wage Rate (7)
			Group 'A' Countries with Non-Negative Interest Rates				
Botswana	12.98	3.65	19.06	41.02	1.24	31.00	0.46
Colombia	5.21	3.45	19.05	20.73	13.47	25.90	0.10
Dominican Republic	6.43	3.86	14.87	19.19	28.98	39.00	--
El Salvador	2.13	8.59	13.98	16.60	12.47	7.00	--
Guatemala	4.85	10.39	13.23	15.71	--	32.00	--
Haiti	2.81	5.51	6.55	13.55	3.79	20.00	--
Honduras	3.83	7.54	16.15	21.05	17.46	16.90	--
India	3.44	5.18	18.86	19.69	1.91	17.49	32.61
Jordan	5.37	4.61	-14.06	23.19	13.16	27.90	--
Korea	7.95	5.52	20.38	25.98	16.18	31.70	1.62
Malaysia	7.06	9.29	26.96	23.64	5.92	30.30	--
Nepal	2.10	0.86	19.12	22.36	--	9.20	--
Pakistan	4.89	4.03	6.72	14.40	28.82	28.40	0.06
Panama	4.46	7.07	21.82	27.03	4.66	16.90	--
Singapore	8.86	12.29	25.99	37.02	--	24.00	--
Sri Lanka	4.25	12.54	12.38	18.37	10.53	22.80	0.03
Thailand	6.64	10.06	21.64	23.59	16.34	28.20	61.34
Average for Group "A"	5.42	4.98	16.28	22.53	11.78	24.03	13.73
			Group 'B' Countries with Moderately Negative Real Interest Rates				
Antigua	7.40	1.73	-3.5	41.1	--	18.20	--
Barbados	3.76	2.38	12.32	22.54	0.07	16.70	--
Burma	4.49	8.30	11.33	13.67	15.02	33.63	--
Costa Rica	4.91	10.67	13.39	22.13	8.55	21.90	0.03
Fiji	4.31	3.84	16.10	21.20	--	20.10	--
Jamaica	0.54	3.30	14.92	21.44	-0.43	-2.00	0.26
Kenya	5.73	5.01	17.34	21.03	13.33	26.10	1.08
Malawi	4.89	4.88	11.48	21.25	20.53	24.60	--
Mauritania	2.15	5.67	26.13	29.16	0.17	9.10	--
Mexico	6.74	4.39	20.67	21.90	16.04	30.80	--
Paraguay	7.67	1.10	16.59	21.06	19.50	36.40	--
Philippines	5.37	3.59	21.92	24.93	18.73	22.09	0.05
Senegal	2.38	13.91	7.23	16.70	7.71	13.80	--
The Gambia	3.03	3.30	30.14	16.08	--	44.60	--
Tunisia	7.09	8.79	19.57	24.28	26.25	30.70	0.49
Venezuela	4.13	6.68	31.04	29.28	7.34	13.80	0.04
Yemen Arab Republic	7.79	1.73	-10.24	20.11	37.03	47.50	
Zambia	0.81	4.30	29.81	28.44	0.68	-2.00	--
Average for Group "B"	5.33	5.87	16.50	23.18	12.60	22.77	0.32
			Group 'C' Countries with Severely Negative Real Interest Rates				
Argentina	1.88	2.46	21.08	20.04	--	12.40	--
Bangladesh	3.18	2.15	1.78	9.74	--	18.10	--
Benin	3.02	5.28	1.66	16.88	7.29	17.10	0.24
Bolivia	3.43	6.68	18.00	18.02	9.80	18.10	0.03
Brazil	7.09	2.91	20.50	22.28	29.14	31.00	11.92
Cameroon	6.15	5.09	17.98	19.42	5.60	31.20	0.71
Chile	2.69	3.46	21.18	23.05	2.64	12.00	0.01
Congo	6.14	7.34	13.30	27.54	--	22.40	--
Dominica	1.10	3.42	-12.50	24.90	--	4.10	--
Ecuador	7.77	4.11	20.76	23.02	23.05	36.30	--
Gabon	5.83	7.52	50.06	42.73	5.51	11.40	0.58
Ghana	0.17	2.86	10.76	10.94	0.23	-2.00	--
Indonesia	7.38	6.85	20.08	18.11	37.53	41.80	--
Ivory Coast	5.52	-0.71	24.02	24.04	10.78	23.50	--
Liberia	--	7.20	29.50	30.90	--	--	--
Mauritius	5.25	14.13	20.38	24.39	8.21	18.50	0.05
Niger	2.83	7.95	12.78	24.60	--	10.80	--
Nigeria	5.91	5.41	25.05	23.07	22.11	32.10	--
Peru	3.12	3.37	14.56	15.17	10.42	20.20	7.07
Portugal	4.51	2.74	10.07	20.64	8.76	21.40	--
Sierra Leone	2.39	2.41	4.72	12.88	7.49	16.50	0.27
Somalia	3.81	17.46	3.96	13.02	--	32.20	--
Tanzania	4.48	4.90	10.83	18.54	13.41	30.80	0.05
Togo	2.77	18.63	15.72	26.39	7.67	12.00	--
Trinidad & Tobago	4.55	5.31	34.77	26.35	--	16.80	--
Turkey	4.69	3.37	15.28	20.21	14.38	24.90	--
Upper Volta	2.96	5.14	-2.70	17.76	4.47	15.80	--
Uruguay	2.88	2.87	9.50	12.20	9.46	25.10	0.05
Yugoslavia	5.10	3.19	25.23	30.03	--	17.00	--
Average for Group "C"	4.00	5.61	16.86	21.95	11.47	19.50	1.90

*Number of countries is not identical with that in Tables 5 to 8 as five countries, mainly Morocco, Zimbabwe, Grenada, St. Vincent and Yemen People's Democratic Republic are excluded for lack of data.

Sources: World Bank Statistical Tables, 1983; U.N. National Income Yearbook, 1983.

1/ Real interest rates are interpreted as non-negative, if they are in a range of -2 percent and above, as moderately negative if they are below -2 but above -5 and severely negative if they are below -5. For explanation, see the text.

divided into three groups--those with non-negative real interest rates--(Group A), those with moderately real interest rates--(Group B), and those with severely negative interest rates--(Group C).

If the real interest rates have significant impact on the macroeconomic variables, it should be reflected in the higher numerical averages for those variables. However, at a first glance the evidence in Table 9 does not seem to support this inference. Group A countries with non-negative real interest rates have generally experienced on average higher rate of growth of real GDP during 1971-80. This holds true also for incremental output/capital ratio. As to be expected, incremental output/capital ratio is highest in countries which have non-negative real interest rates and lowest in Group C countries with severely negative real interest rates. In respect of the other macroeconomic variables, the evidence is mixed. In Group A countries, average for the rate of growth of real financial assets is less than that in Group B and C countries.

The group average for gross saving/income ratio is the highest for 'C' Group countries, followed by that for Group 'B' and 'A' countries, implying that the level of real interest rates may not have had a significant effect on the saving/income ratio. The average of gross investment/income ratio, on the other hand, is highest for Group 'B' countries, and the lowest for Group 'C' countries. The rental/wage ratio is the highest in Group 'A' countries with non-negative level of real interest rates but lowest in Group 'B' countries with only moderately negative real interest rates.

A striking fact about the estimated marginal rate of return to capital is that it is positive in real terms in all the three group of countries and that it is higher than the level of real interest rates. In no country in any of the three groups, for which the data could be obtained was the average of the marginal rates of return to capital during 1971-80 lower than the average level of real interest rates. This suggests that the level of real interest rates in these LDCs, even if raised, could not have hampered investment.

The statistical analysis based on Table 9 should not necessarily be taken as conclusive, since it simply relates the averages of various macroeconomic variables to the level of real interest rate. Any difference between the group averages may or may not be significant in the strict statistical sense because the sample means are not likely to be identical with the respective population means. Furthermore, the procedure adopted in this paper in regard to selecting LDCs is statistically deficient, as the choice is dictated by the data availability. Hence, it is difficult to assume that the countries are normally distributed according to the level of real interest rates. It is therefore necessary to find out by help of an appropriate statistical test whether the mean differences in real interest rates are more systematically related to the mean differences in the selected macroeconomic variables.

A nonparametric rank-sum-test (the Mann-Whitney Test) is used for this purpose. Under this procedure, it is possible to test, without the assumption of normal distribution of population, the null hypothesis that the two samples have the same means. If the results of the test show that there are significant differences between the two samples, then the null hypothesis should be rejected. 1/ In order to apply this test, the 62 LDCs are arranged in an increasing order of the level of real interest rates. That is to say, a country with the highest negative rate is ranked first and the highest positive real interest rate country is ranked last. Countries above median value of real interest rate (i.e., -5.13 percent) are in the upper half and those below the median are in the lower half.

It may be noted that in applying the Mann-Whitney test, only five out of seven macroeconomic variables are included. The excluded variables are the marginal rate of return to capital and the rental/wage ratio. The reason for their omission, apart from the fact that these are not precise magnitudes in view of the suspect nature of the statistics, is that those figures are not available for a large number of LDCs included in Table 9 and for which real interest rate series was constructed. The test results would have been biased, if the sample had covered such countries.

The results of the Mann-Whitney test are summarized in Table 10 below.

Table 10

	Rate of Real Interest	RGDP	RGFA	GSIR	GIIR	IOCR
Real interest rate (Median = -5.13)						
( ) Mean ((Upper half	-16.60***	4.20	5.59	15.08	20.71	18.85
( ) Mean ((Lower half	-1.90***	5.19	5.97	16.29	25.32	22.53
Z statistic	(6.77)	(1.55)	(0.89)	(1.09)	(1.61)	(0.66)

1/ For the description and relevance of this test, see Pfaffenberger and Patterson, 1977, pp. 672-76.

Z critical values:

= .10	Z = 1.64	= *
= .05	Z = 1.96	= **
= .01	Z = 2.57	= ***

RGDP - Rate of growth of real GDP

RGFA - Rate of growth of real financial assets

GSIR - Gross saving/income ratio

GIIR - Gross investment/income ratio

IOCR - Incremental output/capital ratio

It is clear from Table 10 that there is no difference with any statistical significance between the mean of upper half and the lower half of countries. The relationship between the real interest rate and any of the five macroeconomic variables is not significant at 1, 5 or 10 percent level. Therefore, the null hypothesis cannot be rejected, implying that the level of real interest rates taken by itself has little impact on the rate of growth of real GDP, the rate of growth of real financial assets, gross saving/income ratio, gross investment income ratio and the incremental output/capital ratio.

Though the statistical test results appear to refute what one should expect on the basis of economic theory, they should not be taken necessarily as a firm evidence against any relationship between the macroeconomic variables and the real interest rate level. In this paper, as also in other similar studies, what is usually attempted is to observe effects of any one policy variable i.e., interest rate on the major performance variables in the economy. While this helps to perceive the importance of one policy variable, it cannot throw any light on what happens to the macroeconomic variables as a consequence of external factors or changes in other policy variables such as exchange rate, wage rate, fiscal balance and credit policy. 1/ It follows therefore that unless the whole range of policies is analyzed simultaneously in relation to the macroeconomic variables, no useful conclusions can be drawn from empirical research on the effects of interest rate policy *per se*.

1/ Authors of a recent study, analyzing the perverse effects in some LDCs of policies of trade and financial liberalization ascribe them partly to the external shocks and largely to the adoption of inappropriate domestic policies in other spheres, which worked at cross purposes with the policy of liberalization (M. Khan and R. Zahler, 1984).

There is some support for this belief from a recent study by Agarwala (1983) which analyzes the performance of 31 LDCs during the 1970s in terms of the various policies pursued. A composite distortion index has been constructed to reflect distortions in various policies such as real exchange rate, degree of effective protection for manufacture, pricing in agriculture, wage rate, real interest rate, pricing of public utilities, etc. These LDCs are classified into three groups, high, medium, and low, according to the value of the composite distortion index and the group averages of the individual components of growth are then compared in order to see whether these are inversely related to the value of the composite distortion index. These are presented in Table 11.

Table 11 reveals that the group averages of components of growth seem to vary inversely with the value of the composite distortion index, which means that higher the degree of distortions of all possible kinds, the lower the averages of the growth components. The significance of this observation lies in the fact that the empirical investigation that sets out relationships between one or two price distortions and the growth indicators often tends to yield results which are misleading. This is because the removing of distortion in one policy area may well reinforce, or offset a distortion in another policy area. In which case, the real impact of any one policy shift in a desired direction, may not be revealed in empirical findings.

In order to show this, purely for illustrative purposes, two individual distortion indices are added in Table 11 adapted from Agawarla's study. These are real interest rate and real exchange rate distortions. In Group I countries, the value of the composite distortion index is lower than that in Group II and III countries. The real interest rate distortion index is about the same in the Group I and II countries but very much higher in Group III countries. On the other hand, in Group II countries, while the real interest distortion index is about the same as in Group I countries, the real exchange rate distortion in that Group is lower than in the Group I countries. Now if one attempts to draw conclusions about the impact of interest rate and exchange rate policies on the macroeconomic variables on the basis of these two policies alone, nothing meaningful is likely to emerge. It is observed that despite the same degree of distortion in real interest rate but a higher degree of distortion in the real exchange rate policies, the Group I countries had recorded a better performance in regard to all components of growth. But this does not necessarily imply that the real exchange rate did not matter in Group I countries. All that one can say is that it is necessary, though difficult, to view the performance of the economy in relation to all possible policies undertaken at a given point of time or over time. If a change in particular policy is not associated with a change in the same direction in the growth indicators, then it should be interpreted as a signal to change other policies in the same direction in order to complement the effects of the first policy and not as a proof of the falsification of

Table 11. Group Averages of Aggregate Distortion Indices, Interest Rate Distortion, Exchange Rate Distortions and Various Components of Growth During the 1970s*

Country	Aggregate distortion index	Interest rate distortion index	Exchange rate distortion index	Annual GDP growth rate (In percent)	Average domestic saving/income ratio (In percent)	Average return on investment (In percent)	Annual growth rate of agriculture (In percent)	Annual growth rate of industry (In percent)	Annual growth rate of export volume (In percent)	Percentage of income going to bottom 40% of population
Group I	1.56	2.22	1.33	6.80	21.40	27.60	4.40	9.10	6.70	14.90
Malawi										
Thailand										
Cameroon										
Korea										
Malaysia										
Philippines										
Tunisia										
Kenya										
Yugoslavia										
Colombia										
Group II	1.95	2.22	1.22	5.70	17.80	26.90	2.90	6.80	3.90	14.00
Ethopia										
Indonesia										
India										
Sri Lanka										
Brazil										
Mexico										
Ivory Coast										
Egypt										
Turkey										
Group III	2.44	2.83	2.25	3.10	13.80	16.80	1.80	3.20	0.70	13.60
Senegal										
Pakistan										
Jamaica										
Uruguay										
Bolivia										
Peru										
Argentina										
Chile										
Tanzania										
Bangladesh										
Nigeria										
Ghana										

*Adapted from Table 15 included in R. Agarwala, "Price Distortions and Growth in Developing Countries". World Bank Staff Working Papers No. 575, 1983. High, medium, and low distortions are given nominal value of 3, 2, and 1, respectively. Averages are unweighted averages.

some fundamental economic relationships. This conclusion also draws support from another study (Johnson 1984) which attempts an investigation of whether there is a basis for the existence of a firm relationship in LDCs during the period 1976-83, between an outcome of policy measures such as credit expansion, fiscal balance and real effective exchange rate on the one hand and relative economic performance in these countries in respect of inflation, the current account balance and growth on the other. The results are, as expected, mixed, sometimes showing significant relationship and sometimes not, the difference being attributed either to the exclusion of other policies like the real interest rate level or the pricing of infrastructural facilities or to the effects of such exogenous factors as changes in the terms of trade.

A broad conclusion that may be drawn from the foregoing analysis of the empirical data is that when certain policies such as the interest rate policy or the real exchange rate policy or any other, are advocated, they derive their justification from economic rationality, the historical experiences and political and social conditions much more than from any quantification of the effects of those policies. The uncertainty of the empirical results is not so much due to the wrong hypothesis underlying them as due to the inherent difficulties in covering all possible policies, at one swoop in a single objective analytic framework and relating them simultaneously to the various macroeconomic variables though one could, of course, in theory, specify a model which makes allowance for all these factors and then proceed by assuming them to remain constant to determine the effects of real interest rates. This is apart from the absence of cross-section or time series statistical information of desired quality in regard to LDCs. For this reason, the empirical verification of any economic relationship between real interest rate, real exchange rate, public utility pricing or any other policy and the macroeconomic variables should be viewed as one in a series of many steps in understanding the complex economic landscape of LDCs.

V. Interest Rate Policy Component in Fund Programs

This section focuses on the role of interest rate policy in Fund-supported programs in recent past. There are broadly two sources of economic difficulties faced by LDCs--one is the choice of policies adopted by domestic authorities and the other is the external factors beyond the control of authorities. Countries approaching the Fund for use of its resources face both types of difficulties. Fund programs are designed to ensure that countries approaching it for assistance take such action as is necessary to remove domestic policy-induced distortions and financing is provided, in order to enable them to bridge the lag between implementation of corrective policies and the achievement of balance in external payments position, and growth with price stability.

Fund-supported adjustment programs considered here consist both of programs with structurally oriented policy content under the Extended Fund Facility (EFF) and those with demand management policy under the stand-by arrangements during the period 1978-81. Though, there is some distinction in the nature of policies prescribed under these two types of Fund programs, the difference stems not so much from the basic elements constituting the policies specified as from the weights assigned to various components of the policy package and the duration of the time period envisaged for observing the results of the specified policies. However, the objectives of both the types of Fund-supported programs are basically the same, that is, ensuring growth of the economies with stability in prices and sustainable external payments position and as such the framework of policies adopted under two kinds of program is more or less identical. For this reason, these are all considered together for assessing the degree of implementation.

Policy content of program broadly falls into the following categories: monetary and financial policies of which interest rate policy is one of the components, public sector policies, external debt policies, exchange and trade policies, and wages and pricing policies. It is evident from this description that the Fund does not view any single policy in isolation but as an integral part of a whole package of policies considered desirable to remove obstacles to the growth and stability of economies approaching it for financial support. It follows from this that the degree of effectiveness of any particular policy such as interest rate policy is determined not only by how well that particular policy instrument is designed and implemented 1/ but also by how effectively it has been dovetailed into a coherent policy package and how effectively the whole of the policy package is actually implemented.

Information relating to the array of specified policies in the Fund supported programs is presented in Tables 12 and 13 in respect of programs during the period 1978-81. It may be noted that programs during 1978-80 are in Table 12 and the programs during 1981 are separately given in Table 13. Also, the categories of policies differ as between two periods covered in these two tables because of nonavailability of the required information. However, this should not make any qualitative difference as the detailed policies have remained the same with a change only in their classification.

Tables 12 and 13 present program countries in the three groups classified according to the degree of implementation in respect of the interest rate policy requirement in the Fund program. Out of the 29 in Table 12, 9 countries' programs did not contain an interest policy

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1/ Precisely for the same reason, Beveridge and Kelly refrained from ascertaining any association between fiscal content of the Fund Programs and achievement of the objectives of programs (W. Beveridge and M.Kelly, 1981).

Table 12. Extended Fund Facility (EFF) and Stand-By Programs (SBP) Policies: Content and Implementation*, 1978-80

	Monetary and Financial Policies	Interest Rate Policy	Public Sector Policies	External Debt Policies	Exchange and Trade Policies	Wage and Pricing Policies
	I. Countries 1/ Without Interest Rate Policy Requirement					
Group average	2.1	NP	1.3	2.4	1.8	1.7
	II. Countries 2/ Implementing to a Large Extent the Interest Rate Policy Requirement					
Group average	2.2	2.7	1.7	2.1	1.9	2.4
	III. Countries 3/ Poorly Implementing Interest Rate Policy Requirements					
Group average	1.7	1.2	1.7	2.8	1.5	1.8

Source: Exchange Trade and Relations Department, IMF.

*Implementation of policies is measured in a scale of 0 to 3; not implemented = 0; implemented to a limited extent = 1; fully implemented = 3. Programs and policies relate to the period 1978-81 but individual years in this time span vary from country to country and therefore, values put on implementation are the averages for the number of years during which policies were in operation.

Note: NP = not prescribed.

1/ Group I countries are: Oanama, Zambia, Congo, Togo, Pakistan, Sudan, Madagascar, Jaiti, Costa Rica.

2/ Group II countries are: Jamaica, Burma, Guyana, Portugal, Bangladesh, Ghana, Kenya, Malawi, Mauritius, Sierra Leone, Zaire, Mauritania, Sri Lanka, Honduras, Egypt.

3/ Group III countries are: Gabon, Peru, Turkey, Philippines and Western Samoa.

Table 13. Extended Fund Facility (EFF) and Stand-By Programs (SBP) Policies: Content and Implementation*, 1981

	Fiscal and Credit Policies	Interest Rate Policy	Policies to Augment Growth and Improve Efficiency	External Debt Policies
	I. Countries 1/ Without Interest Rate Policy Requirement			
Group average	1.8	NP	1.7	2.7
	II. Countries 2/ Implementing to a Large Extent the Interest Rate Policy Requirement			
Group average	2.3	3.0	1.8	2.8
	III. Countries 3/ Poorly Implementing Interest Policy Requirements			
Group average	1.7	0.8	1.9	3.0

Source: Exchange and Trade Relations Department, IMF.

*In respect of one country, i.e., Yugoslavia, implementation covers two-year period, 1981 and 1982. Implementation scale is the same as in Table 14.

Note: NP = not prescribed.
1/ Group I countries are: Burma, Dominica, Greneda, Libera, Maritania, Morocco, Pakistan, Romania, Senegal, Sierra Leone, Solomon Island, Colombia, Togo and Zaire.
2/ Group II countries are: Central African Republic (CAR), Madagascar, Mauritius, Uganda, Zambia and India.
3/ Group III countries are: Costa Rica, Jamaica, Korea, Thailand and Yugoslavia.

requirement. Of the remaining 20 countries, 15 achieved a fairly high degree of implementation in respect of interest rate policy. These are also the countries which succeeded in implementing, on average, other specified program policies except one (i.e., external debt policies) to a larger extent compared to the Group III countries which poorly implemented the interest rate policies. Almost an identical picture emerges from Table 13.

Two things stand out from the above description of Fund programs. First, while interest rate policy remains an important constituent of the adjustment program, the Fund does not follow this prescription in all cases, perhaps because repression in the financial market is considered either to be moderate or not serious enough to affect other sectors in the economy. Second, those countries which succeed in implementing other specified policies also tend to succeed, in general, in implementing interest rate policies.

However, evaluation of the impact of policies specified in Fund programs on the macroeconomic variables is a difficult task. There are serious conceptual problems in defining an appropriate standard for measuring policy results and economic performance. (For a comprehensive treatment of this aspect of Fund programs, seeJ.Williamson 1983). In this connection, three standards of measurement are generally thought of. The first of these is a practical standard which assesses performance of program countries by comparing it with their performance before the introduction of a program. A second standard is a judgemental one, which compares actual performance of program countries with the hypothetical outcome of the alternative policies that might have been adopted by the authorities of program countries, in absence of Fund assistance (M. Guitian, 1981). The third one compares "what is" with the best possible outcome that could be considered feasible in the given circumstances (J. Williamson, 1983). Analytically, the last two, judgemental and feasible standards would be more appropriate than the first. However, since they contain substantial elements of subjectivity, the conclusions drawn by applying those standards would vary according to the judgment exercized in analyzing the Fund programs. On pragmatic grounds, therefore, effectiveness of policies is often assessed by using a practical standard of measurement, i.e., a standard that measures performance under adjustment programs by comparing their results to the situation that prevailed in the economy prior to the initiation of the program (D. Donovan, 1982). The same procedure is followed here, despite its shortcomings, more in order to gain some perspective on the relevance of the policies structured in the cases reviewed than to come to any definitive and precise conclusions about their effectiveness.

These limitations notwithstanding, and for purely illustrative purposes, changes in some macroeconomic variables in 29 program LDCs, such as inflation rate, GDP growth rate, current account deficit, saving/income ratio and investment/income ratio, comparing pre-program and post-program periods are presented in Table 14. Two types of

comparisons are made. First changes in the macroeconomic variables compare a year before the program commenced, with the program year. Second, such changes compare a two-year period before the program is *initiated with the two-year period starting with the program year.* The latter comparison may enable it to observe the possible lagged effects of the specified program policies. Average changes in the macroeconomic variables in these different periods are also seen in relation to all non-oil developing countries (NODCs) in order to take note of the effects of any exogenous factors affecting the macroeconomic variables. If for instance, performance of any or all of these macro-variables is better, on average, than that in the NODCs, it is possible to ascribe it to the program policies.

Taking first one-year comparison, Table 14 shows that program countries performed better on average than NODCs, in respect of *inflation rate, GDP growth rate, current account and saving/income* ratio. Investment/income ratio of program countries on the other hand slightly declined while in NODCs, it increased. However, judging this in conjunction with a greater fall in GDP growth rate in NODCs may suggest a lower productivity of investment. On the basis of two-year comparison also, the performance of the program countries in regard to the same macroeconomic variables (i.e., inflation rate, GDP growth rate, current account and saving/income ratio) seems to be better than that of the NODCs.

VI. Summary and Conclusions

The principal purpose of this paper is to underscore the difficulties in assessing the level and impact of interest rates in LDCs. Empirical results contrary to what one should expect on the basis of economic theory may be attributed to two major factors: (1) difficulties in measuring the expected real interest rate, and (2) the fact that the impact of interest rate policies on macroeconomic variables is often viewed in isolation from the effects of other economic policies and exogenous factors. 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

Table 14. Stand-By AND EFF Arrangements. Average 1/ changes in Inflation Rate, GDP Growth Rate, Current Account, Saving Income Ratio and Investment Income Ratio Comparing Pre-Program and Post Program Periods*

	Inflation 2/	GDP 3/	Current Account 4/	Saving/Income Ratio 5/	Investment/ Income Ratio 6/
(a) One-year comparison					
Program countries 7/	1.3	-0.20	0.001	-0.01	-0.002
All non-oil developing countries (NODCs)	1.4	-0.65	-2.60	-0.60	0.26
(b) Two-year comparison					
Program countries	2.56	-0.75	0.007	0.02	-0.002
All non-oil developing countries (NODCs)	3.71	-0.90	-0.14	-0.35	0.52

*All definitions relating to program and pre-program periods are the same as in the study of D. Donovan (1982).

1/ Calculated as unweighted average.

2/ Measured by CPI.

3/ Change in GDP at constant prices.

4/ Defined as gross national saving (GNP--(government consumption + private consumption) less gross national investment (gross fixed capital formation minus change in stocks).

5/ Gross national savings over GNP.

6/ Gross national investment over GNP.

7/ Program countries are: Jamaica, Burma, Guyana, Portugal, Bangladesh, Ghana, Kenya, Malawi, Mauritius, Sierra Leone, Zaire, Mauritania, Sri Lanka, Honduras, Egypt, Peru, Turkey, Philippines, Western Samoa, Panama, Zambia, Congo, Togo, Pakistan, Sudan, Madagascar, Haiti, Costa Rica, and Gabon.

consumer goods have a larger weight than capital goods and other long-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 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.

In order to circumvent these difficulties, other procedures based on markets for nondurable and durable goods, stocks and commodities are used to estimate the expected real interest rates. These procedures are illustratively employed in this paper for three LDCs (Brazil, India, Korea) to measure expected real interest rates and the resulting estimates are compared to those derived on the basis of CPI. It is found that there is a lack of consistency between the two sets of real interest rate estimates in respect of those countries. However, the alternative procedures cannot easily be used for most of the LDCs because of the lack of relevant statistical information. A great deal of caution therefore needs to be exercized in taking the estimated real interest rates in LDCs as representing precise magnitudes.

Subject to all these caveats, a series of real interest rates for a number of LDCs is constructed by adjusting the prevailing nominal interest rates for change in GDP deflator which is chosen in the belief that it is more comprehensive in coverage and better reflects the purchasing power of money than the alternative CPI or WPI. In addition to the real interest rate series, another series of interest rates is constructed, by adjusting the relevant foreign interest rate in advanced industrial countries adjusted 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 from these two series 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. A conclusion suggested by this is that LDCs may 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.

Cross-country evidence on the average relationship for 64 LDCs during a period 1971-80 between some of the macroeconomic variables (such as rate of growth of real GDP, real financial assets, saving-income and investment-income ratio and rate of return on investment) on the one hand and the level of real interest rate on the other, is analyzed by applying a nonparametric Mann-Whitney test. It is found that there is no difference with any statistical significance between the two groups of LDCs above and below the mean real interest rate. This implies that the level of real interest rates by itself has little or no impact on the selected macroeconomic variables. This result appears to be more due to viewing the impact of real interest rate in isolation from the effects of other economic policies currently being implemented. This hypothesis derives some support from other studies which show that the group averages of the value of the various macro-economic variables tend to vary inversely with the average value of the composite distortion index which comprises distortions in many policies including interest rate policy.

Fund-supported programs envisage the role of interest rate policy as a part of a policy package. The policy content of these programs broadly falls into the following categories: Monetary and financial policies of which interest rate policy is one of the subcomponents, public sector policies, external debt policies, exchange and trade policies, and wages and pricing policies. Fund-supported programs thus aim at removing a combination of obstacles to growth and price and the balance of payments stability. On the basis of experience during 1978-81, it is observed that not all the programs included an interest rate policy requirement. Furthermore, in general, the countries which largely implement the interest rate policy component of their adjustment programs also implement successfully other specified policies.

Any attempt to determine the effectiveness of interest rate policy has to involve an examination of the effectiveness of the program as a whole. Though inherent limitations of such an exercise are well recognized, analysis of the changes in some macroeconomic variables before and after the programs are initiated in LDCs during the period 1978-81 seems to indicate that the program countries perform by and large better than NODCs in regard to inflation rate, current account deficit and saving-income ratio, taking into account the influence of exogenous factors.

An empirical verification of the impact of Fund-supported programs is difficult in itself as a relevant conceptual framework cannot be easily designed, for analyzing performance of a large number of LDCs with disparate economic and institutional structure and different levels of development. The task is made even more onerous by the lack of data of required quality and the subjective elements involved in determining

what should be the policies as alternative to those specified in Fund-supported programs. Perhaps different policy alternatives and the consequences thereof are better understood by explicitly recognizing the constraints on empirical research in social sciences like economics as Cooley and Le Roy (1981) have emphasized in the context of the present uncertain state of estimation of money demand function. It may be more rewarding to judge the performance of program countries in a broader perspective of prevailing social, political and the institutional factors.

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