Index-Linking of Financial Contracts: A Survey of the State-of-the-Arts

The paper reviews the professional literature on the theory and practice of index-linking of financial contracts with special emphasis on developing countries. Attention focuses on the efficacy of index-linking in preserving the efficiency of the markets for finance and capital in an inflationary context. The key issues are identified and the state-of-the-arts relating to each assessed. Both theory and evidence provide some support to the view that generalized indexing of financial contracts promotes the volume of financial saving in an economy, and, by offsetting the risk of uncertain changes in the price level, permits a longer maturity structure of financial saving and investment than would otherwise be possible. The literature is equivocal on the effects of index-linking on aggregate saving, efficiency of investment allocation, operation of financial intermediaries and inflationary expectation. These issues require empirical resolution through studies of countries which have experimented widely with index-linking.

Prepared by: Kul B. Bhatia (consultant)
Public and Private Finance Division
Development Economics Department
Development Policy Staff
SUMMARY AND CONCLUSIONS

Persistent inflation has become a fact of life all over the world today. In a world of perfect markets, if inflation is correctly anticipated by everyone in the economy and economic agents can adjust their behavior, there will be few deleterious effects of inflation. But in the real world, where markets are imperfect and prices rise at unanticipated rates, inflation imposes a variety of adverse allocational and redistributive effects. The efficiency of markets for finance and capital is believed to be particularly sensitive to inflation. To reduce the inflation-induced distortions in these markets, the suggestion has frequently been made that financial contracts should be linked to a price index or an alternative standard of value. This paper surveys the professional literature on index-linking of financial contracts. It also provides a fairly comprehensive account of the schemes of indexing adopted in various countries.

At the analytical level, the topics discussed include: the effects of inflation on the volume and composition of saving and on the allocation of credit and investment, and what benefits may be derived from indexing; the potential problems related to indexing only as a subset of financial instruments and institutions; the possible impact of indexing on inflationary expectations; indexing and stabilization policy; alternatives to index-linking; and some practical matters pertaining to choice of index and coverage of indexing in terms of instruments and institutions.

Some tentative conclusions emerge. Theoretical arguments, supported by the experience of Brazil and Finland, suggest that indexing promotes the volume of financial saving and, by offsetting risk of uncertain changes in the price level, permits a longer maturity structure of financial saving and investment than would have been otherwise possible. These benefits are likely to be particularly strong in developing countries, where capital markets are new and fragile and restrictions on interest rates abound. While freeing nominal interest rates is a viable alternative for preserving real yields in an inflationary environment, there is no substitute to indexing for reducing the uncertainty costs associated with unpredictable rates of inflation. As regards the effects of indexing on inflationary expectation, there are theoretical proponents on either side; and until empirical studies are conducted, the review supports an agnostic position. The review leads to a similar agnosticism on the effects of indexing on the volume of saving, efficiency of investment allocation and the operation of financial institutions. This is because the professional debate about index-linking has proceeded mostly at the theoretical level, even though the resolution of the above issues must be empirical. A wealth of data has now been collected in several countries with experience of index-linking in one form or another. This needs to be mined systematically.
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INDEX-LINKING OF FINANCIAL CONTRACTS:
A SURVEY OF THE STATE-OF-THE-ARTS

by
Kul B. Bhatia

I. Introduction

Persistent inflation has become a fact of life all over the world today. Even before the present rates of inflation came about in the developed countries, many of the developing countries were facing increases in price level of 20 per cent a year or more. It is well known that, in a world of perfect markets, if inflation is correctly anticipated by everyone in the economy, and economic agents are left free to adjust their behaviour, there will be few deleterious effects of inflation. In the real world, however, market imperfections often restrict people's choices, and policies such as interest rate ceilings, credit restrictions, etc., prevent a full adjustment to even a fully anticipated inflation. In such cases, and when prices rise at unanticipated rates, inflation causes a transfer of resource from lenders to borrowers--both the banking system and the final users of funds, and from holders of cash balances to the government by way of an "inflation tax." Moreover, decisions about allocation of resources in every sector of the economy will be affected because the financial markets will no longer provide the correct signals for such decisions. Assets which provide good hedges against inflation will begin to predominate people's portfolios, in preference to productive investments, the saving-investment decisions will have to take inflationary considerations into account, and there will be other effects on the financial markets, especially for long-term transactions. Many policies have been recommended and adopted from time to time to offset these allocational and redistributive effects of inflation. In this context, index-linking, by which financial contracts are linked to a price index or some other standard, has attracted a great deal of attention. Index-linking can take the form of purchasing power guarantees for deferred payments, escalated contracts, variable-return bonds or bonds denominated in real terms--issued by the government or private borrowers, readjustable mortgages, etc. In all cases, unlike a conventional financial transaction, the agreement is not simply to repay the principal at a predetermined nominal rate of interest at the end of a certain period, but also to include some compensation for inflation, directly or indirectly. The current interest in index-linking is due mainly to the inflationary situation that prevails in many countries today. The subject of indexing throughout this paper is discussed in such a context although it should be recognised at the outset that by and large the same issues will arise in a deflationary situation. In the face of an un-anticipated deflation, thus, indexing will be needed to protect the borrowers and to prevent "subsidies" to holders of monetary assets.

This paper is a survey of the literature on index-linking of financial contracts. It provides a fairly comprehensive account of the schemes of
indexing adopted in various countries. We have tried to include as many schemes as possible, at least those for which documentation in English could be obtained. At the analytical level, the main topics covered are the efficacy of indexing in ameliorating some of the adverse effects of inflation, the pros and cons of index-linking, and how such linkages affect financial markets and stabilization policy. Some practical matters, arising out of the actual experience of several countries in this regard, are also discussed. Although the paper draws heavily on the literature and experience of developed countries with index-linking, the emphasis is on less developed countries (LDC's) which form the backdrop of much of the discussion.

The Scope of the Survey

The paper focuses on index-linking of financial contracts, so, by definition, topics such as the inclusion of escalation clauses in wage contracts the linking of income tax rates to cost of living indices, etc., are not discussed. Moreover, every country that tried index-linking had to deal with a host of legal and technical problems. For example, whether a bond with a variable rate of interest will be negotiable instrument or not, how will indexed assets and liabilities be treated in business accounts, and how would "inflationary premia" be dealt with in matters of taxation? Such questions are undoubtedly important in any practical situation, but they are left out to limit the length of the paper, and to deal more fully with the economic effects and policy implications of index-linking.

The Plan of the Paper

Section II deals with the effects of inflation in a less developed country (LDC) and the pros and cons of index-linking; the history of indexing--both in theory and practice--is discussed in Section III; the effects of index-linking on saving, resource allocation and investment are examined in Section IV; the questions of inflationary expectations and control of inflation are taken up in Section V; Section VI is devoted to the effects of index-linking on financial markets; various alternatives to index-linking are presented in Section VII; Section VIII deals with some practical aspects of index-linking; and the paper concludes with a summary and suggestions for further research in Section IX.

II. The Pros and Cons of Index-Linking

This section describes the economic setting in LDC's and briefly examines the effects of inflation in such a setting. A summary of the pros and cons of index-linking, culled from the literature, is also presented.

The Setting

The developing countries of the world differ considerably among themselves with regards to their institutions, economic structure, and social and political organization. Therefore it is difficult to make many

1For a discussion of some of these problems, see Aharoni and Ophir (1967), and Robinson (1971).
generalizations about them. A few common characteristics, however, do emerge.
Most such countries have low per capita incomes—well below the world mean.
The economy is characterized by dualism, with the primary sector predominating
in most cases. Many LDC's were colonies of the more advanced countries until
quite recently, and traces of colonial exploitation are all too evident in
their socio-economic structures. The standard of living of the people, at
least as measured by per capita consumption, is invariably low. There is
shortage of capital, especially for long-term investment.

The main challenge facing the LDC's is to raise their per capita
incomes for which investment, both short and long term, is needed on a large
scale. Nevertheless, the financial institutions in most cases are not
sufficiently developed to promote and mobilize domestic savings sufficiently
for this purpose. In many LDC's the government provides substantial amounts
for investment in social overheads and financing projects in the private
sector. The money market, like the rest of the economy, has a dualistic
character. The organized sector consists of a central bank and commercial
banks which are similar to the institutions in advanced countries. Discount
and acceptance houses, saving institutions, etc. which play an important
role in the money markets of developed countries, however, are in their early
stages of development in the LDC's. The unorganized sector of the money
market, comprising mainly of indigenous bankers, money lenders, shopkeepers,
landlords, etc., is much larger than the organized sector. Transactions in
the unorganized markets rarely follow organized banking practices. Loans are
often contracted and paid for in commodities, without security sometimes and
carried forward from generation to generation. The institutions are scattered
all over the rural areas. Borrowers and lenders are usually confined to the
same local area and they have little information about interest rates and
terms and conditions of loans in other parts of the country. Institutional
arrangements vary so much from region to region that it is questionable
whether the unorganized sector should be called a "market" at all.

The two sectors of the money market are loosely connected through
large exporters, wholesalers, and landlords who sometimes borrow in the
organized sector and lend in the unorganized market, or who might occasionally
deposit their surplus funds in a bank for a short period. Otherwise, both
the suppliers and demanders in the two markets are quite distinct. In the
organized sector, the borrowers generally are traders and manufacturers,
whereas cultivating tenants, cottage industry workers, and small shopkeepers
will borrow in the unorganized market. Commercial banks are the most important
suppliers of funds in the organized market; in the other market, the supply
comes mainly from professional moneylenders, large traders, landlords, and in
some cases from institutions such as cooperatives, and private and government
sponsored agricultural banks. Interest rates in the unorganized market are
much higher than in the other market. This is partly a reflection of the
demand and supply conditions in the two markets, although no less important
is the fact that interest ceilings, usury laws, and similar other measures
of financial regulation cannot be effectively enforced in the unorganized
market. Also, unlike the organized market, this sector is almost completely
free from control by the central bank.2

2For a further discussion of organized and unorganized money markets,
see Wai (1956, 1957).
Details will vary from country to country but in broad, general terms, this is the socio-economic picture prevalent in many developing countries today. The economic effects of index-linking, or any other policy tool, should be examined in this setting. From this point of view, the existing literature on indexing proves totally inadequate because not many studies have been devoted to index-linking in developing countries. Even the few that have dealt with this topic are descriptive, by and large, and do not incorporate these characteristics into the analysis. One is therefore forced to draw inferences from theoretical studies, and those dealing directly or indirectly with indexing in developed countries.

Effects of Inflation

Since index-linking is mainly a device for offsetting some of the undesirable consequences of inflation, let us examine the effects of inflation in the setting described above. The discussion is confined to unanticipated inflation, or those cases of expected inflation in which market imperfections, restrictions on price alterations (e.g., interest rate ceilings), etc. prevent a full adjustment in all sectors of the economy. In this context, it is well known that inflation will affect income distribution, resource allocation, and the financial markets in any economy.3 This three-way classification is not watertight, however, because many of the redistributive and allocational effects will take place through the financial markets, and changes in these markets in response to inflation will affect the rest of the economy.

Redistributive effects.- There is a redistribution of income from lenders to borrowers, either directly or through the banking system, because the repayments of principal and interest, being fixed in nominal terms, decline in real value in an inflationary situation, and interest rates will generally not rise enough to compensate for unanticipated inflation. There is also an "inflationary tax" on the holders of money, the revenue from which goes to the government and other institutions that "issue" money, the real value of which steadily depreciates.4 For developing countries, it is sometimes argued that such redistribution of income, although inequitable, is conducive to investment and economic development, because income will be transferred to the entrepreneurial class which has a higher marginal propensity to save and invest than the rest of the economy.

Resource allocation effects.- Inflation tends to distort the operation of the price system in numerous ways. In any inflation, all prices will not change at the same rate. Moreover, in many cases, the government of a developing country will be under strong political pressure to protect important sectors of the community from the effects of inflation, through control of food prices, rents, prices of goods and services produced in the public sector, and so on. Hence relative prices, and resource allocation in its turn, will be affected. There is invariably a disincentive for the output of goods whose relative prices lag behind, or are not permitted to rise with, the general price level. Consequences of such tampering with the price system can be seen throughout the world. A typical example is the

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3For a discussion of some of these effects, see Kessel and Alchian (1962).

4Banks will profit to the extent that "benefits" of inflation are not passed on to the borrowers. For an analysis of revenue from the inflation tax, see Friedman (1971).
attempt by many LDC's to keep their exchange rates fixed even in the face of rampant inflation. This lowers the real rate of exchange received by exporters, and makes the real value of their future export earnings more uncertain. It also leads to balance-of-payments difficulties, and the familiar, selective exchange control procedures which also adversely affect the allocation of resources.

Effects on financial markets.- On the supply side, inflation provides a strong disincentive to saving held in the form of cash and bank deposits, because the value of money and of claims expressed in nominal monetary units will deteriorate over time. In many countries, because of ceilings on interest rates which banks can pay, the real rate of interest on saving deposits has even been negative in some years.

While savers receive negative real rates of interest on their deposits, on the demand side, borrowers from banks pay negative real rates because of ceilings on what banks can charge on their loans. Thus inflation and interest rate ceilings combine to make even those operations profitable which will be losing propositions at positive real rates of interest. An excess demand for loanable funds, therefore, is highly likely to emerge at the prevailing ceiling interest rates, which forces banks to resort to rationing in one form or another. It is doubtful that under such bank-administered rationing, the available credit is allocated to the most productive uses from the society's point of view. It is easy to predict that in such situations, the supply of funds to financial institutions will decline because savers will search for better hedges against inflation. At the same time, such institutions will be reluctant to make long- and medium-term loans. This will surely reduce the business of financial intermediaries, besides hurting the process of economic development for which medium- and long-term investment is the sine qua non.

It is difficult to determine how inflation will affect the term structure of interest rates because it depends on expectations about the real rate of interest, and current and future expectations about inflation on the part of borrowers and lenders. It can be said, however, that if prices are expected to rise with certainty, long-term interest rates will tend to rise relative to those on short-term loans because, for comparable risk categories, the interest on long-term loans will now have to include a higher premium for inflation. This shift in the term structure of interest rates will further reduce term-lending by financial intermediaries. In extreme situations, as in Brazil before index-linking was introduced, the development of financial intermediaries, especially for term-financing, will be severely hampered.

Arguments For and Against Index-Linking

Most of the effects of inflation discussed above are detrimental to the functioning of financial institutions and the process of economic development itself. The proponents of index-linking claim that it would ameliorate many of the adverse effects of inflation. In particular, it would: (1) provide an inflation-proof asset which will be of special benefit to lower income classes who, because of their small savings, do not have much access to other types of investment [Slichter (1950a, 1950b), Houthakker (1959), Masse (1962)]; (2) ameliorate the adverse effects of inflation on income distribution and resource allocation by ensuring that at least one relative price—the interest rate—does not lag behind other prices in an inflationary situation [Morag (1962), Palander (1957)]; (3) dampen people's price
expectations [Palander, Slichter (1950a, 1950b)] and prevent speculative purchases of durables and inventories in anticipation of inflation [Goode (1951)]; (4) promote saving by drawing funds that would otherwise be spent to increase inflationary pressures [Bach (1952)] (Friedman (1952) concurs "...[they] might increase voluntary savings because they would be more attractive than existing means of investing savings open to the general public, but I regard this as a minor advantage..."); (5) reduce the borrowing costs for the government [Keynes (1927)] or a subsidized industry [Masse'] because the bond offerings will be tailored to the needs of potential bond buyers who, in the absence of escalation clauses, would wish to include an inflation premium in the nominal bond yield; (6) increase political pressures for anti-inflationary policy because failure to control inflation will increase the liabilities of the government and firms which have issued indexed bonds [Bach and Musgrave]; and (7) provide one more policy instrument and add to "the potency of monetary policy in regulating output, income, and employment" [Gurley and Shaw (1960)]. Tobin (1963) also supports this last point because bonds with purchasing power escalation clauses will be better substitutes than existing debt instruments for capital equity. The government will thus be able to affect the overall return on capital equity more easily, without changing the relative return on specific equities. For LDC's, which are the main focus of this study, it is suggested that index-linking will have the additional advantage of reducing outflow of capital, and lowering the relative prices of real estate and gold because their demand as inflation hedges will fall. Indexing will also help in legally circumventing usury laws and interest rate ceilings because these are usually stated in nominal terms [Robinson (1971)]. Finally, indexing will promote long-term capital flows.5

These arguments are countered, almost point by point, by the opponents of index-linking. They claim that escalation clauses, especially in government bonds, would: (1) create inequities of their own by protecting a few (the holders of government bonds) while all tax-payers bear the cost; (2) add to inflationary expectations because index-linking would symbolize the ineffectualness of government's anti-inflationary policies [Joint Committee on the Economic Report (JCEC hereafter) (1952)]; (3) replace consumption demand by demand for investment goods if higher savings find their way to private investors [Finch (1956)]; (4) increase borrowing costs if prices rise faster than expected, and also impose indeterminate liabilities on the government; (5) reduce support of anti-inflationary measures by those who are normally hurt by inflation [Suviranta (1951)]; (6) spread to the whole economy and "might easily have disruptive consequences for our economic system" [Radcliffe Committee (1959)]; and (7) create a host of practical difficulties due to inadequate indices and administrative problems.

5 It should be noted that many of these points were made in connection with the issue of indexed bonds by a government [Friedman, Goode, etc.], or in discussions of specific indexing proposals. Most of these arguments, however, will apply, *mutatis mutandis*, to practically all cases.
It should be emphasized that the above is a very brief summary of the main points and counterpoints made in the literature. These and similar other arguments have often been adduced in brief, sometimes rhetorical, statements, without basing them on any analytical or empirical studies. Consequently, many of these arguments on both sides will have to be qualified. For example, Keynes' point about reduced borrowing costs for the government will hold if inflationary expectations are not fully realized. If prices rise faster than expected, interest payments on government bonds are likely to be higher for indexed bonds than for the more conventional ones. There are other points, such as the effects of indexing on inflationary expectations, about which not much can be said on a priori grounds. Expectations will be affected by the history of inflation in a given country, the other monetary and fiscal policies being followed there, and a host of other considerations which will vary from one situation to the next.

In summary, it can be stated that index-linking will offset some of the adverse effects of inflation. It will definitely promote financial saving, especially on the part of the lower income groups, by ensuring a positive real rate of return on their savings even when prices rise at unanticipated rates. By the same token, it will discourage purely speculative investment in inflation hedges such as inventories and durable goods. By increasing the flow of saving to financial institutions and eliminating the inflation risk from term lending, indexing will also stimulate medium- and long-term financial transactions. Other claims, pro and con, such as effects on aggregate saving and investment, control of inflation, monetary policy, etc. remain to be substantiated. These points will be discussed at length in Sections IV, V, and VI.

III. Index-Linking in Theory and Practice

The History of Index-Linking

Discussions of index-linking have a long history in economic literature. Jevons (1875) was already referring to suggestions made in 1822 by Joseph Lowe, in 1833 by H. Poulett Scrope, and by G. Porter in 1838. Also well known from the 19th century literature is Marshall's enthusiastic recommendation (1887) for a "tabular standard" which would give the holders of debentures and government bonds "what they want--a really constant income." These ideas were revived again during the inter-war period, notably by Fisher (1928, 1934), Keynes (1924), and others. Fisher said that "Such practices are prudent, and it would be well if they were more widely adopted." Keynes

6Fisher (1928), p. 117. Here Fisher was talking of "single-commodity standards," for example, "gold clauses" in financial contracts, or the practice at Oxford, mentioned by Jevons, "that the rentals of the foundation land grants were to be paid not in money but 'in corn'." Fisher, of course, goes on to discuss linkages to indices or "multiple-commodity standards," and many war-time examples. See, ibid., pp. 117-23. Also see Fisher (1914).

There are many earlier examples also. In Massachusetts, from 1742 to 1749, judges could increase equitably the amounts payable on Bills of Credit if they depreciated relative to English silver coins. After 1747, these Bills were linked to "prices of provisions and other necessities of life" in an attempt to preserve the parity of purchasing power. These and other
suggested that index-linked bonds would "prove popular with particular individuals and so enable the State to raise funds a little more cheaply."  

The Scandinavian countries, notably Finland and Denmark, have experimented extensively with several forms of index-linking. Many descriptive and theoretical articles therefore have appeared in Scandinavian languages. The work of Palander in Swedish is of special interest in this context because he provides a comprehensive discussion of actual schemes of index-linking as well as a thorough analysis of the theoretical aspects of the matter. Earlier writings of Lindahl (1929) and subsequent papers by Arvidsson (1959a), Ahtiala (1967), among others, have kept up the interest in this topic. The *Revue economique* devoted the entire March, 1955 issue to the subject of indexation, dealing at length with the French experience, and there has been a steady stream of papers in English during the last two decades.  

Most of these studies either present the arguments for and against indexing, or review earlier literature, and in many cases provide highly descriptive accounts of index-linking in various countries. What is lacking, with a few notable exceptions of course, is a rigorous theoretical analysis of different aspects of indexing, especially its effect on saving, investment, monetary policy, and the functioning of financial markets. Similarly, hardly any systematic empirical studies have been done to examine the actual experience of individual countries with index-linking, or to evaluate the contribution of indexing to various economic phenomena. These inadequacies in theoretical and empirical literature are substantial, particularly for developing countries, because the special characteristics of their financial markets (including non-existence in some cases) and economic structure have not been incorporated into much of the literature on index-linking. These themes will be developed more fully in the next section. For now, let us look at some of the indexing practices actually followed in various countries.

**Actual Experience**

Although index clauses have been used in mortgage contracts, loan agreements and savings deposits also in many countries, for simplicity much


8 Mention should be made here of papers by Bach and Musgrave, Goode, Finch, Robson (1960), Knox (1964), and Waud (1973). Several aspects of index-linking were discussed before the Patman Committee [JCEC, 1952] by Friedman, Bach and others. For additional references, see the bibliography listed at the end of the paper.
of the following discussion is presented in terms of bond issues. The principles involved are the same in all cases. A saving deposit can thus be treated as a bond-purchase by the depositor, and a mortgage is like a bond-sale by the mortgagor. A term-deposit is like a bond with a fixed maturity.

A wide variety of linkages has been used by government agencies and private firms in various countries in recent years. The index clause has been applied to interest, principal, or both. The linkages have been partial or full (i.e., 100 per cent), continuous or periodic, applicable to increases in price level alone or both inflation and deflation, and in many cases, there have been floors and ceilings to restrict the amount of compensation. The range of links used extends from cost of living indices to the price of a third class railway ticket. The list includes such curious links as price of orange groves (Israel), volume of oil extracted (Argentina), the price of meat (Brazil), and index of industrial output (France). A fairly long list of such index-linked bonds is presented in the Appendix. For analytical purposes, it is useful to classify this bewildering variety of linkages by three criteria: firstly, by the nature of return; secondly, by the type of linkage, and thirdly, by the terms and conditions attached.

A. The nature of return.- The primary classification here is between fixed and variable return bonds. In the former, a fixed inflation premium is specified, either at the time of issue or at a later date. The effect is really a higher nominal yield. Of course, the yield could be fixed in real terms in which case the nominal return will vary directly with the index to which the bond was linked. If the linkage was not 100 per cent, both the nominal and real yields will vary over time. Many bonds of these types were issued in France between 1952 and 1957, and in other countries.

B. The type of linkage.- The following types of indices have been mainly used:

1. A price index, either to reflect changes in cost of living, or the wholesale price index.
2. The exchange rate, either by linking the bond specifically to the

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9 Interest in some explicit or implicit indexing in home mortgages has been revived again in recent years. See, for example, Poole (1974) and Tucker (1974).

10 Some differences between bonds and deposits, however, do exist. For example, bonds can be traded in secondary markets whereas the only option open to a holder of a term deposit generally is to borrow from the bank on the security of the deposit. Also, deposits have invariably been linked to cost-of-living indices, but many different types of linkages have been used for bonds. These differences are minor and do not affect the substance of the discussion. Deposits will be referred to specifically wherever need arises as, for example, in the treatment of financial saving in the next section.

11 In Israel, in 1962, the borrower of public funds for agricultural purposes could repay the loan at the nominal rate of 8 per cent plus a 3 per cent inflation premium. In Canada, in 1974, in view of the high rate of inflation, the government has announced an inflation premium which is different for bonds of different maturity, but raises the nominal yield on all of them to 9 per cent. The inflation premium, however, is payable only if the bonds are held to maturity. As of this writing (October 1974), a second premium has been added which raises the effective nominal yield on Canada Saving Bonds to 10 per cent.
exchange rate, or denoting the bond in terms of a foreign currency. For example, U.S. dollar bonds have been issued in Israel and in some Latin American countries.\textsuperscript{12}

3. Some variable connected with the issuer of the bond, e.g. the price of the product produced by it. As another example, in Argentina, the government-owned oil company (YPF) issued bonds where the principal was linked to the average wage rate of YPF employees, and interest payments varied with the volume of oil extracted each year.

4. Other indices, for example, an index of industrial production in France.

Of these four only the first can be called a direct purchasing power bond. Its main purpose is to provide a hedge against changes in the price level. The other three types of linkages might also serve this purpose, but indirectly. The foreign exchange linkage is used mainly to protect foreign investors against devaluation risk or to protect an intermediate lending agency which has borrowed funds abroad. If the country has a truly flexible exchange rate, the bond will also provide an inflation hedge.

The third type of linkage really provides a low risk equity. In some cases, the bonds have been tied to corporate earnings and/or dividends. In other cases, the linkage is with turnover, or the price of the product manufactured by the firm that issued the bond [Rozental (1959)]. These are obviously proxies for profits and dividends which, in the absence of linked bonds, would have benefited only the equity holders. It is difficult to determine a priori how well such bonds will hedge against inflation. In the Argentine example cited above, if wage rates lag behind changes in price level, as they have in many countries, the real value of the bonds will decline. Often the raison d'etre of such bonds is to prevent the issuers' liabilities from rising too much if their earnings do not increase as fast as the general price level. This point probably explains the wide variety of links adopted for bonds of this type.

Many indices, external to the firm which issues bonds, have been employed from time to time, especially in France, for bonds issued by the nationalized sector. National or industrial averages have been commonly used. Sometimes "external" and "internal" indices are combined.\textsuperscript{13} These bonds are similar to the third category discussed above, except that their return does not directly depend on the performance of the issuer. They are a type of equity but provide no sure hedge against inflation.

C. The terms and conditions attached. Many terms and conditions have been attached to indexed bonds. Linkages in some cases cover only the interest rate, in others the principal is also linked, and sometimes both the interest and the principal are included. The coefficient of indexation,

\textsuperscript{12}I am told that it is a fairly common practice in the Euro-dollar market to give loans at a certain percentage above the prime lending rate in Zurich. As of this writing, I have not been able to find any documentation on this practice. In any case, such clauses are intended to ensure that the loans remain profitable for the lending bank throughout the term of the loan, and in this respect they are different from the other types of index-linking discussed in this section.

\textsuperscript{13}For example, for the MONOD bonds issued in France in 1952, the extra return was a non-linear function of the wage bill, the price of steel, and the price of cement.
which governs the extra compensation to be paid, can range from zero (indicating no indexing) to one (indicating full linkage). In France, in the fifties, this coefficient varied from 1:1 to 1:30 or less. Furthermore, the coefficient of indexation may be different for different components of the index. The scope of the linkage can also vary with the term of the loan. For example, in Israel in the mid-1950's, loans for less than two years were granted without linking, there was a 50 per cent linking for loans for two to five years, 60 per cent for those between five to eight years, and 70 per cent for loans of longer durations.

All these are attempts, in one form or another, to regulate the yield on indexed bonds and provide only a partial compensation for inflation. These riders have the disadvantage of complicating the comparative evaluation of rival issues and perhaps confusing potential buyers of bonds. In many instances, such conditions are added to take care of the exigencies of a given situation, perhaps to enhance the appeal of such bonds to a particular group of investors. These considerations are of minor importance when compared with the larger questions concerning the economic effects and other aspects of such bonds. Throughout the rest of the paper, therefore, we shall not refer much to these terms and conditions, on the assumption that they can be summarized in yield differentials.14

IV. Index-Linking, Aggregate Saving, and Resource Allocation

It was noted in Section II that supporters of index-linking claim that it would promote saving and improve resource allocation. The main question is "How does indexing affect people's portfolio choices--i.e., saving held in the form of financial assets--aggregate saving, and investment in an economy?" This section takes a closer look at these issues, drawing upon the theoretical and empirical literature on saving and investment, and the actual experience of some countries which have tried index-linking.

Effects on People's Portfolios

It is to be expected that in an inflationary situation, people will try to protect the real value of their savings, and this is usually accomplished by replacing cash and financial deposits by better inflation-hedges. In advanced countries, savers will tend to invest in business assets directly or indirectly through equities, in real estate, and similar other assets. In developing countries, however, capital markets do not often provide such a variety of choice, so savers are more likely to hoard consumer durables and precious metals, and resort to other "unproductive" investments whose main purpose is to provide a hedge against inflation.15 In fact, if banks are prohibited from raising interest rates, and the prevailing inflation is higher than the interest payable on deposits, savers will be better off by withdrawing their deposits and simply holding inventories of goods. It does

14 Later in the paper we shall look beyond these yield differentials to consider the policy implications of some of these terms and conditions.

15 In Brazil, for example, Kafka (1968) states that during the recent inflation people were hoarding all sorts of things, including automobiles.
not take much economic sophistication to realize that, in such a case, an increase in the real yield on deposits will tend to increase the flow of financial savings. The real yield can be increased and its variance lowered by making such deposits readjustable, either through periodic adjustment of the principal and interest rate, or by including escalation clauses to compensate for inflation.

Investment in equities and real estate, especially the former, requires the savers to assume a business risk. Most small savers, because of the small absolute amounts of their saving, do not have the resources to diversify their portfolios enough to minimize such risk. Index-linking, thus, will provide a special incentive to savers in the lower income classes. When there are widespread expectations of continued inflation and prices are changing at unanticipated rates, there is no better mechanism than index-linking to ensure a positive real yield on financial saving. It will provide a hedge against inflation, at the same time helping savers to avoid the risks involved in other types of investment.

The Finnish experience provides a good example of the effects of index-linking on financial saving. As Table 1 shows, by 1965, indexed bonds accounted for more than 50 per cent of all outstanding government bonds (excluding indemnity bonds). The holdings of such bonds increased at the rate of more than 50 million markkas a year until 1957, and later in the 1960's, the increase was even larger. A similar story is told by the holdings of bonds issued by financial institutions. The holdings of such bonds also increased steadily until, in 1966, 89 per cent of all outstanding bonds of financial institutions were tied to a price index or the pound sterling. Index-tied deposits accounted for more than 20 per cent of all term deposits in banks during 1958 and 1959, but their proportion dropped considerably during 1959-63 due to restrictions on the magnitude of the linkage and higher yields on government bonds. The restrictions were removed in June 1963 when index-tied deposits began to get more popular once again. They accounted for almost 35 per cent of all term deposits by the end of 1967.

These facts and figures do not isolate the effect of index-linking on the flow of financial saving. The influence of other factors such as changes in income, money supply, tax regulations, the relative supply of different types of bonds, etc. will have to be eliminated before the contribution of index-linking to financial saving in Finland can be quantified. Between 1955 and 1967, the cost of living index rose steadily—the increase ranged from a low of 1.6 per cent in 1959 to a high of 11.4 percent in 1957, with the median being at 4.9 per cent. During these years, the interest rates

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16 The following discussion and the data in Table 1 are based on a Bank of Finland monograph (1969).

17 From the beginning of 1959 to the end of May 1963, banks could allow only 50 per cent linkage on new deposits. The rate of interest on such deposits was about 4 per cent. The cost of living increased at an average rate of about 3 per cent during this period. With 50 per cent linkage, the return on such deposits would have been about 5.5 per cent. The yield on ordinary government bonds then was about 7 per cent, and index-tied bonds would have yielded about 9 per cent or more. It is no surprise, therefore, that index-tied deposits in banks declined between 1959 and 1963. In June 1963, the 100 per cent deposits were reintroduced. The government subsequently exempted them from tax to make them more attractive.
### TABLE 1: Changes in the Cost of Living and Holdings of Bonds and Deposits in Finland

<table>
<thead>
<tr>
<th>Year</th>
<th>Per Cent Change in Cost of Living</th>
<th>Amounts of Index-Linked Bonds and Deposits (million Finnish Marks)</th>
<th>Shares of Index-Linked Securities Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1953</td>
<td>1.8</td>
<td>18.6</td>
<td>28.6</td>
</tr>
<tr>
<td>1955</td>
<td>-3.0</td>
<td>154.0</td>
<td>46.7</td>
</tr>
<tr>
<td>1960</td>
<td>3.3</td>
<td>301.4</td>
<td>151.9</td>
</tr>
<tr>
<td>1963</td>
<td>4.8</td>
<td>554.2</td>
<td>182.9</td>
</tr>
<tr>
<td>1965</td>
<td>4.9</td>
<td>780.5</td>
<td>294.6</td>
</tr>
<tr>
<td>1967</td>
<td>5.3</td>
<td>1,076.9</td>
<td>333.6</td>
</tr>
</tbody>
</table>

**a** Based on data contained in Tables 1, 3, and 4, Bank of Finland monograph (1969).

**b** Base 1945=100. Although data for each year are not presented, changes in cost of living are always computed with respect to the index in the preceding year.

**c** In each category, indexed-tied securities are expressed as a percentage of total outstanding. For example, Col. 5 states indexed government bonds as a percentage of all government deposits, Col. 7--indexed deposits as percentage of all deposits, etc.

**d** Domestic government bonds denominated in Finnish marks. Excludes indemnity bonds.

**e** Domestic bonds, denominated in Finnish marks, issued by financial institutions.
on indexed bonds were roughly 1 to 2 percentage points below those on other bonds. The rate of interest on ordinary (unindexed) term deposits stayed around 4 1/2 per cent during most of these years. It is highly unlikely that bonds and financial deposits in such magnitudes would have been held in the absence of index-linking.18

Indexing and Aggregate Saving

Effects of indexing on aggregate real saving are rather indirect and far more tenuous than those on financial saving. The total saving in any economy consists of saving by households, business saving, and saving on the part of the government. Of the three, it is not clear if indexing will affect business and government saving. Presumably, if all private and government loans are indexed, and inflation occurs at a high rate so that borrowing costs are higher than before, firms might be forced to replace loans by undistributed profits or equity issues. This result, however, depends on the interest elasticities of investment and demand for loans, and the magnitude of the actual increase in borrowing costs, besides other factors. Similarly, even if indexing does raise the debt-servicing costs of the government, and the revenue from the "inflation tax" is lower, it is not clear if budgetary surplus or deficit will be affected at all. Decisions on such budgetary matters are generally guided by larger economic objectives. How interest costs on public debt are affected by indexing, presumably, will not be a very important consideration especially because the government can use other policy instruments to offset such increases in its liabilities. For these reasons, the response of business and government saving to indexing has not received much attention in the literature. Most of the discussion has focussed on how index-linking will influence household saving, even though the subject being discussed, ostensibly, is aggregate saving.

It has often been argued that indexing will increase household saving for several reasons:
1. Indexing removes a part of the saver's risk. "On the assumption that saving ... is negatively related to uncertainty regarding the future value of savings, the reduction or abolition of this risk will increase the flow of saving." (Please and Christoffersen (1966), p. 21).
2. In countries where high rates of inflation and relatively low ceilings on legal interest rates conjoin to cause negative real rates of interest, indexed debts may be prerequisite for voluntary personal savings (Cf. Cohen, p. 454).
3. "In underdeveloped countries, there often exists a significant 'luxury' consumption difficult to reach by taxation, which might be tapped if the alternative of value-stable saving is offered." (Economic Bulletin for Latin America (1957), p. 84).

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18 This statement, of course, ignores the very likely possibility that, in the absence of index-linking, some other devices would have been adopted to stimulate financial saving in Finland. Nevertheless, it would be useful to carry out the appropriate econometric analysis and try to isolate the contribution of index-linking to financial saving in Finland.
The arguments against a beneficial effect of indexing on saving are also numerous:

1. People save for a "real" target, say, a given standard or living, or building a house, etc. They will therefore save less when a part of their saving is guaranteed against purchasing power loss.

2. Even if savers do not have a well-defined target, in an inflationary situation, they will maintain some "safety margins" in their savings to hedge against inflation. These will now be eliminated or reduced, resulting in lower saving.

3. "If all financial assets were linked to a price index, rising prices would no longer induce more personal savings via a reduction in people's real wealth." (Goode, p. 339). This argument assumes that households will try to maintain the real value of their wealth. So, if inflation erodes it, people will compensate by saving more.

   It is difficult to resolve this issue by the above arguments alone, without asking the more basic questions, viz. what are the determinants of saving and how are they affected by index-linking?

   Research on aggregate personal saving, both in developed and developing countries, suggests that current and lagged incomes are the most important determinants of saving. Although empirical evidence is inconclusive, several studies of the saving function in developing countries suggest that saving will also respond to variables such as capital inflow (Landau (1969), Chenery and Eckstein (1970)), taxation (Please (1970), Singh (1971)), exports (Lee (1971), Chenery and Eckstein), and interest rates (Williamson (1968), Gupta (1970)). Since saving is simply income minus consumption, variables that affect consumption also affect saving. From the theoretical and empirical work on aggregate consumption we learn that, besides income, wealth (Spiro (1962)), distribution of income, capital gains (Bhatia (1972)), perhaps interest rates (Weber (1970)), and some socio-economic variables should also affect saving.

Indexing and the determinants of saving. - Of these determinants of aggregate saving, perhaps it is reasonable to expect that indexing will have a direct impact on interest rates. In all likelihood, it will tend to raise the real yield on saving, especially if prices are rising at unanticipated rates. Staunch supporters of index-linking might wish to establish links between indexing and exports, capital inflow and other variables, but such links are at best tenuous and will have to be proved in empirical studies for individual countries. At any rate, even if such links could be established, these variables will have an unpredictable effect on saving. Saving could increase, decrease or remain unchanged, and the existing studies do not show what results will follow under which conditions. The only other definite effect indexing will have is to expand the portfolio choices open to the people. Besides conventional bonds, equities, and other assets, they will now have an extra asset whose yield and face value will be linked to a price index.

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19 For a summary and appraisal of many of these studies, see Mikesell and Zinser (1973).

20 A detailed review of this literature is outside the scope of this paper. A comprehensive, up-to-date survey has been published by Ferber (1973).
The new asset is a unique type of asset. It can provide a perfect hedge against inflation. Although real assets such as commodity inventories and real estate are often used as inflation-hedges, they are not perfect substitutes for linked bonds because they are subject to obsolescence, deterioration, and fluctuations in their relative prices, and these risks remain even if their prices are highly correlated with an index of general purchasing power. In spite of the unique, riskless character of indexed bonds, however, it is not clear if they would lead to an increase in saving. For example, if people transfer funds into indexed bonds from a saving account, only existing saving gets reallocated. No new saving takes place. There is of course the possibility that since indexing removes the purchasing power risk, people will save more, but this possibility has to be proved empirically.

Interest rate and saving.- The response of saving to changes in the real interest rate is also uncertain. Most writers on the subject recognize that an increase in yield has both an income and a substitution effect. The same bundle of future goods and services can now be obtained by giving up a smaller amount of current income than before; in other words, future goods are now "cheaper." As in the textbook model of income allocation between two goods, this reduction in the price of future goods will have both an income and a substitution effect. An individual's real income is higher (because of a reduction in the price of one of the goods), so he would like to buy more of both current and future goods unless one of them happens to be an inferior good. At the same time, he will substitute the cheaper good (future goods in this case) for the relatively more expensive one (present goods). So far as current consumption is concerned, the income and substitution effects thus work in opposite directions. The net change in current consumption, and hence, in saving, consequently, is uncertain and will vary from one situation to the next.

This elegant logic derives from microeconomics in which we deal with one individual at a time. When the interest rate rises, to each household it would appear that it could go on consuming the same total quantity of current goods and yet have more goods at some future time because of the increased earning of his savings. However, all households together could not have more future goods without "producing" more goods in the future. And this can be done only by sacrificing more current consumption (i.e., more saving today) unless there is some increase in physical capital, land, labour, or in their present or prospective productivities. In other words, for constant real resources for the economy, there could be no income effect in the aggregate. There will be a substitution effect only, so saving must increase when the interest rate rises. This conclusion is as certain as the familiar

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21 This is equivalent to a clockwise rotation of the budget line in the conventional, two-dimensional indifference curve diagram in which current consumption is measured on the X-axis, and future consumption on the Y-axis.

22 An economy has "constant real resources" if it has a given technology, and all possibilities of current and future investment are known and definite. Cf. Bailey (1971, pp. 106-107).

23 If prices are expected to rise, the substitution effect is likely to be reinforced. More current nominal income will have to be saved to buy the same future bundle of real goods and services.
proposition that a demand curve, keeping real income constant, must slope
down.24 The income effect for the economy as a whole will have to be pro-
vided by larger investment, technological improvements, etc.

In real life situations, over time, income would be rising, accumula-
tion of capital and perhaps technical progress would be taking place, causing
shifts in the saving and investment schedules and also reintroducing the in-
come effect. To isolate the influence of changes in the interest rate on
aggregate saving in empirical analysis therefore would be a complex task. As
Mikesell and Zinser (1973) state, "The relationship between interest rates
and aggregate saving involves a number of complex theoretical and econometric
problems; the most important are separating out income and substitution
effects of interest changes, quantifying the role of expectations and planning
horizons in saving decisions, and solving a difficult econometric identifica-
tion problem." A few studies, which have tried to come to grips with these
problems have provided conflicting estimates of the effect of interest rates
on saving.

Colin Wright, in an analysis of U.S. data, determined that the
compensated interest elasticity of saving (i.e., holding real income constant)
ranged from 0.18 to 0.27. These estimates are much larger than those assumed
to exist by many economists who feel that saving is unresponsive to changes
in the rate of interest.25 By contrast, Williamson (1968), in his regressions
for six Asian countries found that, with the exception of Burma, real rates
of interest were negatively correlated with national saving. The coefficient
for real interest rates, however, was not significant in 7 of the 12 regres-
sions, including the two for Burma. For India, using per capita data, Gupta
(1970) found that the coefficient of interest rate in the saving function was
positive and significant for several alternative measures of the real rate of
interest. Brown's work (1971) on Korean monetary reform suggests that aver-
age private saving rates showed a high degree of correlation with interest
rates. It should be pointed out that all these studies include income vari-
ables in their regressions, although the same specifications are not used in
all of them.

A thorough appraisal of the empirical literature on this subject lies
outside the scope of this paper. Nonetheless, it is reasonable to conclude
that there is some empirical support for the proposition that aggregate
saving does respond positively to changes in interest rates.

To relate the above discussion to index-linking, it is obvious that
the only impact of indexing on saving that can be quantified is via changes
in interest rates. Yet hardly any empirical research has been done on this
topic for any of the countries which have experimented with index-linking.
This is obviously a promising area for much substantial econometric research.
Heuristic arguments are made about the contributions of indexing to dampening
inflationary expectations, promoting monetary stability, and expanding people's

24 For a fuller discussion of many of these points, see Bailey [(1956)
and (1971, Ch. 6)]. For a mathematical derivation of the income and substitu-
tion effects of a change in interest rate, see Wright (1969).
25 See, for example, Suits (1963).
portfolio choices. For example, Please (1964), in his discussion of the Machado proposal, notes that in Israel and Finland, banks and insurance companies were convinced that their business picked up considerably after they were enabled to guarantee, wholly or in part, the real value of people's savings. In Finland, at least, the insurance companies felt that, because of the past history of the Finnish currency, only a purchasing power guarantee could have brought forth additional long-term saving. No plausible increases in the nominal interest rate could have convinced the potential policy-holders.

Between 1948 and 1957, gross domestic saving in Finland was 26 percent of GNP, and this percentage rose to almost 28 during 1958-1966. Initially, public saving accounted for much of this saving, but with the end of war reparations in 1953, public saving as a fraction of total saving declined steadily, and saving by households continued to increase. Part of the credit for increase in household saving should go to index-linking which was one of the most important devices to attract small savers. Tax concessions, higher nominal interest rates, etc., also undoubtedly contributed to increased saving.

We shall return to some of these points later in the paper. Suffice it to note here that tracing the influence of indexing on aggregate saving through these routes and forming empirical judgments about its magnitude are rather arduous tasks under the present state of the arts.

Indexing and Investment

Two types of issues have been dealt with in the literature: firstly, the effects of indexing on borrowers and their investment plans [Arvidsson (1959)], and secondly, how the allocation of investible funds is altered by the introduction of index-linking [Ahtiala (1967)].

Effects on investors (borrowers) and investment. - Knox (1967, pp. 247-248) provides a concise summary of Arvidsson's discussion of this topic. All firms are first dichotomized into self-financing and borrowing firms, and then divided into three categories: those anticipating a smaller rise in the index than the market, those who agree with market expectations as revealed in the difference between the yields on the two types of bonds, and lastly, firms which expect a rise in prices greater than the market anticipation. It is assumed that monetary authorities hold the money rate of interest unchanged when index bonds are issued, and that firms are free to operate with index bonds or the conventional ones.

Firms in the first category will not be affected by indexed bonds. They will prefer to invest their funds rather than lend them. The other two categories of firms, especially if they are risk-averse, will prefer lending in the index market to investment on their own. Real investment, thus, is likely to decline.

Turning to firms financed with borrowed funds, those in the first category will borrow in the index market. They will operate on the assumption that their borrowing costs have decreased, so some of them will increase their investment. Firms in the second category, i.e., those who concur with the market expectations, will also borrow in the index market if they are averse to risk. Their investment might also increase, much like that of the firms in the first category. Other firms will continue to borrow in the money market and their investment plans will remain unchanged. Arvidsson concludes that the net effect on investment is uncertain.
Arvidsson's conclusions is certainly correct, although his reasoning is not very convincing. It is difficult to agree with his dichotomy of firms into self-financing and borrowing types because most firms will have both retained earnings and debt obligations. Also, he does not come to grips with the all important question of the interest elasticity of investment about which there has been much controversy for a long time. Clearly, if investment is not very responsive to changes in interest rates, the introduction of index bonds will not have much effect on investment. The final verdict on Arvidsson's argument, therefore, will depend on empirical considerations also: on the interest elasticity of investment, and changes in borrowing costs brought about by index bonds.\textsuperscript{26}

Effects on allocation of investible funds. It is widely believed by economists and financial analysts that inflation, especially the unanticipated type, will distort the allocation of investible funds. It is clear that unless interest rates adjust quickly to clear the market, an excess demand for funds is bound to arise in an inflationary situation. Moreover, for medium- and long-term lending, lenders will like to include some compensation for unanticipated increases in the price level if no escalation clauses are included in the contract. If interest rates are prevented from rising, or rising high enough, one must ask how financial markets alleviate the resulting excess demand before the effects of index-linking on allocation can be examined.

A bank which cannot raise interest rates, but is facing an excess demand for loans at the going interest rate, has several options: (1) it can rank the prospective projects in order of decreasing (social) return and finance the most productive projects until funds run out; (2) it can try using "fine print" clauses, which are of dubious legality in most cases, to raise interest rates in effect; or (3) it can resort to some other non-market method of selecting the acceptable borrowers. The first option is obviously the ideal one from the society's point of view because that is what a perfect capital market would try to achieve, but it is doubtful that banks--especially the private, profit-maximizing ones--will use this criteria for rationing credit. The other two options are likely to result in some misallocation which can be corrected, at least partially, by introducing index-linking. Purely speculative projects, such as investments in inventories, which are profitable merely because the price level rises faster than borrowing costs, will be ruled out immediately. Even other low-productivity investments, which could be undertaken because the investor had access to bank loans at the ceiling rate, would now be discouraged by the higher cost of credit brought about by escalation clauses in loan contracts.

Medium- and long-term projects are affected most adversely in the absence of index-linking because banks would be willing, if at all, to give loans for short periods only. In Brazil, for example, before escalation clauses were permitted, there was no commercial market in which a loan for any length of time could be raised. From the point of view of economic development, paucity of funds for long-term projects is particularly harmful because such projects provide the infrastructure for development in many cases. Unless inflation could be predicted with certainty, index-linking is the only effective way of channeling private financial savings into long-term investments.

\textsuperscript{26}For a discussion of the controversy about the interest elasticity of investment and some of the relevant empirical literature, see Bailey (1971), Ch. 8.
To summarize the discussion in this section, index-linking, by increasing the real yield on financial saving, will increase the holding of financial assets, especially by households in the lower income brackets. On a priori grounds, it also seems plausible that the overall rate of household savings would be larger if the real return on them were not zero or negative. The heart of the controversy is the magnitude of the effect of indexing on saving. No empirical studies, however, deal directly with this topic, and even those which analyze the effects of interest rates on aggregate saving do not resolve the issue. In this context it should be recognized that even if aggregate saving remains unchanged, indexing could increase the flow of financial savings by affecting people's portfolio choices.

The effect of indexing on investment is uncertain. However, by raising the cost of credit and charging positive real interest rates on loans, index-linking will contribute to efficient allocation of investment. Purely speculative investments will be eliminated, and projects with low returns will be discouraged. The biggest beneficiaries will be long- and medium-term projects. In an inflationary situation, there seems to be no substitute for escalation clauses in financial contracts to mobilize voluntary savings for such projects. Besides, the yields on indexed loans will enable the banks to pay higher interest rates on deposits which will help the saving picture.

V. Indexing and Inflation

It is generally accepted that index-linking will offset some of the undesirable redistributive and allocational effects of inflation, but critics claim that indexing itself would promote inflation and also hamper anti-inflationary policy. This section deals with the broad issues of how index-linking affects inflation and anti-inflationary policy, drawing upon the actual experience of countries such as Finland and Brazil which have experienced both indexing and inflation.

Can Indexing Promote Inflation?

Three sets of arguments can be used to answer this question in the affirmative. Firstly, the Radcliffe Committee took the view that indexing could spread to the entire economy and have disruptive consequences for the economic system. The view is based on the idea that price increases in one sector will lead to increases elsewhere and result in a cumulative, multiplier effect. In the absence of escalation clauses, some prices will lag behind others. For example, if wages are negotiated once a year, they might lag behind a general price index, especially if prices increase unexpectedly. With index-linking, such lags will be eliminated, resulting in a larger inflationary impact. Secondly, there is the theoretical result, implicit in Patinkin's work (1956) and stated also by Baumol (1965), that any economy in which everything is fully indexed--including money--cannot have a determinate overall price level. "Any price level will do as well (or as badly) as any other. More specifically, if the economy is in a state of general equilibrium, no price level change can cause disequilibrium in any sector of the economy--not even in the money market... ." [Baumol (1956, p. 110)]. And finally, to complete the case against indexing, there is the observation by the Bank for International Settlements about the 1967 devaluation of the Finnish markka: "The difficulties which led to this step... appear to have derived mainly from the persistence of cost/price inflation, the intensity of which was ascribable
partly to the widespread use of indexation arrangements." This observation can be regarded as a special case of the Radcliffe Committee view.

Let us examine these arguments in turn.

The Radcliffe Committee view.- Implicit in the view of the Radcliffe Committee are a number of assumptions about the functioning of an economy, the speed of adjustment, and the relationship between anticipated and actual changes. If prices rise as expected, the effect on the economy will be the same, more or less, whether escalation clauses are used or not. If prices rise faster than expected, index-linking could prove more inflationary if it is assumed that no provision would otherwise have been made in contracts for such unforeseen happenings. These, however, are strong assumptions. Economic groups which tend to lag behind changes in price level will learn from their mistakes. They will revise their expectations, and try to over-protect themselves if their circumstances permit. For example, a strong trade union, even in the absence of escalation clauses, could not be denied provisions for unanticipated price increases in wage settlements for any length of time, especially if it has erred on the side of under-compensation during the last few rounds.

The Baumol-Patinkin argument.- The Baumol-Patinkin argument can be appreciated with the help of a simple example. Consider a situation in which all markets, except the market for commodity X, are initially in equilibrium. Assume that an excess demand for X exists, resulting in an increase in its relative price. People will tend to substitute other commodities for X which is now relatively more expensive. Since all other markets were in equilibrium, this results in an excess demand for some other commodity, and hence an increase in its price. The price increases, however, have no income or real-balance effect because full escalation ensures that the real values of money income and cash balances are immediately restored. There is nothing in this economy to stop the prices from rising indefinitely. In the absence of indexation of money, for instance, rising prices would have reduced the real value of money balances, which in its turn would have eliminated the excess demand in the commodities market.

The Baumol-Patinkin argument is theoretically correct, but it can lead to continued deflation just as easily as it describes runaway inflation. In the above example, if the initial excess demand for X is replaced by an excess supply, the result will be a steady decline in the price level provided that indexing clauses apply to both upward and downward movements in the price level. Fortunately, no country has ever gone so far as to index everything, including the money supply. And in a real world situation, with fixed exchange rates, once the inflationary process starts, such an economy would soon run into serious balance-of-payments difficulties, which would require remedial action. This theoretical argument therefore need not detain us much longer.

The Finnish experience.- Indexing was discontinued in Finland because it was felt that the benefits of the 1967 devaluation would be wiped out very quickly due to escalation clauses throughout the economy, especially in wage contracts. Therefore, an incomes policy solution, with a general

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27 38th Annual Report, p. 77.
abolition of index linkages, was devised through negotiations between the
Government and various interested parties. A massive stabilization program
was introduced in 1968 under which a temporary freeze on rents and prices
was placed, and provisions were made for comprehensive wage agreements every
year.

Several interesting questions arise about the Finnish experience:
(1) How much did indexing contribute to inflation? (2) Can the role of escal-
ation clauses in financial contracts per se be isolated? And (3) how have
prices behaved since the abolition of index-linking?

Unfortunately, no definitive answer can be given to the first question.
Several published and unpublished studies have been conducted at the Bank of
Finland but these are mostly descriptive and do not try to isolate the contribu-
tion of indexing or indexing in financial markets to inflation. To consider
the third question, some data on changes in the cost of living index in Finland
have been presented in Table 1. During 1969 and 1970, the two years immediately
following the removal of indexing, the index rose at less than 3 per cent a year.
Nevertheless, in 1971, the cost of living increased by 5.5 per cent, in 1972 by
7.8 per cent, and the increase in 1973 was 10.8 per cent. It is obvious that
inflation is back on the scene. The cost of living increases in 1972 and 1973
are higher than the average increases during the period when indexing was in
force in Finland.

The Brazilian experience.- The Brazilian experience in this regard is
also interesting. According to Simonsen (1969), "The inflationary gallop of
recent years apparently began in 1959, when the government decided to abandon
the promising program of monetary stabilization prepared at the end of 1958.
In 1959 prices rose some 40 to 50 per cent. In 1960 inflation relented a bit;
prices rose only 25 to 30 per cent. But in 1961 they jumped again, 40 to 50
per cent, and in 1962 even higher, 50 to 60 per cent. In 1963 ... prices
rose 80 per cent ... effort on the part of the Castello Branco government
not exactly to combat inflation, but to escape hyperinflation, succeeded in
reducing the effective rate of price increases to about 90 per cent in 1964." (p. 135). Savings deposits and savings bonds were linked to the general
wholesale price index in 1964, and other types of linkages were introduced
in subsequent years. From the data on price movements in Brazil presented
in Table 2, it appears that the inflationary record is no worse than in the
years before 1964. Prices have in fact been rising at a somewhat slower rate.

It would be naive to conclude from these facts about Finland and Brazil
that indexing has no appreciable effect on inflation, or that indexing
exacerbated inflation in Finland but ameliorated it in Brazil. Simultaneously
with index-linking, so many other changes have been taking place in these two
countries, in their domestic economic policies and in their trading relations
with the rest of the world, that it is difficult to zero in on the role of
index-linking by casual empiricism only. Nevertheless, it may be possible
to control for these other developments in econometric studies. Further
econometric work with Finnish and Brazilian data, therefore, promises to yield
rich dividends. We shall appraise the Brazilian experience more fully later
in this section.

Indexing and Control of Inflation

There is much controversy about the contribution of indexing to anti-
inflationary policy. Those who feel that index-linking will hinder control
of inflation claim that indexing implies "a deliberate acceptance of inflation
by the monetary authorities" [Day (1964)], and "it is a clear admission of
### TABLE 2: Inflation in Brazil

<table>
<thead>
<tr>
<th>Year</th>
<th>Consumer Price Index</th>
<th>Wholesale Price Index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Index (Base 1963=100)</td>
<td>Percent Change in Index</td>
</tr>
<tr>
<td>1963</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>1964</td>
<td>187</td>
<td>87.0</td>
</tr>
<tr>
<td>1965</td>
<td>302</td>
<td>61.5</td>
</tr>
<tr>
<td>1966</td>
<td>443</td>
<td>46.7</td>
</tr>
<tr>
<td>1967</td>
<td>591</td>
<td>33.4</td>
</tr>
<tr>
<td>1968</td>
<td>723</td>
<td>22.3</td>
</tr>
<tr>
<td>1969</td>
<td>866</td>
<td>19.8</td>
</tr>
<tr>
<td>1970</td>
<td>1,082</td>
<td>24.9</td>
</tr>
<tr>
<td>1971</td>
<td>1,300</td>
<td>20.1</td>
</tr>
<tr>
<td>1972</td>
<td>1,514</td>
<td>16.5</td>
</tr>
<tr>
<td>1973</td>
<td>1,709</td>
<td>12.9</td>
</tr>
</tbody>
</table>

the expectation of defeat by the one agency in the economy which has both the power and the responsibility for combating inflation." [Nevin (1962)]. Somers (1952) added a political argument: "...the inclusion of an escalator clause ... gives everyone a stake in inflation. If everyone has a stake in inflation, what chance is there of enacting or enforcing any counter-inflationary measures?" Collier (1969, p. 119), summarizing his discussion with some economists at the British Treasury, states: "It is disastrous for the government to admit that inflation is inevitable, for this reinforces the price rise. Only a country subject to overpowering inflation, and willing to admit it, would use such bonds from choice, for they reflect badly on the nation's financial strength and stability."

Similar arguments are adduced by those who believe that index-linking will help in controlling inflation. Palander opines that index bonds eliminate some of the injustices which result from changes in the value of money, at the same time giving the authorities greater scope for fighting an inflation, presumably because they will have an extra weapon in their economic arsenal.\(^{28}\) Moreover, by appropriate inter-market operations (e.g., by borrowing in the conventional bond market), the government could narrow the spread between the yields on conventional and index bonds, thereby dampening inflationary expectations.\(^{29}\) Then there is Slichter's argument, already noted above, that indexing will help in implementing an anticyclical policy by promoting saving, or at least inducing individuals not to increase their consumption when prices are expected to rise. Tobin (1963) also rejects the view that index-linking of financial contracts will promote inflation because "...it is far from clear that a regime with purchasing power bonds would actually be more susceptible to inflation than the present financial regime. In the first place, purchasing power bonds would strengthen the controls over the economy possessed by the monetary and debt management authorities. In the second place, the availability of a more satisfactory menu of assets might well increase non-inflationary saving." (p. 208).

In this largely rhetorical debate, there are three basic economic issues involved: (1) the effect of indexing on aggregate demand, the principal components of which are consumption and investment; (2) the influence of index-linking on people's expectations about inflation; and (3) the contribution of indexed bonds to stabilization policy, more precisely, to anti-inflationary monetary and debt management policies. We have already dealt with the response of saving and investment to indexing, concluding that some increase in saving will probably take place. The rest of this section will deal with expectations, and stabilization policy.

**Indexing and expectations.** - How people form their expectations about inflation is a question about which economic theory does not have much to say. It is primarily an empirical question. Expected-price variables in most econometric studies have been approximated by weighted averages of past

\(^{28}\) Palander, p. 16, quoted by Knox, p. 240.

\(^{29}\) In equilibrium, the yield-spread between indexed and non-indexed bonds will be exactly equal to the expected rate of inflation. Arvidsson (1962, p. 118) attributes the argument in the text about inter-market operations to Palander, pp. 211-12.
changes in prices, which assumes that expectations are based on past experience. Other than that, believers in the quantity theory of money would say that, over long periods of time, price changes are highly correlated with changes in money supply, but this correlation becomes tenuous and slight for short-run forecasts. In developed countries, price forecasts are often based on large or small econometric models, and since these are widely circulated, they might have some effect on price expectations. But in developing countries, where econometric models are scarce, and the use of financial newspapers, etc. is limited, how price expectations are formed is even more of a mystery. It is difficult to expect, on a priori reasoning alone, that the mere introduction of indexed bonds will have any effect on expectations.

There is no systematic discussion, analytical or empirical, in the literature about how or why index-linking should alter price-expectations, in developed or developing countries of the world. It is true that, if money markets are functioning reasonably well, the yield differential between indexed and non-indexed bonds will reflect expected price changes, but it is difficult to determine if this measure of expectations would be larger or smaller than that used in the absence of indexed bonds. It cannot be denied that the terms on which indexed bonds are issued, and the government's other policy measures could affect price expectations. For example, given the choice of two markets, if the government sells non-indexed bonds, people might interpret this action to mean that the government expects prices to rise faster than the existing yield differential between the two types of bonds. In the light of this interpretation, people could revise their price expectations upward (Robson, p. 65).

Under the present state-of-the-arts, therefore, the question of how indexing would affect price expectations should be regarded as wide open. There are no strong theoretical arguments one way or the other. The actual results in a given country will depend on the history of price changes there, the terms on which index bonds are issued, and the functioning of financial and other markets.

Indexing and stabilization policy.-- Gurley and Shaw (pp. 168-69) express the view that the introduction of real bonds makes monetary policy more effective in regulating output, income, and employment. Money is not neutral in its effects on the real variables in this case. To illustrate this point, assume first that there is only inside money, created by the purchase of nominal bonds by the monetary authorities (the Banking Bureau), money and such bonds are the only financial assets and there is a fixed number of bonds paying $1 (nominal) a year for ever. The bonds, thus, are like consols. Gurley and Shaw assume that compensation for inflation will be paid by simply issuing more nominal bonds to the bondholders. In the absence of index-linking, starting from an equilibrium position, if money supply is doubled, the new equilibrium is reached when the price level doubles, leaving the interest rate unchanged. All markets are cleared and there is no change in output. The new equilibrium, however, will be different if all bonds have index clauses because, at twice the original price level, the Banking Bureau gets more bonds than before. The real money balances in the hands of the public will be the same as before but the ratio of real balances to real-bonds will now be higher. There is an excess supply of money and an excess demand for bonds, goods, and labour. Gurley and Shaw conclude: "In a new general equilibrium, the interest rate is lower, the price level is higher but not in
proportion to monetary expansion, and output is increased." If there is uncertainty regarding the price level, these tendencies are reinforced because people will prefer real-bonds to money and try to adjust their portfolios accordingly.

Tobin also agrees with the Gurley-Shaw opinion, albeit for a different reason. "The power of the monetary and debt authorities to control the economy would be enhanced if they could deal in equities themselves or at least in debt instruments that are closer substitutes for equities than conventional government obligations. At present the authorities try to affect the supply price of capital by exchanging with the public one kind of government debt for another--demand debt for short debt, demand debt for long debt, short debt for long debt... If investors regard one kind of debt as a good substitute for another, they will require little movements in rates... In contrast, imagine that the authorities could exchange government debts for equities. Then open market and debt management operations would alter the relative supplies of government debt and capital outstanding, and the supply price of capital would change. Open market and debt management operations would be a tremendously powerful tool of economic stabilization." Since the government cannot issue equities on any large scale without causing unintended distortions of the allocative mechanism of the capital market, a purchasing power bond would be the ideal instrument to use. It would share the role of equity as an inflation hedge, and would also be a much better substitute than existing debt instruments for ownership of capital.

Tobin's argument is based on changing the supply price of capital, or the yield investors require of capital equity. The Gurley-Shaw analysis is carried out in terms of regulating output, income, and employment. The question of how indexed bonds will affect prices is not taken up at all. It follows from the Gurley-Shaw discussion, however, that such bonds might reduce the efficacy of monetary policy as an anti-inflationary tool. A reduction in money supply in the Gurley-Shaw framework will not lead to a proportionate decline in the price level because part of the adjustment will be made in interest rate and output.

**Indexing and built-in economic stability.** - Related to the issue of stabilization policy is the question of built-in economic stability. Tobin (1973), a long-standing advocate of index bonds, states: "The common objection to escalated bonds is that they would diminish the built-in stability of the system. The stability in question refers to the effects on aggregate real demand, *ceteris paribus*, of a change in the price level. The Pigou effect tells us that government bondholders whose wealth is diminished by inflation will spend less. This brake on old-fashioned gap inflation will be thrown away if the bonds are escalated... In the 1970's we know that the government can, if it wishes, control aggregate demand--at any rate, its ability to do so is only trivially affected by the presence or absence of Pigou effects on part of the government debt." Waud (1973) presents a rigorous analysis of index bonds and economic stability, using the IS-LM framework. He demonstrates that if wealth effects enter the money demand function, it is not possible to say unambiguously whether an index bond regime will be more or less stable than a non-index bond regime.

Waud's model, although adequate for proving his point, is not well suited for discussing anti-inflationary policy. The model assumes that the price level is a positive function of real income, which is a simplistic assumption and also incorrect in all probability because, in the real world, price increases have often accompanied both constant and decreasing real
incomes. Moreover, the only way of checking inflation under this assumption is to reduce the rate of growth of real income which is hardly an encouraging prospect for policy. The model is particularly unsuited to a developing country, even for comparative-statics analysis, because it makes no room for interest rate ceilings, other capital market imperfections, and the salient structural features of LDC's. In the next section, some of these shortcomings will be corrected when we deal with financial markets and how they are affected by index-linking.

The Brazilian experience once again.- The theoretical literature summarized above suggests that index-linking does not necessarily help or hinder control of inflation. Indexing has no strong, clear-cut effects on inflationary expectations, stabilization policy, and built-in economic stability. However, speaking of index-linking in Brazil Friedman (1974a) states: "With it, they have been able to reduce inflation gradually from about 30 per cent now without inhibiting rapid growth, and they may be able to succeed in gradually bringing inflation down to near zero." Several points should be noted in this context.

Firstly, while index-linking neutralizes some inflationary distortions, it can also have a feedback effect on inflation. This is essentially the Radcliffe committee argument which was also applied in the Finnish case. In Brazil, according to Simonsen, "It is true that [monetary] correction permitted substantial sale of Readjustable (Treasury) Bonds to the public, thus serving to dampen inflation on the side of demand. On the other hand, it is probable that the extent of feedback has been appreciably enhanced by the large scale application of monetary correction." (Quoted by Fishlow (1974)).

Secondly, besides index linking, the government followed growth-inducing policies in the domestic and foreign sectors, and also directly intervened to limit industrial prices. Fishlow (1974) asserts that "the successful reduction of inflation in Brazil has little to do with indexing, but is related both to direct governmental intervention and successful monetary and fiscal policy..." This view is shared by Krieger (1974) who states: "In fact, Brazilian anti-inflation strategy during this period (1964-67) consisted mainly of the old-fashioned classical medicine: an agonizing contraction of growth in aggregate demand by means of fiscal and monetary restraint. This was combined with...a tough wage policy imposed by an authoritarian government." (p. 44)

Thirdly, in terms of the concerns of this paper, indexing in Brazil has not been restricted to financial contracts only. Also it has been far from an automatic correction for general price movements because the government has freely modified the indexing schemes and continually used tax concessions, etc. to accommodate other policy objectives. Indexing, thus, has been a tool for government intervention.

In view of these points, it is difficult to agree with a literal interpretation of Friedman's statement which seems to be based on casual observation rather than on a rigorous analysis of the Brazilian situation. Under a broader interpretation, however, the statement raises two important questions: (1) Did indexing force the adoption of other policy measures which led to a reduction in the rate of inflation in Brazil? This is the "feedback argument" in reverse because the government knew that if wages and prices of key industrial goods were not checked, the resulting inflation would be much worse because of widespread index-linking. (2) Did index-linking enhance the efficacy of other policies designed to stimulate exports, output, and financial saving in the economy?
The answer to these questions might resolve the controversy about the effects of indexing on inflation and its control. There is no doubt that index-linking increased the flow of financial saving and improved the working of financial markets in Brazil—a subject to which the next section is devoted—but it is not clear if all the policies used in Brazil since 1964 would have been adopted, or would have been as effective, without widespread index-linking. Further analysis of the Brazilian experience along these lines will be highly productive.\(^3\)

The main conclusion which emerges from the discussion in this section is that there is much uncertainty about most of the issues concerning indexing and inflation. There is theoretical evidence, supported to some extent by the Finnish experience, which suggests that indexing might promote inflation. Nevertheless, the contribution of index-linking in financial markets, which is the main concern of this paper, has not been discussed separately in the literature. How indexing will affect price expectations is an empirical question although most of the discussion about it has been of a rhetorical nature, without much support from the actual experience in countries which have experimented with index-linking. Theoretical analysis suggests that indexed bonds will increase the effectiveness of monetary and debt management policies, but it is doubtful if such bonds would increase the built-in stability of the economy. The Brazilian experience suggests that index-linking, at least as part of a larger policy package, can help in controlling inflation. The effects of monetary correction per se or of financial indexing alone, however, have not been isolated in empirical studies. A comparative evaluation of the Brazilian and Finnish experiences in this regard will also be useful because the two countries have provided apparently contradictory evidence on the effects of index-linking.

VI. Index-Linking and Financial Markets

This section deals with the effects of indexing on financial markets, taking into account some of the features of such markets in developing countries. Indexed bonds, in terms of which much of the earlier discussion in this paper has been carried out, are one of many indexing arrangements that are possible and have been tried in various countries. We shall look at some of these other indexing schemes also. The main issues considered are the coexistence of indexed and non-indexed securities, and the effects of indexing on the operation and profitability of financial intermediaries and on their role as allocators of financial resources in the economy.

Can Indexed and Unindexed Securities Coexist?

A concern is sometimes expressed that once indexed bonds are issued, even on a small scale, it will be very difficult to sell unindexed bonds. Indexed bonds will drive out unindexed securities. Whether this will happen

\(^3\) Fishlow (1974) provides a useful summary of the various types of index-linking adopted in Brazil and the circumstances in which these were introduced.
depends on inflationary expectations, the terms on which the two types of securities are issued, and the nature of secondary markets. If bonds cannot be resold, either because they are non-transferable or no secondary markets exist, people will buy unindexed bonds only if they expect prices to rise less than the yield-spread between the two types of securities. If bonds are transferable, and the secondary markets are active and efficient, prices of bonds will adjust to reflect changes in inflationary expectations. Adjustments are constantly being made in the bond markets of developed countries to reflect financial conditions of issuers (default risk on private bonds), changes in expectations about inflation, and other variables. In an extreme case, when there is great uncertainty about future changes in the price level, there may not be a positive price at which anyone would wish to buy a bond without an escalation clause. Only in such an unusual situation will unindexed bonds go out of business. Some of these propositions can be examined further with the help of Palander's twin markets proposal, which is of interest per se.

In Figure 2, subscripts r and m denote indexed and unindexed bonds, respectively, superscripts s and d refer to supply and demand, and B and E successively represent number of bonds and nominal yields. In the first quadrant, the number of real bonds is plotted on the X-axis and their yield on the Y-axis. The curves show demand and supply for indexed bonds. The demand and supply of unindexed bonds are shown in the third quadrant where yield is measured along the X-axis and number of bonds is indicated on the Y-axis. For simplicity, it is assumed that the supply of both types of bonds is fixed, but this assumption is not crucial for the analysis. The equilibrium relationships between the two markets are depicted in the second quadrant for different inflationary situations where expectations about changes in the price level are indicated by $\pi$. The solid lines indicate the zero inflation case in which the yield on the two types of bonds will be equal and the equilibrium will be on the 45 degree line ($\pi=0$).

If prices are expected to rise, the demand curve for indexed bonds shifts down and to the right, because for any given yield $E_r$, people would like to hold more bonds of that type. Analogously, nominal bonds, at the given yield, will be demanded less, so the demand curve for unindexed bonds will shift up and to the left. The new curves are drawn in dotted lines in quadrants I and III. The equilibrium line in quadrant II shifts downwards, the extent of the shift is equal to the difference between the yields on the two types of securities. If prices are expected to fall, the above shifts will be reversed, and in quadrant II, equilibrium will take place on a line above the 45 degree line.

Clearly, there is no problem so far about the coexistence of indexed and unindexed bonds. By changing the relative supplies of the two types of bonds, the government can regulate the spread between the two yields. Likewise, for exogenous shifts in price expectations, the effects on relative yields can be analyzed.\footnote{This diagram is taken from Eagly (1967). He extends this model to include real saving and investment but the exposition here is enough to establish the main points. The discussion of Palander's proposal here is based on Eagly (1960, 1967).}
Figure 1. The Markets for Indexed and Unindexed Bonds
Now let us introduce a ceiling on nominal interest rate, the yield on unindexed bonds. If the ceiling is fixed at $E_m$, the point of initial equilibrium, the exogenous shift in inflationary expectations will induce people to sell money bonds and buy indexed bonds. There will be an excess supply of money bonds, so their price will fall thereby raising the effective yield on them. The reverse effects will happen in the indexed market: bond prices will rise and yields will fall. The government will not be able to sell any more unindexed bonds at the existing, fixed rate of interest, except at a discount.

If inflationary expectations continue to rise, new money bonds will have to be sold at ever increasing discounts, and the liquidity of existing bonds in the secondary market will be seriously affected. In terms of Figure 2, $B_m^d$, the demand curve for money bonds, will keep shifting to the left, raising the effective yield on them. What happens in the market for money bonds in this situation, however, would have happened even in the absence of indexed bonds. Their presence in this framework merely provides a measure of the expected rate of inflation. Unindexed bonds will be driven out by inflation, not by indexed bonds.

**Effects on the Operation and Profitability of Financial Intermediaries**

The government is in a privileged position to issue indexed bonds because no private institutions—banks, insurance companies, corporations, etc.—can escalate their liabilities without similarly escalating their assets, or at least a substantial part of them. We noted earlier in the paper that indexing of deposits will raise the yield on financial saving and increase their flow. Clearly, such institutions will need higher earnings, in the form of higher interest rates, more profitable investments, or escalation clauses in loan contracts to meet their increased liabilities on deposits. In this context, schemes of partial indexing, under which escalation clauses do not apply to all types of contracts and all institutions, can create many complications:

1) A suggestion is made that since indexed bonds are needed mainly to protect the long-run savings by small savers, the government should issue non-marketable indexed bonds to such people. Or, they should be issued only to pension funds and insurance companies which would then offer the corresponding retirement and insurance policies. If banks are not permitted to index deposits in this situation, they are bound to lose some business to these other institutions. The banks' plight would be worsened considerably if there are ceilings on interest rates they can charge or pay, and prices are rising at a rapid rate.

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32 In the discussion that follows it is assumed that if both assets and liabilities of a financial intermediary are indexed, the linkage use the same or similar indices. Situations can arise, however, in which deposits are linked to, say, the wholesale price index but loans are linked to some other index, for instance, the price of the borrower's output. Unless the two price indices move together, some cash flow problems are likely to arise. This point was suggested by Graeme Dorrance.

33 This was the essence of Senate Bill 1331 in the United States. The maximum amount an individual or his agent could purchase in one year was set at 10,000, and no individual could hold more than 60,000 worth of them. See Eagly (1967), pp. 281-84 for a critique of that Bill.
Tobin (1963) suggests two possibilities to help the banks: they can offer escalated deposits or shares to the public, or they can make escalated loans. Under the first option, these institutions "would serve as middlemen, overcoming for the small savers the obstacles to direct ownership of bonds: indivisibilities, transaction costs, and interest rate risks." The second option will, of course, increase the earnings of banks, enabling them to meet their escalated liabilities on deposits.

In most cases, both measures suggested by Tobin will be needed. The first one puts the banks on the same footing as insurance companies, thereby preventing the loss of some bank deposits to them, but it does not cover investments other than in government bonds. Banks will need the second measure to increase their earnings from mortgages, business and personal loans which form the bulk of banks' assets in many countries.

2) If banks accept both indexed and unindexed deposits and also give both types of loans, changing price expectations can create difficulties if the liabilities typically have a shorter maturity than the assets. Banks in Finland had to cope with this situation during the period of index-linking. Assume that initially the bank has covered its indexed liabilities with indexed loans, and similarly for unindexed deposits. If depositors shift from unindexed to indexed deposits in response to, say, a rise in inflationary expectations, banks' unindexed loans will exceed their unindexed liabilities. The banks will either have to suffer a capital loss on their holdings of unindexed bonds in switching to index bonds, or assume the increased risk involved in holding on to the original portfolio. If the shifts in deposits do not take place within the same institution, the institution losing deposits will have to suffer a capital loss.

Banks can use several devices to get around the problems posed by deposit-switching. They can reduce the liquidity of index deposits by making them payable only after a notice. They can insert renewal clauses in their long-term loan agreements, so that they can change the interest rates and other terms of lending before maturity. Deposit-switching can always be slowed down somewhat by changing the relative yields on deposits.

3) Apart from the first point above, if only some types of institutions are allowed to have index-linking while loans and deposits at others -such as commercial banks- are not readjustable, there is a strong probability that, in an inflationary situation, depositors will prefer the former whereas borrowing will be concentrated in the latter type of institutions. The problem will be exacerbated if there are interest rate ceilings on unindexed deposits and loans.

34 At a bank one can withdraw a sum today, and redeposit it tomorrow, with no penalty except loss of interest from the previous crediting date. By contrast, if one cashes a nine-year old government savings bond today, he cannot buy it back tomorrow. He can buy only a brand-new bond, with ten years to maturity instead of one. Also, a bond has to be cashed in full whereas any part of a deposit can be withdrawn.

35 The discussion of this point draws heavily on Ahtiala (1967), pp. 45-47. He mentions an interesting innovation used by Finnish banks to protect themselves against risks of deposit-switching. All loans were subject to 100 per cent linking but the index compensation was prorated to the share of indexed deposits in the total liabilities of the bank. Accordingly, the
4) Special difficulties will arise in the absence of index-linking for institutions which borrow abroad, or transmit funds given to them by agencies such as the World Bank, because they will have to cover both the inflation and devaluation risks. One analyst unofficially calculated for the Industrial Development Bank of Turkey, when it had obligations repayable in dollars, that a 10 per cent devaluation of the lira could, if the bank were unprotected, wipe out one year's profit. A 25 per cent devaluation would wipe out the accumulated profits and the reserves of previous years, and a 75 per cent devaluation would completely decapitalize the bank. Clearly, the banks cannot bear such risks themselves. In fact, the International Financial Corporation requires, as a condition of a credit to, or an investment in, a development bank, that the problem of maintenance of value be solved to its satisfaction. In such cases, the loan might be linked to the exchange rate or, as was done in Israel after the devaluation in 1962, the government can assume the foreign exchange risk while the ultimate borrower will bear the inflation risk.

These problems, although ostensibly emanating from index-linking, are really caused by inflation. The Finnish institution facing deposit-switching will be faced with exactly the same problem as in the second point above if depositors withdrew funds to invest in inventories in the absence of indexed deposits. Indexed deposits perhaps make it easier for depositors to hedge themselves against inflation but that does not create the basic problem. Indexing probably ameliorates the difficulty by preventing some of these funds from leaking out of the banking system.

If index-linking has to become viable, the above problems will have to be solved. Ultimately, institutions which have adjustable liabilities will have to acquire adjustable assets, and with similar maturity structure. Some policy innovations might also be necessary to solve these difficulties. It would be very useful to examine the experience of countries which have tried index-linking to determine the nature and extent of the problems discussed here, and what measures were taken to resolve or circumvent them. No such studies appear to have been undertaken, or at least published, so far.

**Indexing and Financial Resource Allocation**

It was observed in Section II that inflation reduces saving in the form of financial assets, and artificially increases the demand for loans. The resulting excess demand for funds requires non-market, and in many cases, arbitrary rationing of funds if banks are not allowed to raise interest rates due to ceilings and other restrictions on their operations. It was also noted in Section IV that index-linking, by increasing the real return on saving, will attract funds to financial intermediaries. At the same time, purely speculative investments which were profitable simply because the borrowers had access to loans from banks at low or even negative real rates of interest, will be eliminated. Other demand for loanable funds might also decline because of the borrower's cost increased with inflation only if depositors switched to index deposits thereby increasing the bank's interest costs. Similar innovations may have been used in other countries also.

36 See Dock Houk (1968), pp. 26-47 for a discussion of the operations of development banks in inflationary situations and the various devices they can use to protect themselves. The calculation about the Turkish Bank is also reported by Dock Houk.
increase in the real cost of borrowing. The excess demand for funds experienced by banks in an inflationary situation will thus be decreased, which will also reduce the bank-administered rationing of funds. Removal of interest rate ceilings will also help in this process, but to anticipate one of the conclusions of the next section, there is no substitute for index-linking when much uncertainty prevails about the future course of inflation.

Indexing and term-lending.- Index-linking will bring about an appreciable improvement in resource allocation by stimulating flow of funds into long- and medium-term investments. If changes in the price level cannot be forecast with certainty, lenders are reluctant to tie up their funds for long periods of time. They would rather invest for short periods which gives them a chance to adjust interest rates periodically. Although this point is too obvious to need support from empirical evidence, this phenomenon has been observed in many countries all over the world. In many LDC's, for example in Latin America, before index-linking arrangements were introduced, there was no commercial market in which long-term loans could be raised. A bank incurs a serious risk by making long-term loans in an inflationary situation, especially when inflation is accelerating, if its deposits consist mainly of demand and short-term deposits. With the help of indexing, banks will be able to attract time deposits which will enable them to make long-term loans.

Indexing and term structure of interest rates.- There is considerable uncertainty about this point because it is not clear how inflation would alter the term structure in the first place. It is clear, however, that long-term rates will include a risk premium for uncertainty about future inflation. That risk premium will be eliminated by index-linking. Therefore, if expectations about the real rate of interest or future inflation are not affected by index-linking, it can be expected to lower long-term interest rates somewhat. Another way of explaining this point is to consider what happens to the supply and demand for funds in the financial market. When indexing is introduced, lenders will increase the supply of funds to the long-term market. The demand in this market, however, will not increase (in all probability it would decrease), so long-term interest rates will decline. If the future course of inflation is certain, and both borrowers and lenders share those expectations, index-linking will have no effect on the term structure of interest rates.

Effects on Financial Markets in LDC's

Much of the earlier discussion in this section applies, mutatis mutandis, to the organized or modern sector of financial markets in developing countries also. Such markets in many countries have commercial banks, saving institutions, and insurance companies, much like the institutions in developed countries, so their operations will be similarly affected by index-linking. Secondary markets and long-term lending agencies, however, are not as developed in most LDC's, and much long-term financing has to be done by the government directly, or through development banks and finance institutions controlled and subsidized by the government. The biggest advantage of index-linking in this context will be to increase the flow of financial saving to existing institutions, and promote the
growth of financial intermediaries, especially for long- and medium-term loans. As Harberger (1966) states in a Latin American context, "... under the typical financial arrangements of the inflationary countries, there is today no commercial market in which such (long- and medium-term) credit can be obtained. It is obvious that no such market will develop in an inflationary environment unless the lenders can be assured of a positive real return on their funds. The introduction of readjustable loans is thus the clear way of filling what has up to now been a very important gap in the credit structure of the inflationary countries of Latin America. And once again, this measure would permit the payment of positive real interest rates on the deposits that are the counterpart of long and medium term loans, and thus help to offset the negative effect of inflation on household savings."

The Brazilian experience. - The financial markets in Brazil present almost a textbook illustration of some of the points discussed in this section. Simonsen (1969) states: "Long term loans are virtually unavailable in Brazil, except through certain government institutions ... The impasse results basically from uncertainty about the future rhythm of inflation. In an inflationary situation, the rate of interest that would tend to be established in a free market depends on expectations about the velocity of price increases, which for the long run is totally unpredictable. A rate of 3 per cent a month in a ten-year operation can be disastrous for the borrower if prices stabilize, or disastrous for the lender if inflation explodes." The prohibition of inflation clauses until 1964 caused the disappearance of any private supply of funds for long-term loans. "The sources of supply were thus limited to government institutions like the National Economic Development Bank (BNDE), the biggest supplier of long-term loans; the Bank of Brazil; and a few regional and state institutions. Also, some international financial agencies, particularly USAID, occasionally extend long-term loans in cruzeiros." (p. 150-51). Loans from such institutions, however, were heavily subsidized, so at one time Brazil was in the curious situation of having a long-term interest rate well below the short-term rate.

It is also interesting to know how financial institutions circumvented usury laws and how their attempts influenced their operations. In Brazil, interest in excess of 12 per cent has been illegal since 1933. To quote Ellis (1969), "But even by the time that inflation had reached a 12 per cent annual rate, the banks had invented several ways of circumventing the law: by oral understandings with borrowers by which they paid sums in excess of the interest stipulated in writing; by adding various commissions and ostensible costs to the nominal interest charged; by requiring a large unspent balance from the deposit resulting from a loan, and so on." (p. 205). The banks did not do much for their depositors, however, so new firms grew up to capture savings from the commercial banks. "The Sociedades de Crédito, Financiamentos e Investimentos offered letras de câmbio (Bills of Exchange) at whatever discount was necessary, without actually violating the usury law." The situation in the capital markets, nonetheless, was unsatisfactory. "While the banks were paying depositors 3-6 per cent per year, they were charging borrowers 4 or 5 per cent or more per month, and the letras de câmbio were furnishing capital to businessmen at rates as high as 90-100 per cent per year." (p. 205). (Emphasis added.)
Strangely enough, in spite of the heavy discounts on the letras de câmbio, "the average real yield was negative, by varying amounts running as high as 2.6 per cent per month, from September 1961 to the end of 1965, except for ten months in late 1964 and early 1965 when positive yields were achieved varying from .07 to 1.52 per cent per month." (p. 206). "The success of these instruments can be explained only by the money illusion of a good part of the public, by the lack of better alternatives on the market, and by the aggressive sales policy of the credit and finance companies." (Simonsen, p. 149).

Although the above discussion so far relates mostly to the period before indexing, or monetary correction as it is called in Brazil, was introduced, it provides a perfect illustration of what indexing will do to the financial markets. The supply of long-term credit was severely restricted in the absence of index-linking. Banks could raise interest rates on loans without changing the yield on deposits, so they made huge profits. But other institutions, which too could charge high interest rates from borrowers, soon stepped in and competed away the supply of savings from commercial banks. This is what would happen if index-linking is restricted to a few institutions. Moreover, in spite of all the schemes devised by banks and credit companies, the supply of saving did not keep up with the demand for loans. The biggest losers were the savers who received a low, or even a negative, real return on their savings. In this situation, index-linking alone could have ensured a positive real yield on saving, and it might also have increased the flow of financial saving to the institutions.

Experience with indexing. - As one would predict from the above discussion, indexing did considerably increase financial intermediation in Brazil. "While credit might be expensive, it could at least be predictably obtained. There can be little doubt that an organized capital market did much to dispel the uncertainty and inefficiencies of previous years." (Fishlow). Between 1966 and 1973, the public's holdings of financial assets increased from 13.2 billion to 115 billion cruzeiros, which represents an increase of almost 900 per cent. Time deposits too increased by leaps and bounds--from 327 million in 1966 to 27.5 billion cruzeiros in 1973. Virtually all the time deposits were of the indexed variety in 1973.

It is interesting to note that escalation clauses are not being used in all financial contracts. Acceptances, which are an important source of short-term credit, continue to be quoted in nominal terms. Their high yield and short duration attracts investors. Monetary correction has been used mainly in medium-term loans (two years or less) which are generally floated for working capital requirements. A long-term capital market, with private investment banks and other institutions, however, has not come into existence. The government is offering fiscal incentives, and attempts are currently under way to introduce fixed and convertible debentures to encourage long-term capital flows.

Indexing and unorganized markets. - Back in Section II a distinction between the organized and unorganized sectors of the financial markets in LDC's was introduced. The question arises: "How does index-linking affect the unorganized sector and its relationship with the organized sector?"

Given the institutions involved in the unorganized market and the type of

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37 This section is based on Fishlow (1974).
transactions that take place there, it is doubtful that index-linking could be introduced and enforced in such a market. Since the unorganized market in many countries has remained free from regulation by the monetary authorities, it has devised its own safeguards against inflation. In some rural areas in India, for example, agricultural loans are contracted in terms of a proportion of the harvest. This is not index-linking but a loan contract repayable in kind. Nonetheless, it does serve to protect the lender against inflation risk to some extent. The conditions in the unorganized markets vary so much from country to country, and from one region to another within the same country, that it is difficult to make any general statements about how index-linking might affect the unorganized money markets.

The introduction of index-linking in the organized sector will affect the unorganized sector, but once again the effect will vary from one situation to the next, depending upon the existing links between the two sectors of the financial markets. The markets can be linked on the supply side if, for instance, the rural moneylenders keep their surplus deposits in commercial banks. If these banks index their deposits, it is conceivable that the rural moneylenders might bring back the deposits they had withdrawn earlier because of the low real returns they earned at the commercial banks. Similar arguments can be made for links on the demand side. Clearly, these are empirical matters which depend on the particular circumstances prevalent in a given situation.

To sum up the main conclusions of the discussion of index-linking and financial markets in this section, it is shown that indexed and unindexed securities can coexist provided there are no restrictions on the terms at which they are issued or traded in the secondary markets. Index-linking will have appreciable effects on the operation and profitability of financial institutions, and schemes of partial indexing under which indexing is limited to a few institutions, or a few types of activities, will create complications. Moreover, indexing will bring supply and demand for funds closer together and improve allocation of financial resources. There will also be the additional effect of channeling private saving into long- and medium-term investments more effectively, which will be of special benefit to developing countries. Besides, indexing will help in the growth of financial intermediaries in LDC's, although the effects on the unorganized sectors of the money markets in such countries are uncertain.

VII. Alternatives to Index-Linking

Index-linking is primarily a device for offsetting some of the undesirable consequences of inflation. It is often suggested that the same effects can be achieved by removing interest rate ceilings and adopting other policy measures. Such alternatives to indexing are the subject matter of this section. We have observed above that index-linking has important effects on financial saving, resource allocation, the financial markets, and perhaps control of inflation itself. The question arises: "Is index-linking the best way of bringing about these results, or is a more efficient technique possible?" The question is important per se, and also because index-linking may not be feasible in many countries where, for instance, suitable price indices might not be available.
Alternatives to index-linking can be divided into three categories: (1) technical alternatives, which essentially duplicate the mechanical aspects of index-linking; (2) facilitating alternatives, which try to achieve the effects of indexing on saving, resource allocation, etc. without resort to index-linking, and (3) preventive alternatives, which attempt to make index-linking unnecessary by controlling inflation. The first category will include such measures as removal of ceilings and other restrictions on interest rates, renegotiation clauses in term-lending contracts, and perhaps payment of interest on demand deposits, etc. The second group of alternatives takes a piecemeal approach to the problem and attempts to duplicate the results of indexing in every sector of the economy. In a way, every policy measure ever devised to control inflation, or to make it more predictable, is an alternative to index-linking. For example, in 1968, Finland decided to scrap index-linking in favour of a massive incomes policy. Such policies constitute the third set of alternatives to index-linking. It should be obvious that there would be considerable overlap among the three sets of alternatives, and that some would be closer substitutes than others for index-linking.

1. **Technical Alternatives**

One reason why index-linking has been used in Israel, Brazil, and other countries is that the legal interest ceilings in many instances are well below the prevalent rates of inflation. An obvious and rather close substitute for index-linking, therefore, is the removal of all restrictions on interest rates and any terms and conditions people might attach to their financial transactions. If the capital markets are functioning well, some mechanism will be found by which interest rates will fully reflect a changing price level and expectations about its future course. Such a mechanism, if it does not incorporate indexing explicitly, could include one or more of the following: (1) Recontracting clauses which require renegotiation of terms periodically or whenever one of the parties desired. Such clauses can be observed in some business loans and mortgage contracts at least in Canada and the United States. (2) Secondary markets in which borrowers and lenders can hedge themselves against future inflation through discounting or resale of negotiable instruments. (3) For instruments which cannot be transferred, for example Canada Saving Bonds, the issuer might raise the yield periodically in an inflationary situation. A series of discrete, lagged adjustments might thus be made in an inflationary context. For ease of reference, let us refer to these three devices as the "renegotiation", "secondary markets" and "discrete adjustments" alternatives.

In developed financial markets, all these alternatives might be feasible. The interesting question to ask, therefore, is: Which alternative would be the best and under what circumstances? Could we say, for instance, that "renegotiation" is better for medium-term loans but indexing is indispensable for long-term loans? Can threshold levels of inflation and uncertainty -as measured by, say, mean and variance of changes in the price level- be determined to choose among the various alternatives? And for index-linking per se, perhaps one could ask: "Left to itself, under what circumstances will index-linking develop if all restrictions against it were removed?" These questions do not seem to have been dealt with at all in the literature so far. Explorations along these avenues, therefore, promises rich dividends.

In LDC's, given the nascent state of their financial markets, it seems that the "secondary markets alternative" will not be feasible. The government is therefore left with only the "renegotiation" and "discrete adjustments" alternatives. It is also likely that index-linking will require a spur from
the government, at least initially. The government could actively promote indexing, or issue indexed bonds which will provide a cue to the rest of the economy. On the contrary, if indexing had to be discouraged, the government could explicitly forbid indexing as in Finland after 1967, or take a strong stand against it. If the government seeks to promote index-linking, it will involve sizeable administrative costs, in compiling adequate price indices, in selling the idea to the public, and in the overall supervision of various indexing schemes which will inevitably evolve. Some of these points will be taken up in the next section, but it should be noted here that, from the administrative point of view, indexing might well turn out to be the most expensive alternative, especially in those LDC's where statistical services, etc. might not yet be highly developed.

The important policy question then arises: Why use index-linking - with all its administrative costs - when other alternatives could do the job? In other words, what is the purpose of introducing additional institutional constraints on borrowing and lending if the price mechanism can handle the problem without external intervention? The literature once again does not give us much guidance on this issue. In fact, one wonders if a satisfactory, general answer can be found to this question. Much depends on the circumstances prevailing in a given situation. The Canadian government, for example, without expressly taking a stand on index-linking, resorted to "discrete adjustments" to stem the tide of saving bonds which were being turned in for cash. In Brazil, as the discussion in Section VI indicates, the ceilings on interest rates were clearly being circumvented--on deposits by varying the discount rates on bonds, and on loans by levying service charges, etc. These devices essentially made a one-shot adjustment for inflation. They did not keep up with continuing inflation, so index-linking had to be introduced.

In the face of uncertainty about changes in the price level, there is no better device than index-linking. "Purchasing power bonds and mortgages clearly represent a much more satisfactory financial adjustment to inflation than an increase in nominal interest rates on conventional debt instruments since they compensate for any price level change, either up or down, whether foreseen or not, and in so doing make the time shape of debt repayments more closely match the time shape of income receipts." [Poole (1972), p. 21].

### 2. Facilitating Alternatives

Some of the effects of index-linking could be duplicated by following policies tailored to such objectives in different areas. Although there is no sure way, except indexing, of explicitly guaranteeing a positive real return on saving, special saving bonuses in the form of tax concessions, prize bond schemes, or straight monetary payments have been tried with varying degrees of success in many developing countries. These schemes may have the effect of increasing saving, but they do virtually nothing for the resource allocation effects of indexing. In any case, if a set of policies, each specifically designed for a particular purpose, could be devised, they would certainly be more cumbersome and expensive than the simple device of index-linking.

The idea of a national equity has been discussed by Day (1964), and Nevin (1962) to replace index-linking. According to Nevin, it gives investors "an asset whose yield can grow pari passu with the national output as a whole. ... it will be an announcement by the authorities of the probability, not of inflation, but of continued economic growth." Nevin would link the bond to real per capita GNP whereas Day would prefer GNP in current prices. The main argument in favour of a national equity is that it will prevent people from "benefiting" from inflation if it is not accompanied by an increase in real output.
First of all, as Please (1964) points out, national equity is an indexed bond—the index, however, is not an index of the price level. Historically, there has been no definite correlation between GNP or its growth rate on one side, and inflation on the other. Therefore, only fortuitously will the national equity provide a hedge against inflation. In any case, the alleged superiority of such a bond over direct index-linking is based on the argument that somehow the announcement of indexing is a major factor in the inflationary process. That argument, in my judgment, has been grossly overworked.

3. Preventive Alternatives

Admittedly, index-linking is not a first-best policy. It is useful mainly because under the present state-of-the-arts we cannot predict inflation with certainty, much less control it. Any policies which improve our expertise in these two areas therefore can be treated as alternatives to index-linking. Monetary policy, fiscal policy, or any combination of these and other policies, if they can reduce the uncertainty of inflation and keep it within reasonable bounds, will be much better than any form of index-linking, provided that the financial markets are not hampered by undue restrictions on interest rates, etc. While the search for that elixir goes on, index-linking should be accepted as a palliative which ameliorates but does not cure the malady.

Index-linking vs. incomes policy.—Finland discontinued index-linking in 1967 and replaced it with a stabilization program. The main component of this program was a wage-price policy under which the government would freeze prices initially and then wage contracts would be made annually to incorporate productivity gains, etc. into wages. Wages and salaries would not be adjusted immediately and automatically for changes in the price-level.

It might appear from these policy measures in Finland that an incomes policy is a substitute for index-linking, and it was so publicized in Finland at that time. An incomes policy has immediate relevance to wages and salaries, not to financial contracts on which this paper focuses. The need for indexing in financial markets will be eliminated only if an incomes policy succeeds in preventing inflation, or at least reducing it to such low levels that the costs of indexing no longer justify its benefits. Unfortunately, the record of wage-price policies in this regard is a dismal one, in Finland itself, and other countries such as the United States and Great Britain. Such policies might succeed in stemming the tide of inflation for a short time, but once the controls are lifted, the floodgates open, and the subsequent inflation in many cases has been worse than the one incomes policy was intended to control in the first place. Moreover, wage-price controls rarely apply to all prices in the economy. Relative prices, therefore, are likely to be affected, and the resulting change in resource allocation will add to the costs of an incomes policy.
VIII. Some Practical Matters

By now most of the theoretical issues concerning the pros and cons of indexing and its effects have been looked at. Some practical matters, dealing mainly with actual policies about index-linking, are discussed in this section.38

What to Index?

As the list in the Appendix shows, there are numerous instances in which both the principal and interest have been index-linked, sometimes to different indices. France is the only country in which the policy of indexing either the principal or the interest - but never both - seems to have been followed, although for bonds issued by Électricité de France in 1952 and by the French railways in 1953, both the principal and the interest were tied--the 1952 bonds to the average price of a kilowatt-hour of electricity, and the 1953 bonds to the price of railway tickets.

The difference made by indexing both the principal and interest can be illustrated by a simple example. Suppose that a loan of $1,000 is made for a 3 year period at 10 per cent a year, and prices are rising at the rate of 5 per cent a year. The payments-stream under different arrangements will as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>No linkage</th>
<th>Principal only linked (adjusted at the end of the year)</th>
<th>Both principal and interest linked</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100</td>
<td>100</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>105</td>
<td>110.25</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>110.25</td>
<td>115.76</td>
</tr>
<tr>
<td></td>
<td>100 + 1,000</td>
<td>1,157.62</td>
<td></td>
</tr>
</tbody>
</table>

Thus if only the principal is linked, interest payments will adjust with a lag of one period. This will cause no serious problems if inflation is as mild as in the above example, but if the rate of interest is 70 per cent and prices are rising at 50 per cent or more every year, both the principal and interest will need to be escalated. If the principal could be adjusted continuously, or with a very short lag, however, it would be unnecessary to adjust the interest rate also. As a practical matter, the issuing agency might wish to pay no more than the absolute minimum necessary to sell the bonds, so it can resort to all sorts of devices to keep its borrowing costs down.

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38 This section does not deal with the specific practical problems which might arise in a particular case. For example, if wages are not escalated but interest rates are, a borrower in an inflationary situation might find that interest rates have risen much more than wages. He will thus have an "artificial" incentive to substitute labour for borrowed capital. The government might have to give an employment subsidy to offset that incentive. The list of such practical problems is obviously endless.
Which Assets?

It is clear from the discussion in the previous section that there is no substitute for indexing for medium- and long-term contracts. Lack of indexing will not be very serious for short-term contracts unless prices are rising at a very fast rate. In situation of unanticipated inflation, and where ceilings and other restrictions on interest rates are present, widespread use of indexing in all financial transactions will be useful. If indexing is restricted to a particular type of loan, it will introduce an unnecessary distortion in the capital market. The best policy for the government will be to remove all restrictions on index-linking so that borrowers and lenders are free to make whatever transactions they wish. Left to itself, a reasonably active market will determine the relative yields at which indexed and unindexed securities will be able to coexist.

Which Institutions?

If the bulk of the liabilities of an institution are index-linked, ultimately most of its assets also will have to be adjustable. In many countries, banks maintain different deposit-reserve ratios for different types of deposits, for reasons of business prudence or central bank regulations. If savers switch from time deposits to saving deposits, a bank could thus run into liquidity problems. For institutions which accept both indexed and unindexed deposits, a switch between the two types of deposits might also cause similar problems. Banks which borrow abroad will have to hedge themselves against devaluation risk besides the purchasing power risk, so indexing will be of paramount importance for such institutions.

In most countries, indexing appears to have started with government transactions, mostly with the issue of a government bond, or a bond issued by a state-sponsored agency. In Finland, indexing was used by banks, insurance companies, and financial and other private corporations. Chile has applied escalation clauses to mortgage institutions and savings deposits, and Israel has used it extensively throughout the economy, using a variety of indices.

Which Index to Use?

On the basis of actual experience, linkage to a foreign currency seems to be the least favoured in almost every country. In Israel, after the 1962 devaluation which substantially increased the liabilities of borrowers with dollar-linked liabilities, the linking of debts to exchange rates was ended. In Chile also, an attempt was made to attract deposits denominated in U.S. dollars, and it proved very successful. The policy was quickly reversed, however, when it was realized that a foreign exchange crisis would be imminent if a sizeable fraction of the dollar-depositors demanded payment in dollars during any short period.
From an economic point of view, any country, especially a developing one, should be free to change the par value of its currency in response to its needs. Nevertheless, if the government has substantial liabilities denominated in foreign currencies, an additional factor will enter into decisions about devaluation, with possible harmful effects on the economy.

Wherever indexing has been introduced to provide a hedge against inflation, a cost of living index has been most commonly used, especially if an independent statistical agency has been responsible for compiling it. A cost of living index has its drawbacks too. There is much disagreement about what constitutes a good index, and the best ways of handling quality change, new commodities, etc. are not altogether certain. Moreover, if many outstanding liabilities are linked to such an index, decisions about subsidies, indirect taxes, etc., which directly affect the index, will assume a political character and often generate unnecessary controversy.

If the objective of indexing is not just to hedge against inflation but to provide a low-risk equity or to serve some other purpose, the index should be based on some variables connected with the economic performance of the borrowers. Profits, dividends, output prices, or some combinations of these and other variables have often been used as linkages in many countries. For the savings and loan scheme in Chile, for example, the cost-of-living index was not chosen because it did not have a sufficiently direct and immediate relationship to the earnings of borrowers who were mainly wage earners and would use the money to buy or build a house. It was feared that the borrowers' earnings might not keep up with the price-level, so the loans were linked to a wage index.39

A fairly complete list of these and other linkages is presented in the Appendix. The choice of an index will depend on the objectives of index-linking and other circumstances in a given situation.

IX. Conclusions and Summary

This paper has surveyed the state of theoretical and empirical knowledge about index-linking, a device by which escalation clauses are introduced into financial contracts to link them to an index. Although we have drawn heavily on the literature of developed countries, developing countries, faced with high rates of inflation, have provided a backdrop for much of the discussion. The most common objective of indexing in inflationary situations is to protect the lenders against inflation, especially unanticipated inflation, so a price index has been the most commonly used linkage. However, many other linkages, some reflecting the performance of the borrowers, and others relating to the performance of an industry or the entire economy, have also been used.

The main conclusion that emerges from this survey is that there is much uncertainty about the effects of index-linking, except in a few areas. Theoretical arguments, supported by actual experience in countries such as Brazil and Finland, suggest that indexing of financial contracts will promote saving in the form of financial assets. By raising the real yield on saving and offsetting the risk of uncertain changes in the price level,

39 Cited by Dock Houk (1968), p. 27. He also presents a useful comparison of different indices which might be used for index-linking.
indexing will help in channeling private saving into long- and medium-term investments. This will be specially beneficial to developing countries where capital markets are relatively new, not very active in many cases, and often subject to undue restrictions on interest rates and other aspects of their operation. In the face of a high rate of inflation, whose future course cannot be forecast with certainty, there is no substitute for index-linking to prevent misallocation of resources and redistribution of income from lenders to borrowers.

Besides these definite benefits of index-linking, its proponents claim that indexing will dampen inflationary expectations, increase aggregate saving, and enhance the effectiveness of stabilization policy. These effects are possible but they will not happen in every case. To a considerable extent, these are empirical matters, yet few empirical studies have been conducted to quantify them or to establish the conditions under which they will hold. The extent of the increase in aggregate saving caused by indexing, for example, depends on the interest elasticity of saving. No empirical studies, however, deal directly with the effects of indexing on aggregate saving, and even those studies which analyze how saving responds to changes in interest rates present conflicting evidence.

The main argument against index-linking is that it adds to inflationary expectations thereby making it more difficult to control inflation. The opinions expressed by the Radcliffe committee and the actual experience in Finland seem to support this argument. However, there seems to be more support for the views that indexing has no definite effect on expectations and the control of inflation, and that it is primarily a device for ameliorating some of the deleterious effects of inflation. It also appears that the efficacy of stabilization policy will not be affected much by index-linking. Its contribution, if any, via the Pigou effect, will be small.

A pertinent question to raise at this stage is that if index-linking is indeed as beneficial as its supporters suggest, why has it not been used more extensively? Also, why have countries such as France and Finland discontinued indexing after experimenting with it for many years? The answer to the first question lies mainly in institutional reasons. In many countries, there has been explicit or implicit prohibition of escalation clauses in financial contracts. In the absence of such restrictions, the popularity of index-linking will depend on the expectations of borrowers and lenders. If in a given situation, lenders would like to charge a rate of 15 per cent on an unindexed loan, or 8 per cent with an escalation clause, and the borrower would pay 15 per cent for an unindexed loan but only 6 per cent for an indexed one, clearly the transaction will be made at 15 per cent without any escalation clauses. In this case, the borrower's expectations about future inflation exceed those of the lender. If people are left completely free to make any transactions they wish, the use of index-linking thus will depend on the intersection of future price-expections held by rival parties.

Regarding the second question, the main reason given for the scrapping of index-linking in France was the confusing array of linkages already in use. The real reason was probably the same as in Finland, namely, the belief that

\[40\] For example, indexing has been explicitly forbidden in France since 1958. It could of course be argued that this restriction is a direct result of the French experience with index-linking.
it would contribute to inflation. The immediate reason for abolishing indexing in Finland was the fear that the benefits of the 1967 devaluation of the Finnish markka will be wiped out in a short time because of the extensive system of escalation clauses throughout the Finnish economy. Nonetheless, it remains to be proved that index-linking caused the initial inflation or even exacerbated it considerably in Finland.

The professional debate about index-linking has remained mostly at the theoretical level, and in many cases, the arguments pro and con have been almost rhetorical. However, the basic issues about the effects of indexing on saving, resource allocation, financial institutions, and on inflation itself, are largely empirical. A wealth of data has been collected in countries which have adopted index-linking in one form or another. Systematic empirical work with these data will be highly productive in enhancing our knowledge about the effects of index-linking.
## APPENDIX

### Linkages Used in Various Countries

#### BRAZIL

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
<th>Linkage</th>
<th>Terms</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1964</td>
<td>Savings Deposits.</td>
<td>Subject to general wholesale price index.</td>
<td>Savings adjusted every quarter in accordance with the adjusted value of Treasury bonds which in turn are adjusted according to the general wholesale price index.</td>
<td>Robinson (1971), p. 181.</td>
</tr>
<tr>
<td>1964</td>
<td>Savings Bonds.</td>
<td>The general wholesale price index.</td>
<td>May provide for payment of interest and monetary correction, or they may be capitalized.</td>
<td>Ibid.</td>
</tr>
<tr>
<td>1967</td>
<td>Livestock Loans.</td>
<td>Unlimited index linking to the price of meat.</td>
<td>Adjustments to be made on price changes up to 10 per cent each year for the first 4 years.</td>
<td>Ibid., p. 58.</td>
</tr>
</tbody>
</table>

In addition, several laws were passed in 1964 and 1965, provided for the creation of readjustable obligations of the National Treasury, permitting escalation clauses in real estate contracts, and giving legal sanctions to monetary correction in many instruments such as debentures, bills of exchange, time deposits, and long-term certificates of deposit. The more recent instances of index-linking in Brazil are discussed at length in the text.
<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
<th>Linkage</th>
<th>Terms</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1947-48</td>
<td>Loans offered by Insurance Companies.</td>
<td>Wholesale price index of domestic goods.</td>
<td>Interest is a little below the going market rate and is applied to the outstanding debt by a 50 per cent compensation clause.</td>
<td>Ibid., p. 74.</td>
</tr>
<tr>
<td>Since 1948</td>
<td>Insurance premiums and policies.</td>
<td>Cost-of-living index.</td>
<td>Adjusted fully to every 10 per cent increase in the cost-of-living index.</td>
<td>Ibid.</td>
</tr>
<tr>
<td>1953</td>
<td>Loan.</td>
<td>Domestic wholesale prices.</td>
<td>Compensation limited to a 100 per cent rise in prices and becomes effective when the index increases (or falls) by 5 per cent.</td>
<td>Ibid.</td>
</tr>
<tr>
<td>1954</td>
<td>Government loans.</td>
<td>Both principal and interest rate linked to the cost-of-living index.</td>
<td>Compensation equal to 50 per cent of the increase in index.</td>
<td>Ibid.</td>
</tr>
<tr>
<td>1954</td>
<td>Government loan.</td>
<td>Wholesale price index.</td>
<td>Full compensation for each 5 per cent price rise but only up to a maximum increase of 100 per cent. Bonds exempt from income tax.</td>
<td>Ibid.</td>
</tr>
<tr>
<td>Year</td>
<td>Description</td>
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<tr>
<td>1955</td>
<td>Four new loans.</td>
<td>Retail price index for three of the loans. The fourth loan is tied to the wholesale price index.</td>
<td>In some cases, 50 per cent compensation without an upper limit. In others, full compensation for every 5 per cent increase, but the compensation is limited to a doubling of the price level.</td>
<td>Ibid.</td>
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<tr>
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<tr>
<td>1955</td>
<td>Deposits.</td>
<td>Cost-of-living index.</td>
<td>50 per cent guarantee on deposits. The deposits are blocked for a period of one year and carry an interest of 1 per cent below that of savings deposits.</td>
<td>Ibid.</td>
</tr>
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</tr>
<tr>
<td>1955</td>
<td>Loans by Industrial Mortgage Bank.</td>
<td>Exchange rate.</td>
<td>Interest rate and repayments are to be increased by half of the percentage increase in the exchange rate. This applies only when the rate is more than 3 per cent above the basic rate. No reductions are made if the rate falls below the basic rate.</td>
<td>&quot;The Machado Proposal,&quot; Appendix 4, p. 2.</td>
</tr>
<tr>
<td>Year</td>
<td>Description</td>
<td>Linkage</td>
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<tr>
<td>1955</td>
<td>Time deposits.</td>
<td>Cost-of-living index.</td>
<td>100 per cent linking but the rate was 1 1/8 per cent below prevailing rate on deposits without purchasing power guarantees. Return exempt from taxes.</td>
<td>Finch (1956), p. 1.</td>
</tr>
<tr>
<td>1963-67</td>
<td>Government loans to power companies.</td>
<td>Cost-of-living, or General wholesale price index.</td>
<td>25 per cent or 50 per cent.</td>
<td>Ibid.</td>
</tr>
<tr>
<td>Year</td>
<td>Description</td>
<td>Linkage</td>
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<tr>
<td>1952</td>
<td>Public utility bonds.</td>
<td>Both interest and principal linked to the average selling price of electricity.</td>
<td>Annual interest equal to the average selling price of 100 kilowatt hours or 720 francs, whichever was higher. Redemption value was to be the higher of 16,000 francs or the average price of 2,000 kilowatt hours.</td>
<td>Finch (1956), p. 19.</td>
</tr>
<tr>
<td>1953</td>
<td>Bonds.</td>
<td>An index of the ratio of value of sales to the number of hours of direct labour.</td>
<td></td>
<td>Rozental, p. 525.</td>
</tr>
<tr>
<td>1953</td>
<td>SOMUA Bonds.</td>
<td>Interest and capital value linked to productivity.</td>
<td>The corporation has the right to retire the bonds when annual interest and amortization is four times the guaranteed interest and capital value.</td>
<td>Ibid., p. 526.</td>
</tr>
<tr>
<td>Year</td>
<td>Description</td>
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<td>Terms</td>
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<tr>
<td>1953</td>
<td>Electriate de France</td>
<td>Price per 100 kilowatt hours.</td>
<td>4.5 per cent minimum rate, to vary upward.</td>
<td>Ibid., p. 523.</td>
</tr>
<tr>
<td>1953</td>
<td>Bonds issued by Pechiney</td>
<td>Earnings and dividends.</td>
<td>5.5 per cent coupon plus 1/3 of percentage increase in earnings and dividends.</td>
<td>Ibid., p. 524.</td>
</tr>
<tr>
<td>1953</td>
<td>Bonds issued by Sidelor</td>
<td>Dividends and reserves.</td>
<td>6 per cent coupon and 20 centimes are added to interest and 3 francs to capital for each million franc increase in dividends and reserves.</td>
<td>Ibid.</td>
</tr>
<tr>
<td>1954</td>
<td>Bonds issued by SNCF. (Railways)</td>
<td>Price of rail travel per kilometer.</td>
<td>Premium payable in cash or railway tickets if linkage rises by more than 50 per cent above base year.</td>
<td>Ibid., p. 526.</td>
</tr>
<tr>
<td>1954</td>
<td>6 per cent Loan. (Probably a government bond)</td>
<td>(a) Price of steel. (b) Total production of the borrower.</td>
<td>For each 10 per cent increase in the steel price beyond 30,000 francs per ton, the interest and amortization are increased by 2.5 per cent and for each 10 per cent increase in total production beyond 10,500 tons on steel, interest and amortization are increased by 7 per cent.</td>
<td>Economic Bulletin for Latin America (1957), p. 75.</td>
</tr>
<tr>
<td>Year</td>
<td>Description</td>
<td>Linkage</td>
<td>Terms</td>
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<tr>
<td>1955</td>
<td>Bonds issued by Michelin</td>
<td>Both interest and principal linked to tonnage sold and the price of rubber.</td>
<td>5.5 per cent coupon rate to which are added a) 55 centimes for each per cent increase in tonnage sold, and b) 82.5 centimes for each per cent increase in the price of rubber. The corresponding premia on capital are 25 and 10 francs.</td>
<td>Rozental, p. 525.</td>
</tr>
<tr>
<td>1955</td>
<td>Variable return bonds issued by Renault. Similar issues also by SAVIEM automobile group and GICEL electrical-construction industry group.</td>
<td>Changes in the rate of turnover.</td>
<td>Minimum return of 5.5 per cent, but it varies upward.</td>
<td>Ibid., p. 523.</td>
</tr>
<tr>
<td>1956</td>
<td>Bons d'Equipment Industriel et Agricole.</td>
<td>National index of production.</td>
<td>Variable returns on interest only.</td>
<td>Ibid.</td>
</tr>
<tr>
<td>1956</td>
<td>5 per cent Floating bond loan.</td>
<td>Principal linked to the index of the market prices of fixed-interest bearing securities and shares quoted on the Paris stock exchange.</td>
<td>Capital premium payable on redemption is tax exempt.</td>
<td>Economic Bulletin for Latin America, p. 75.</td>
</tr>
<tr>
<td>Year</td>
<td>Description</td>
<td>Linkage</td>
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<tr>
<td>1952-57</td>
<td>Several issues of government bonds</td>
<td>(a) Principals linked to (i) free market price of the gold coin &quot;Napoleon&quot;, (ii) stock prices, and (iii) a combination of stock and bond prices. (b) Interest payments linked to the volume index of industrial production.</td>
<td>Guarantee in respect of either principal or interest payment, but not both. Guarantee was to the full 100 per cent of change in whatever index the principal or interest was linked.</td>
<td>Please and Christoffersen (1969), p. 49.</td>
</tr>
<tr>
<td>Year</td>
<td>Description</td>
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</tr>
<tr>
<td>1951</td>
<td>Public corporations and private companies' bonds.</td>
<td>(a) Price of product or (b) Cost-of-living index, (c) To the U.S. dollar or (d) A combination of both (b) and (c).</td>
<td>Obigations linked to the wage level.</td>
<td>Ibid.</td>
</tr>
<tr>
<td>Early 1950's</td>
<td>Provident and pension funds.</td>
<td>Obligations linked to the wage level.</td>
<td>Registered in the name of the holder and not transferable.</td>
<td>Economic Bulletin for Latin America (1957), p. 75.</td>
</tr>
<tr>
<td>1951</td>
<td>Savings Bonds</td>
<td>U.S. dollar</td>
<td>Both principal and interest are linked. Bond holders also entitled to buy cement at fixed price with the interest coupons.</td>
<td>Ibid., p. 75.</td>
</tr>
<tr>
<td>1952</td>
<td>Two debentures</td>
<td>Price of cement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Description</td>
<td>Linkage</td>
<td>Terms</td>
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<tr>
<td>1955</td>
<td>&quot;Save to Build Project&quot;</td>
<td>Changes in the cost of construction.</td>
<td>An initial sum is paid, depending upon the size of the flat desired, and thereafter a monthly installment. Should building costs increase, the price of that part of the flat which has not yet been paid for is raised accordingly. When the amount saved has reached 25 per cent of the value of the flat at 1955 prices, the participant may take part in annual lottery drawings for flats.</td>
<td>Ibid.</td>
</tr>
<tr>
<td>1955</td>
<td>&quot;Citrus Grove Through Saving Project&quot;</td>
<td>(a) Payments during the first five years linked to the planting and maintenance cost of the grove. (b) Interest and repayments on the government loan linked to changes in the exchange rate at which the government converts income from the marketing of citrus abroad.</td>
<td>Citrus grove plots of varying sizes acquired by 2 initial payments and supplementary monthly payments over a period of five years, after which ownership of the grove transferred to the participant. These payments represent half the cost. The government provides the remaining half by a loan for 14 years.</td>
<td>Ibid.</td>
</tr>
<tr>
<td>Year</td>
<td>Description</td>
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<td>Terms</td>
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</tr>
<tr>
<td>1955</td>
<td>Debenture loan floated by the Palestine Electric Corporation.</td>
<td>(a) Official exchange rate of the dollar or (b) Consumer price index.</td>
<td>6.5 per cent government guaranteed interest rate. Also maximum rate of tax on the interest income from these debentures limited to 25 per cent.</td>
<td>Ibid.</td>
</tr>
<tr>
<td>1954</td>
<td>Government bonds.</td>
<td>Cost-of-living or Official exchange rate.</td>
<td>(1) 50 per cent of the loan for 2-5 year bonds. (2) 60 per cent of the loan for 5-8 year bonds. (3) 70 per cent of the loan for more than 8 years.</td>
<td>Robinson (1971), p. 175</td>
</tr>
<tr>
<td>1955-56</td>
<td>Long-term loans by government.</td>
<td>Consumer price index or U.S. dollar</td>
<td>Interest limited to 7½ per cent provided that 70 per cent of the loan was linked either to the dollar or consumer price index.</td>
<td>Ibid.</td>
</tr>
<tr>
<td>1957</td>
<td>(a) 6 per cent registered bonds (taxable). (b) 4½ per cent bearer bonds (tax-free).</td>
<td>(a) U.S. dollar or (b) Cost-of-living.</td>
<td></td>
<td>Collier (1969), p. 110.</td>
</tr>
<tr>
<td>Date</td>
<td>Description</td>
<td>Linkage</td>
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<td>Year</td>
<td>Country</td>
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<tr>
<td></td>
<td>Chile</td>
<td>Adjustable bond loans.</td>
<td>Nominal value based the market price of a metric quintal of wheat; or on the cost of one square meter of concrete construction.</td>
<td></td>
</tr>
<tr>
<td>1963</td>
<td>Chile</td>
<td>Savings and loans system.</td>
<td>The wage-salary index or cost-of-living index, whichever was the lower.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paraguay</td>
<td>House Mortgage Loans</td>
<td>When such loans are made possible by external loans they be adjusted to the U.S. dollar rate.</td>
<td></td>
</tr>
<tr>
<td>1969</td>
<td>Uruguay</td>
<td>Savings and Mortgages.</td>
<td>Average salary index.</td>
<td></td>
</tr>
</tbody>
</table>

Besides these countries, Peru has used adjustment clauses in mortgage contracts financed by external loans guaranteed by the government. Columbia also passed legislation in 1966 to permit index-linked saving deposits and loans. In 1972, Columbia established a number of Savings and Loan Corporations whose deposits and loans were subject to index-linking.
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