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The Quarterly Review is published by the Research and Statistics Function of the Federal Reserve Bank of New York. Among the members of the staff who contributed to this issue are MARCELLE ARAK *on innovations in the financial markets, page 1;* BETSY BUTTRILL WHITE *on monetary policy without Regulation Q, page 4;* MICHAEL DOTSEY, STEVEN ENGLANDER, *and* JOHN C. PARTLAN *on money market mutual funds and monetary control, page 9;* ANDREW SILVER *on original issue deep discount bonds, page 18;* DOROTHY MEADOW SOBOL *on the SDR in private international finance, page 29;* MARK A. WILLIS *on leasing—a financial option for states and localities, page 42;* PAUL BENNETT *and* DEBORAH KUENSTNER *on natural gas controls and decontrol, page 50;* JAMES R. CAPRA *and* DAVID C. BEEK *on combining decontrol of natural gas with a new tax on producer revenues, page 61.*

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Innovations in the Financial Markets

Radical changes in the instruments used in financial transactions are occurring today. Instruments developed a while ago have suddenly become popular; at the same time, some brand new ideas are being experimented with. These changes are affecting many aspects of our economic environment, including the interest rate risk borne by various borrowers, and are complicating monetary policy decisions.

Money market mutual funds are one of the money substitutes whose appeal has recently widened substantially. Although only ten years ago money market funds were a new invention, today for every dollar held in a checkable deposit there are 57 cents held in a money market mutual fund. The nature of loans is also changing. While variable interest rates on business loans or mortgages were a rarity in the United States a decade ago, today over half of bank loans to businesses carry interest charges that float with the prime rate or with money market interest rates, frequently the London Interbank Offer Rate (LIBOR). And, of the conventional home-mortgage commitments made in late 1981, one out of every three carried an adjustable rate of interest.

Another striking change on the financial scene is the development of a financial futures industry where contracts for future delivery of, say, Treasury bonds or Swiss francs are traded alongside contracts for silver and cattle.

Many factors contributed to this changing financial environment. Certainly, the historically high interest rates witnessed in 1979-81 and the great variation in both rates of interest and rates of exchange between currencies played a significant role. Other key factors included regulations which affected the profitability of one type of asset versus another. In addition, the use of computers facilitated frequent transfers from one asset to another, while the growing sophistication of the typical American household, not to mention the corporate treasurer, added to the momentum of change.

In this issue of the Federal Reserve Bank of New York's *Quarterly Review,* we include several articles on the innovations in the financial markets. These articles explore the causes of change as well as the implications for the economy and for monetary policy.

High interest rates and asset choices

The rapid acceleration in inflation in the 1970s put enormous pressure on both long- and short-term interest rates as investors sought a rate of return to compensate them for the dollar's eroding purchasing power. As interest rates rose, financial innovations and shifts into new assets accelerated, with the effect of high interest rates on people's decisions reaching a crescendo in the 1979-81 period.

Businesses and households substantially reduced their checkable deposits and passbook savings accounts—whose rates were subject to legal ceilings—relative to their expenditures. Taking a long view over the decade, households reduced the ratio of their checkable deposits to their consumption spending by 18 percent and corporations reduced their checkable deposits relative to gross national product (GNP) by 38 percent. In the case of passbook savings accounts, households reduced the ratio of their passbook sav-

ings balances to consumption spending by 50 percent.

Businesses and households moved funds from checking and savings accounts into traditional market instruments such as Treasury bills, commercial paper, and large certificates of deposit (CDs), as well as into the relatively new money market mutual funds and six-month money market certificates (MMCs).

Through money market mutual funds, people with only moderate amounts of financial wealth could for the first time invest, albeit indirectly, in large CDs, commercial paper, and Treasury obligations. In addition, while money funds offered a slightly lower rate than money market instruments, they provided greater liquidity. For some people, then, they were a good temporary resting place for funds that might be needed for purchases, not unlike the traditional savings account.

Besides shifting funds into money market mutual funds, households took advantage of regulatory changes and purchased close to $500 million of six-month MMCs at banks and thrift institutions. They now comprise one fourth of these institutions' deposits. MMCs were authorized in June 1978. Although they are available only in minimum denominations of $10,000, the ceiling rate on MMCs is keyed to the rate on six-month Treasury bills, making them an attractive alternative to other types of deposits—which were subject to legal interest rate ceilings. Another newly authorized deposit that attracted funds was the small savers certificate, a 2½-year time deposit with a ceiling rate keyed to the rate on 2½-year Treasury notes.[1]

Issues for monetary policy

Some of these shifts of funds have created new difficulties for the monetary targeting approach used by the Federal Reserve. For example, a huge inflow to money funds occurred in 1981 at the same time that M-1B—checkable deposits and currency—was weaker than would have been expected considering general economic financial conditions. Were money funds substituting for checkable deposits in their use as transactions balances? If so, should the definition of M-1B be changed to include money funds and should this new money supply concept be the one that the Federal Reserve seeks to control. In an article entitled "Money Market Mutual Funds and Monetary Control", Michael Dotsey, Steven Englander, and John C. Partlan examine these questions.

Another problem for monetary policy is evaluating the potential consequences of various regulatory changes. The Depository Institutions Deregulation and Monetary Control Act of 1980 specifies that the Regulation Q interest rate ceilings on deposits, other than demand deposits, must be phased out by the end of March 1986. As ceiling rates on negotiable order of withdrawal (NOW) and automatic transfer service (ATS) accounts are removed, rates on such accounts may tend to move closer to market interest rates and vary more with them. This could have major implications for monetary control as Betsy Buttrill White discusses in the article "Monetary Policy Without Regulation Q."

Interest rates and financial intermediaries

Shifts of wealth into new assets by households and businesses affected the risk position of banks and thrift institutions. The attractiveness of the new six-month MMCs, for example, resulted in a shortening of the average maturity of thrift institutions' and banks' time deposits. Also, since these MMCs paid a market-related rate of interest, the cost of banks' and thrift institutions' funds became increasingly sensitive to market rates of interest as these certificates became a larger fraction of deposits.

One answer to this sensitivity of funding costs to short-term interest rates was to make loans with yields that increased when the cost of funds increased. Business loans with interest rates linked to the prime rate were an example of this approach. Large banks, who had been relying increasingly on large negotiable CDs and similar instruments with market-determined interest rates, were already moving in the direction of floating rate loans before the advent of MMCs. And, by the end of 1980, over 70 percent of outstanding long-term business loans were of a floating rate variety, some tied to the prime rate alone, others with a LIBOR-pricing option. These loans were an adaptation of rollover credits whose rates were tied to LIBOR, which had become the standard form of lending in the Euromarkets. The Eurobanks were not restricted in the interest paid to depositors. Since their deposits were largely short term, when interest rates rose, their cost of funds therefore also rose. To limit their risk, the Eurobanks tied the rates on loans to the rate which they would have to pay for funds.

Adjustable rate mortgages were another instrument designed to reduce the interest rate risk of the lender. Until recently, however, thrift institutions were not very eager to shift in this direction and so there was little pressure to change the regulations to permit such mortgages. For example, until mid-1979, no Federally chartered thrift institution could offer adjustable rate mortgages and many states prohibited state-chartered

[1] In October 1981 the all savers certificate, a one-year time deposit with a ceiling rate keyed to 70 percent of the 52-week Treasury bill, was authorized; $1,000 of the interest earnings on these certificates is tax exempt on individual returns ($2,000 on joint returns) for 1982.

institutions from offering them. Thus, the thrifts' assets remained largely in fixed-rate mortgages, and they experienced substantial losses in late 1980 and early 1981 as interest rates again began to rise. But, by 1981, new regulations on adjustable rate mortgages and growing awareness of the dangers of mismatching the maturities of assets as liabilities led thrifts to alter their mortgage lending policy: in late 1981 about one third of new conventional mortgage commitments of savings and loan institutions were of the adjustable rate type. These new mortgage instruments, along with floating rate loans, represented efforts on the part of financial intermediaries to reduce interest rate risk by "match-funding"—shortening the effective maturity of their assets to match the shortening of their liabilities.

With such floating rate instruments, more of the interest rate risk is put on the borrower. How this will affect the behavior of borrowers remains to be seen. Firms might be more reluctant to make long-term investments in plant and equipment and families may be more reluctant to buy houses. In addition, the responsiveness of aggregate spending to interest rates might change: when interest rates fluctuate in the future, the effect on some households' spendable income and firms' profits will be greater than in the past. This could mean that the spending on consumer goods and investment items will be more sensitive to changes in interest rates.

A second answer for at least some types of interest rate risk was to hedge by taking an opposite position in the interest rate futures market. The financial futures markets—currency futures and interest rate futures—were set up in the mid-1970s largely in response to the increased variability of exchange rates and interest rates. These markets grew very rapidly. However, few financial intermediaries were participants, due in part to the fact that there was no good way to hedge a fixed-rate, long-term mortgage of twenty-five to thirty years with existing futures instruments.[2] Other financial businesses such as investment bankers and securities dealers, however, did participate in the financial futures market, though much of the activity was apparently for speculation or tax reduction reasons.[3]

[2] Shorter term loans, such as rollover mortgages renewed every three years, could be hedged in large part by selling three-month Treasury bill futures contracts which spanned most of those three years.

[3] See "Interest Rate Futures" by Marcelle Arak and Christopher McCurdy in the Winter 1979-80 issue of the *Quarterly Review* for a discussion of some of the early developments in these new futures markets.

Effects on the capital markets

Activity in the long-term bond markets was greatly affected by interest rate movements. At times when rates appeared high, corporate treasurers were reluctant to issue long-term debt. Also, concern about the possibility of further rises in long-term rates of interest made the traditional buyers of long-term debt—life insurance companies and pension funds—wary of long-term fixed-rate bonds.

As a result of both investor and borrower reluctance to lock in interest rates, there was some shortening in the average maturity of new issues. In addition, there were new issues of bonds which had special features, such as convertible bonds, bonds with warrants, and commodity linked bonds. One particularly popular instrument in 1981 was the original issue discount bond. In "Original Issue Deep Discount Bonds", Andrew Silver discusses the reasons for their newfound appeal.

International financial markets

Just as high and varying interest rates created an impetus for change in the United States financial markets, continuing wide fluctuations in exchange rates generated pressures for new ways to hedge exchange rate risk.

This could be done by taking positions in the currency forward markets, and these markets grew substantially. In addition, futures markets, by offering standardized negotiable contracts in small denominations, were a useful way for small and medium-size businesses and for individuals to hedge their currency risk. This contributed to the growth of these markets.

Other efforts to reduce investors' risk included commodity linked bonds and those denominated in a market basket of currencies; some tailor-made, others fixed in special drawing rights (SDRs) or European currency units (ECUs). Bonds or deposits denominated in this way reduced exchange rate risk. The use of SDR-denominated instruments is discussed by Dorothy Meadow Sobol in an article entitled "The SDR in Private International Finance".

Concluding remarks

The inflationary experiences of the last ten years and the accompanying interest rate and exchange rate behavior may continue to produce more innovations for sometime to come. And the changes that have already occurred may have important ramifications for the behavior of the economy. Clearly there is much analysis yet to be done.

Marcelle Arak

Monetary Policy Without Regulation Q

The financial system in the United States has changed dramatically over the last two decades. New financial instruments have been introduced, financial institutions generally have assumed broader roles in servicing customers, and geographic barriers to customer base have eroded. Several factors have worked together in bringing about these changes, but one of the most important factors contributing to innovation in financial instruments has been Regulation Q interest rate ceilings. Over the last twenty years, these ceilings have constrained deposit interest rates well below market rates during several periods, in each case providing an environment in which new financial instruments have flourished. The Depository Institutions Deregulation and Monetary Control Act of 1980 (MCA) requires that Regulation Q interest rate ceilings on deposits be phased out by April 1986. How will this deregulation affect the characteristics of deposits at banks and other depository institutions? Will it call a halt to the recent trend toward increased financial innovation? In this article, it is argued that the variety of financial instruments, in fact, should *increase* and a substantial shift of funds into the new instruments will occur. As interest rate ceilings are phased out, more deposit liabilities will pay close-to-market rates of interest. As a result, growth of deposits will become less sensitive to changes in market rates. And these changes will limit the Federal Reserve's ability to influence the growth of the monetary aggregates using traditional policy instruments.

The analysis starts with a review of the economic effects of interest rate ceilings. It then focuses on the changes in depository liabilities and economic behavior that may occur as Regulation Q ceilings are phased out. Finally, the implications for Federal Reserve policy are discussed.

Effects of interest rate ceilings

In a competitive world without regulations, one would expect that the types of assets that banks hold, the types of liabilities banks issue, and the rates at which they are issued would depend upon (1) the financing needs of borrowers, (2) the investment preferences of depositors, and (3) the risk that banks are willing to assume in their roles as intermediaries. Regulation Q-type interest rate ceilings on transactions accounts, passbook savings accounts, and small time deposits prevent banks from paying a competitive rate of interest when market rates exceed the ceiling rates. When this occurs, the behavior of banks, depositors, and borrowers changes. First, banks who can earn a market return on the funds in such deposits will try to attract deposits by offering nonmonetary compensation to their depositors to offset the restrictions on paying explicit interest. Services such as monthly checking account statements and the return of canceled checks, conveniences such as extensive bank branch networks, fancy lobbies, and premiums such as toasters and radios are examples of this type of compensation. However, banks' ability to adjust the level of such nonmonetary compensation is limited, and the costs involved in changing this form of remuneration render it relatively insensitive to changes in market rates of interest.

If depositors do not feel fully compensated, they will seek to lend directly to borrowers. The development of the commercial paper market in this country is an example of this sort of phenomenon. Depositors

will choose to lend directly to borrowers when market rates of interest exceed the overall return on deposits by more than the added cost they face in lending directly to borrowers. This added cost includes the costs of finding and assessing the credit risk of potential borrowers, the credit risk itself, and possibly legal fees. Given the economies of scale associated with these costs, the small investor may not find cost-effective investment alternatives to deposits. Further, many borrowers find it least costly to issue only relatively large-denomination debt instruments. For both of these reasons, the small investor may have no choice but to hold deposits even when deposit rates are well below market rates.

Finally, when the opportunity cost of holding regulated deposits gets sufficiently high and depositors seek unregulated investment alternatives, the incentive to create such alternatives increases. Nonbank intermediaries, not subject to interest rate regulations, spring up. Money market mutual funds are a case in point. (Because money market funds offer "shares" in a portfolio of assets, not "deposits", they are not banks subject to rate ceilings.) Further, depository institutions will try to create new liability instruments not subject to interest rate restrictions. The introduction of Eurodollar certificates of deposit (CDs) and retail repurchase agreements (RPs) fits this characterization.

In summary, when market rates of interest surpass regulated deposit rates, banks will offer depositors nonmonetary forms of compensation or new investment instruments not subject to interest rate ceilings. Nevertheless, some depositors may choose to lend directly to borrowers or to nonbank intermediaries.

The effects of phasing out Regulation Q rate ceilings

Checkable accounts. At present, depository institutions offer checkable deposits on which the interest rate is limited: demand deposits pay no interest and negotiable order of withdrawal (NOW) and automatic transfer service (ATS) accounts can pay up to 5¼ percent. As discussed, banks offer noninterest forms of compensation to attract checkable deposits. And most of these services and conveniences serve to enhance these deposits as a medium of exchange. The degree to which such compensation is perceived by the depositor to be adequate when measured against market rates of interest depends upon several factors, such as the volume of transactions effected through the account, the level of prevailing market rates, and the rate at which the depositor's marginal income is taxed. (Because checking services and conveniences are not taxed, such forms of compensation should be compared with the aftertax yield on alternative deposits in assessing relative yields across deposits.) Regardless of what the perceived relative return on checkable deposits may be, households hold them because they provide a safe, generally accepted medium of exchange.

In contrast, money market mutual funds have grown in popularity because they offer the combined features of a medium of exchange *and* a highly liquid investment asset paying a market rate of interest. (The major restriction on the use of money market fund redemption checks as a medium of exchange is the minimum denomination—most often $500—for which checks may be written.) Some depository institutions have introduced alternatives to money market funds to their retail customers. But, given current regulations, such alternatives tend to be rather complex arrangements and thus far have had only limited acceptance.[1]

When Regulation Q interest rate ceilings are eliminated, depository institutions will be free to offer deposits which are competitive with current nondeposit alternatives.[2] As a result, the variety of checkable deposits is likely to increase and may range in nature from accounts which pay little or no explicit interest and provide full checking services to accounts which provide very limited checkability but pay a market-related rate of interest. At the same time, some accounts may provide liberal checking privileges *and* pay a market-related rate of interest but charge explicit fees for services rendered. Current deposit "sweeping" arrangements—*i.e.,* the automatic transfer of demand deposit funds above some minimum level into interest-bearing investments like money market funds—suggest another possibility. That is, depository institutions may offer a market rate of return only on balances in excess of some required minimum level. These excess balances may be left in the transactions account or swept into another account, perhaps a savings deposit or retail RP.[3]

[1] Examples of such arrangements include RPs and money market certificates (MMCs) that secure a line of credit accessible by draft and deposit "sweeping" arrangements.

[2] The prohibition of interest payments on demand deposits is set forth in the Federal Reserve Act and is not altered by the 1980 banking legislation. Nevertheless, other transactions accounts (NOW and ATS accounts) and all savings and time deposits will no longer have rate ceilings.

[3] When the MCA regulatory changes are fully phased in, transactions accounts in institutions with more than some minimum level of transactions accounts (at present, $26 million) will have a 12 percent reserve requirement while personal savings accounts will have a zero reserve requirement. (For reserve purposes, transactions accounts are defined to be deposits on which more than three withdrawals by negotiable or transferable instruments, payment orders of withdrawal, or telephone and preauthorized transfers to third parties are allowed per month.) Consequently, banks will be able to offer a higher rate of interest on savings accounts than on transactions accounts, all other factors being equal.

There are many possible combinations of checking services, minimum balance requirements, account fees, and explicit interest which might be offered in the future, and the specific permutations that will dominate in the end will be determined by bank costs and depositor preferences. Nevertheless, it is clear that the checkable deposits of the future will be more varied than at present. And, while some of these deposits will serve only as a medium of exchange, those paying a market-related rate of interest will serve as short-term investment assets as well.

Small time deposits and savings accounts. If, as stated above, banks in the future offer transactions accounts with limited checking services paying a close-to-market interest rate, one might conclude that the demand for passbook savings accounts would fall, perhaps to zero. However, passbook savings accounts theoretically will be able to pay a higher interest rate than transactions accounts because they will have lower reserve requirements than transactions accounts.[4] Further, with no checking privileges, passbook accounts should be less costly for banks to supply than transactions accounts, thus allowing them to offer a higher rate on savings accounts than on transactions accounts. Therefore, it is not clear that the distinction between transactions and savings accounts will fade.

Time deposits are not likely to fall by the wayside either. Banks who hold fixed-rate assets may want to match fund a portion or all of these assets. In addition, to the extent that competitive investment alternatives continue to trade in large minimum denominations, the small investor will continue to hold time deposits. In fact, as rate ceilings are phased out, one would expect that depository institutions would offer a fuller schedule of time deposit maturities.[5]

At the same time, the structure of savings and time deposit interest rates and the process by which this structure is determined is likely to change. Savings and small time deposits will be priced in the same way other managed liabilities are today. That is, the supply of these liabilities that banks will offer at any given interest rate will become less than perfectly elastic and will depend on banks' expectations about the future course of interest rates and the perceived interest rate risk involved in mismatching asset and liability maturities. As a result, the relative volumes of different types of savings and time deposits, and the rate paid on each, will be determined by the interaction of borrower financing decisions, bank funding strategies, and depositor investment preferences.

Financial institutions. The phasing-out of Regulation Q rate ceilings is occurring within the context of a world in which many factors are working to stimulate financial innovations. These factors include improved computer technology, improved communications, growing financial sophistication of depositors and borrowers, increased integration of international and domestic markets, and in recent years an increase in interest rate volatility. The evolution in financial institutions and financial instruments over the course of the next few years will depend in part on such technological and economic factors as well as on other regulatory changes that may take place.

As Regulation Q is phased out, it is clear that depository institutions will be able to offer a greater selection of deposit liabilities paying explicit competitive rates of interest. This, in turn, will improve their competitive position in attracting funds *vis-à-vis* other financial intermediaries which were never subject to the regulation. At the same time, however, bank profits may be squeezed as "cheap" sources of funds disappear. How this change will affect the final outcome —the types of financial institutions that will win in the end—will depend on the many other forces working to change the nature of the United States financial system.

Implications for the definitions of money

In the future, the variety of checkable deposits will increase. Under current definitions, M-1 includes all checkable *deposits* (except those, like the so-called "loophole" MMCs, for which writing a check is a form of borrowing money from the bank).[6] If M-1 is defined the same way in the future, its value as a measure of balances used for transactions purposes will decline. This will occur, in large part, because of the investment aspect of interest-bearing checkable deposits to be included in M-1. That is, the demand for such deposits will reflect investor demand for short-term liquid assets as well as consumer demand for transactions balances.

The usefulness of M-1 may be further marred if deposit sweeping arrangements become popular. The fixed minimum balances (if any) associated with such arrangements cannot be viewed as funds available for effecting transactions since the depositor is re-

[4] If banks can raise reserve-free money at, say, 10 percent, they would be willing to pay only 8.8 percent on funds subject to a 12 percent reserve requirement, all other factors being the same.

[5] The Federal Reserve Act prohibits the payment of interest on deposits with maturities of less than fourteen days. However, retail RPs are not deposits and, therefore, can fill out the maturity spectrum.

[6] In January 1982, M-1B was renamed M-1.

quired to keep these balances on deposit. It is only the funds in excess of such balances that can be used for transactions purposes, and it is these funds which are transferred automatically into investments not included in M-1.

In the future, the savings and time deposit components of M-2 are likely to be more varied and their relative interest rates will change in response to changes in borrower preferences and in bank funding strategies. To the extent that some time deposits pay market-related rates, these deposits will be better investment substitutes for such instruments as Government securities or mutual bond funds with comparable maturities. At the same time, however, fixed-rate bank deposits will remain distinct from market instruments because the principal invested does not vary with market rates (even if withdrawn before maturity) as in the case of marketable assets. Consequently, the distinction between bank liabilities, which at one time were viewed as "near money" (and therefore part of M-2), and market instruments will fade but not disappear altogether.

In short, the spectrum of financial assets will be much fuller than at present. Traditional distinctions between transactions balances and investment balances, between near money provided by banks and market instruments, will become even more blurred than at present, and in the case of M-1 an "appropriate" definition will be difficult, if not impossible, to determine.

The implications for monetary policy

The major objective of Federal Reserve policy today is to control the growth of the monetary aggregates, and thereby to reduce the rate of inflation over the next several years. This policy is predicated on the presumption of a predictable relationship between the monetary aggregates and gross national product (GNP). The analysis above suggests that the relationship between the monetary aggregates and GNP is likely to change—at least during the next few years as Regulation Q ceilings are phased out and possibly even after the phaseout is completed. If current definitions are retained and deposit sweeping arrangements do not increase in popularity, M-1 will include a substantial investment component and should increase relative to GNP. Growth of M-1 relative to GNP will reflect investment choices as well as the need for transactions balances. Further, if money market funds are excluded from M-1, factors affecting one but not the other (for example, changes in regulations) will continue to cause secular shifts in the M-1/GNP relationship. (At the same time, to the extent that money market funds are short-term investments, inclusion of these funds in M-1 will also alter the M-1/GNP relationship.)

Since it may not be possible to measure a transactions-related aggregate in any reasonably accurate way, greater reliance on a broader monetary aggregate may be necessary. But, when all deposits pay a market-related rate of interest, not even a broader aggregate will be a viable intermediate target in the sense that the Federal Reserve could control it over some period of time. Under current operating procedures, the Federal Reserve adjusts the level of nonborrowed reserves in a manner consistent with its desired growth rates for M-1 and M-2. When these aggregates are increasing more rapidly than the target rates, the demand by banks for reserves exceeds the level of nonborrowed reserves supplied. This excess demand for reserves exerts upward pressure on the Federal funds rate which in turn puts pressure on other market rates of interest. However, the rates on transactions accounts and other regulated deposits do not rise so that the foregone earnings on funds held in these accounts increase. In response, the public tries to conserve on balances held in such deposits, and the growth of the monetary aggregates is slowed.

In the future, when deposit rates are allowed to move with market rates of interest, the foregone earnings associated with holding bank deposits will not be so affected by rising market rates. The only remaining wedge between deposit rates and other rates of interest will be the cost of the 12 percent reserve requirement on transactions balances. However, to generate a spread between market rates and deposit rates of, say, 5 percentage points, market rates would have to exceed 40 percent! And, because personal savings and time deposits will have a zero reserve requirement, there is no reason for rates on these deposits to be below equivalent market rates. Therefore, in the future, the sensitivity of M-2 growth to changes in the overall level of market rates should be minimal. Efforts to control M-2 growth using traditional operating procedures, which are based on an inverse relationship between interest rates and money growth, may not be valid.

At the same time, traditional methods for controlling the growth of the monetary aggregates will affect credit growth differently in the future. In the past, policy-induced high market rates of interest (coupled with Regulation Q ceilings and usury laws) stimulated the disintermediation of funds and, at times, resulted in "credit crunches". That is, the supply of credit available to a sector of the economy or to a group of borrowers was reduced dramatically. Changes in usury laws and other regulatory changes have reduced the degree of disintermediation during recent periods of relatively high interest rates. The complete

elimination of Regulation Q ceilings should reduce further, or possibly eliminate, the phenomenon of disintermediation.

When banks are allowed (or forced) to compete for money supply deposits, policy-induced high market interest rates will have less effect on the relationship between deposit rates and market rates than at present. As market rates increase, banks will have to increase the rates paid on transactions, savings, and time deposits. The relationship between rates paid on money supply deposits and market instruments will change only to the extent that the cost to banks of supplying deposits (such as the cost of reserve requirements) is directly related to the level of interest rates. Therefore, for a given increase in market interest rates, the shift from deposits into other financial assets should be smaller in the future. And this, in turn, should reduce the possibility of credit crunches.

However, while the *availability* of credit should be less influenced by changes in market rates of interest, the *price* of credit may be more sensitive to future changes. Regulation Q ceilings, in effect, provide banks with an intramarginal stock of "cheap" deposits. As the ceilings are phased out, the volume of such deposits will decline. Therefore, to the extent that loan rates reflect the average (rather than marginal) rate paid on bank liabilities, loan rates will tend to increase to a greater degree in response to a given rise in market rates as rate ceilings are phased out. In short, growth of bank credit will be affected less by supply considerations (as high market rates will lead to less disintermediation) and perhaps more through interest rate effects on the demand for credit when Regulation Q ceilings are eliminated. Further, with no deposit interest rate ceilings, the small saver will have among his investment options a wide variety of insured deposits paying a competitive rate of return. To the extent that decisions to spend or to save income depend upon the return earned on savings, changes in market rates of interest will have a greater impact on consumption-saving decisions.

In the future, policy-induced changes in interest rates may have a greater direct impact on aggregate demand than at present, but the direct effect on money growth will be muted. The influence of monetary policy on the monetary aggregates will depend upon the effects of changing interest rates on the decisions made by borrowers and consumers. And, as these decisions affect the level of economic activity, the demand for money will change also. However, this sequence of causality—in which monetary policy affects money growth through its impact on GNP—raises serious questions regarding the continued usefulness of monetary aggregates as intermediate policy targets.

Betsy Buttrill White

Money Market Mutual Funds and Monetary Control

Money market mutual funds have existed since the 1970s; however, it is only in the past three years that they have become a significant portion of the public's portfolio of financial assets. From the end of 1978 to November 1981, money market funds (MMFs) have increased more than sixteenfold. Much of this growth stems from the features which distinguish MMFs from other financial assets. They provide market rates of interest, entail a degree of risk which is acceptable to a wide range of investors, and with the convenience of checking for large withdrawals (generally $500 or more) are highly liquid. Moreover, it is just this unique combination of features that raises important issues for the conduct of monetary policy. In particular, are MMFs being used as transactions accounts and, therefore, directly substituting for checkable deposits at commercial banks and thrift institutions? To the extent that this has occurred, it is possible that the below-target growth of the money supply during 1981, as measured by M-1B, may be related to the rapid growth of MMFs.

At the same time, the unique features of MMFs raise a number of definitional questions about their positioning in the monetary aggregates. Should, for example, some portion of MMFs be included in the narrowly defined M-1B aggregate, or is the current inclusion of all MMFs only in the larger M-2 measure still appropriate? Furthermore, including all MMFs in M-2 is complicated by the consideration that institutional investors may view them as close substitutes for large certificates of deposit (*i.e.,* CDs, certificates in denominations of $100,000 or more) and other market instruments. Such assets are not included in M-2 but are part of the broader aggregates, M-3 and L.

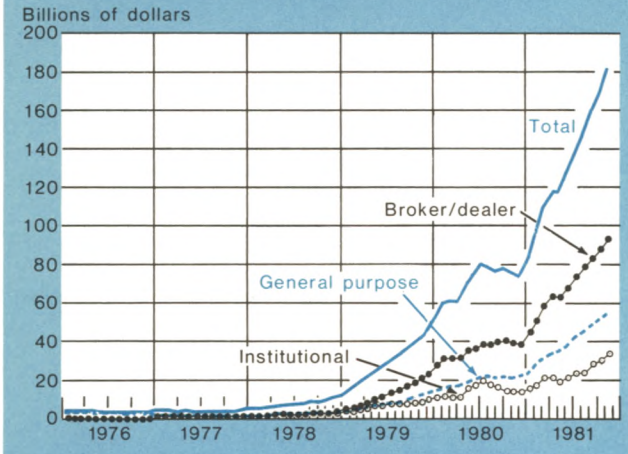
In this article, evidence is presented that suggests MMFs have contributed in a significant way to the weak growth of M-1B during 1981. However, MMFs do not appear to be functioning largely as transactions accounts, although some portion is likely being used in this manner. Rather, the available evidence suggests that MMFs held by individuals more closely resemble savings accounts in their use. Hence, the inclusion of MMFs in M-2 but not in M-1B still seems warranted.[1] This result also indicates that the impact of MMFs on the growth of M-1B has been primarily indirect in nature. That is, while not serving as direct substitutes for M-1B deposits, MMFs have provided a high-yielding alternative way to hold liquid assets, causing individuals and businesses to economize on their holdings of transactions deposits. The same type of behavior would be expected in the absence of MMFs if the interest rate paid, say, on savings accounts were raised to the level of market rates and large withdrawals by check were permitted. In other words, when a new, very liquid instrument that offers market yields becomes widely accepted and used, it is not all that surprising to see slower M-1B growth than would otherwise have occurred.

While these conclusions about MMFs can be drawn from past experience, they may not apply to the future in the same way. The United States financial system continues to evolve with new innovations which seem likely to blur the distinction between transactions

[1] As will be shown later, an argument can be made for excluding from M-2 that portion of MMFs which is held primarily by institutional investors, while continuing to include all MMFs in the broader monetary aggregates.

Chart 1

Money Market Mutual Fund Assets



Source: Investment Company Institute.

balances and other monetary assets even further. New ways are being developed to provide access to funds invested in MMFs which could over time make them closer substitutes for transactions accounts. For example, one major brokerage house allows checks of any size to be drawn on an MMF if the account holder has $20,000 invested through this firm.[2] Another MMF is planning to establish a "sweeping" arrangement which would transfer balances between its customer's negotiable order of withdrawal (NOW) account and the MMF account at the end of each day. Also, major credit card issuers are planning to offer MMF links with their credit cards. Such developments will further complicate monetary control.

Types of money market funds and their growth

While new ways to use MMFs are being developed which could well influence their overall pattern of growth in the future, some insights into their past behavior can be gained by dividing all MMFs into two broad categories: institutional funds and noninstitutional funds. Institutional funds are those MMFs which are available only to or through institutional investors. Noninstitutional funds are available to all investors and can be further divided into broker/dealer funds, which are affiliated with stockbrokers, and general purpose funds.

All three categories have experienced a dramatic increase in assets during the past three years with broker/dealer funds currently accounting for the largest portion of total MMF assets (Chart 1 and Table 1). General purpose funds have exhibited a somewhat slower rate of growth. These two classes of MMFs have similar characteristics, as is shown by the statistics on the size of the average account (Table 1), and for purposes of analysis they have been combined. As of November 1981 institutional funds represented only 18 percent of all MMF assets, a substantial reduction from their over 30 percent share at the end of 1978. These MMFs have a considerably larger average account size and have displayed a somewhat more erratic pattern of growth, which suggests that their behavior may be affected by a different set of economic factors than the noninstitutional funds.

The growth of MMFs, both institutional and noninstitutional, seems to be closely related to the difference between their own rate of return and the yields of alternative financial assets. For example, as is shown in the top panel of Chart 2, the growth of noninstitutional funds since 1979 has responded in a fairly systematic way to the spread between MMF yields and the yields of six-month money market certificates (MMCs) despite the difference in the maturities of these two assets. One possible explanation for this pattern is that individual investors are simply choosing the highest yielding asset among the convenient alternatives irrespective of maturity.[3] A second explanation stems from the time lag between changes in market yields and MMF yields. Because of the accounting method used by most MMFs, their yields will tend to be above those of other short-term assets when interest rates are falling and below them when rates are rising.[4] If the average interest rate on six-month Treasury bills, which determines the MMC rate, reflects

[2] Most MMFs restrict the size of check redemptions to a minimum of $500.

[3] In a household survey conducted by the University of Michigan Survey Research Center in June 1981, 52 percent of respondents indicated that their funds would have been in MMCs if MMFs were not available.

[4] Most MMFs do not take capital gains or losses on securities in their portfolios into account when they are computing their yield. Their yield under most circumstances is a weighted average of the yields of their securities at the time that they were purchased, the weights determined by the share of each security in its portfolio. Thus, the yields of these MMFs reflect market rates at earlier points in time rather than current rates and tend to lag behind current market yields. All institutional and most noninstitutional funds calculate yields in this fashion. Even among MMFs which do take capital gains and losses into account in computing yield, many do so only for securities with more than sixty days to maturity. When interest rates are stable, the accounting methods do not make too much difference. When rates are falling or rising rapidly, MMF yields can be significantly different from market yields.

market expectations of average short-term rates over the next six months, then a fall in MMC rates indicates an anticipation of falling short-term rates in the near future. But, because of MMF accounting procedures, this is precisely the circumstance under which the yield on MMFs will exceed other market yields, making MMFs a more attractive investment. Since most short-term interest rates move closely together, charts incorporating other interest rates showed almost the same pattern. However, the spread using the six-month MMC rate appeared to show the best "fit".

A revealing aspect of the relationship between the growth of noninstitutional funds and interest rate spreads is that these MMFs have rarely experienced declines in asset levels. Even when market interest rates were far above MMF yields (*i.e.,* the spread shown in Chart 2 is negative), the assets of noninstitutional funds continued to grow or fell only slightly. This suggests that individual investors are still learning about MMFs and are shifting funds into MMFs as they become acquainted with them even though MMFs may not at times pay as much as is available elsewhere.

Table 1

Assets of Money Market Funds

Assets in billions of dollars and percentage of total; average account size in thousands of dollars.

		Broker/dealer			General purpose			Institutional		
End of month	Total assets ($)	Assets ($)	Assets (%)	Average account size ($)	Assets ($)	Assets (%)	Average account size ($)	Assets ($)	Assets (%)	Average account size ($)
December 1976	3.4	0.4	12	16.7	2.4	70	16.6	0.6	18	78.5
December 1977	3.9	0.8	20	17.0	2.1	53	17.3	1.0	27	84.8
December 1978	10.9	3.7	34	16.9	3.9	36	19.5	3.3	31	63.9
December 1979	45.2	22.9	51	16.6	12.7	28	15.8	9.7	21	73.6
December 1980	74.4	38.9	52	14.3	21.6	29	11.8	14.0	19	65.0
November 1981	181.6	93.7	52	17.3	54.2	30	12.5	33.7	18	140.1

Source: Investment Company Institute.

Table 2

Turnover Rates

	Money market funds				Commercial bank deposits		
Year	Total	Broker/dealer	General purpose	Institutional	Demand deposits*	NOW/ATS accounts†	Savings deposits‡
1976	2.6	2.7	2.4	3.7	79.8	§	§
1977	2.7	3.2	2.6	2.7	85.9	6.5	1.5
1978	3.4	3.8	3.1	3.5	96.8	7.0	1.7
1979	2.9	3.0	2.4	3.4	113.3	7.8	2.7
1980	3.0	3.0	2.2	3.8	134.3	9.7	3.4
January-September 1981	2.6	2.7	1.8	3.8	178.3	14.3	3.7

* Excluding major New York City banks.

† Accounts authorized for negotiable order of withdrawal (NOW) and accounts authorized for automatic transfer to demand deposits (ATS).

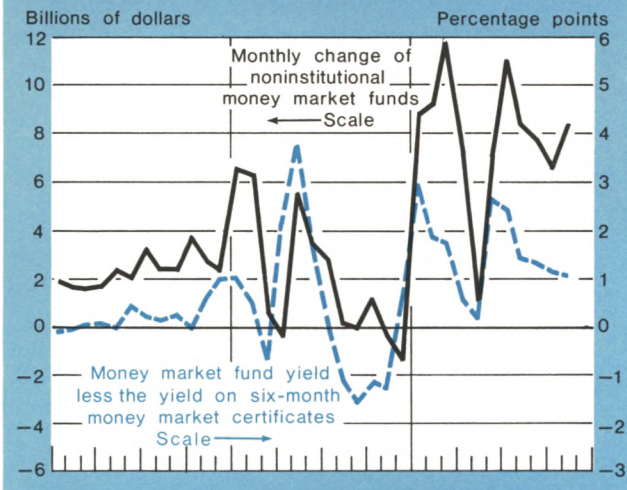
‡ Savings accounts other than NOW, ATS, and business savings.

§ Not available.

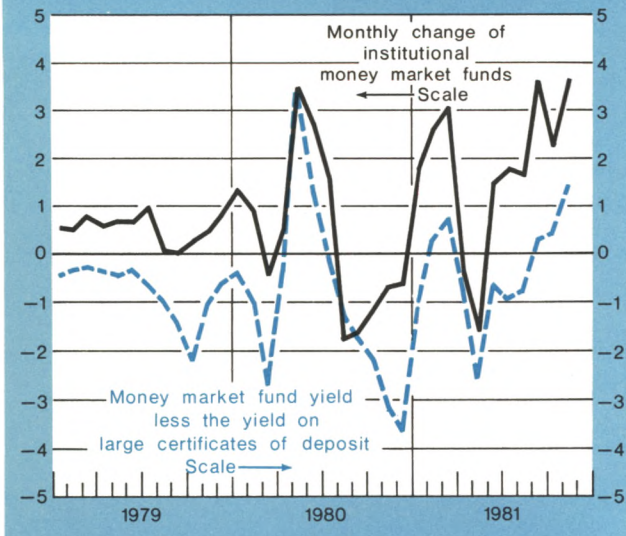
Sources: Investment Company Institute and *Federal Reserve Bulletin.*

Chart 2

The growth of money market mutual funds appears to be closely related to the spread between their yields and the yields of alternative assets . . .



. . . although institutional money market funds appear to be more responsive to changes in interest rates than noninstitutional money market funds.



Sources: Investment Company Institute; Donoghue's Money Fund Report (Holliston, Mass.); Federal Reserve Bulletin.

The pattern of growth of institutional funds, meanwhile, indicates that investors in these MMFs are much more responsive to changes in interest rates. (The lower panel of Chart 2 relates the growth of institutional funds to the spread between MMF yields and the yield on large CDs.) Unlike the noninstitutional funds, which appear to have a strong upward trend, the institutional funds had not shown much growth since mid-1980 until very recently. Indeed, there were substantial declines in their asset levels when market interest rates exceeded the yield on MMFs in contrast to the behavior of noninstitutional funds under similar circumstances. The large average size of institutional fund accounts makes it both possible and worthwhile for their holders to consider direct investments in market instruments, such as large CDs and United States Government or corporate securities as alternatives to MMFs.[5] Indeed, the accounting methods of institutional funds insure that the spread between their yield and the yield on alternative investments will change when market rates move up and down. The responsiveness of institutional fund investors to interest rate spreads suggests that they have become much more acquainted with MMFs than noninstitutional fund investors and view them as close substitutes for other financial assets.

Most of the assets which seem to be reasonable alternatives to institutional funds are not included in M-2. As a result, the flow of funds into and out of institutional funds is of concern for monetary control because they can affect the growth of M-2, particularly in the short run. For example, the annualized growth rate of M-2 between July and October 1981—a period when short-term rates fell and institutional funds increased sharply—was 8.8 percent. With institutional funds subtracted from M-2, this figure drops to 7.2 percent. Conversely, the exclusion of institutional funds from M-2 during the second half of 1980, when rates increased and institutional funds declined, would have raised the growth rate of M-2. Some of these short-term fluctuations in M-2, stemming from the decision by large investors to hold market instruments either directly or indirectly through MMFs, could be avoided if institutional funds were excluded from this aggregate or if the accounting methods used by these MMFs were changed. Of course, institutional funds should continue to be included in M-3 and L, which contain similar financial assets.

[5] In fact, most institutional funds have minimum initial investment requirements of $25,000 to $100,000.

Use of money market funds

Evidence on the use of MMFs can be obtained by examining data on the volume of redemptions. This allows the calculation of turnover rates , *i.e.,* the ratio of redemptions over a given time period to the average level of assets during that period. A high turnover rate is usually associated with an asset used for transactions purposes, while a low turnover rate would indicate an instrument used for longer term holding of wealth.

Table 2 shows turnover data for MMFs[6] and commercial bank deposits. For the first nine months of 1981, MMF turnover averaged 2.6 at an annual rate, far below the 178.3 annual turnover rate for demand deposits (excluding deposits at major New York City banks) and also lower than the turnover of NOW and ATS accounts (14.3). Indeed, MMF turnover strongly resembles that of savings deposits, which averaged 3.7 during the first nine months of this year.

The turnover rates for MMFs have also been relatively stable over time. While turnover rates for demand deposits and NOW/ATS accounts have risen steadily since 1976, MMF turnover has hovered around an average value of 2.9, even during the last few years. This would suggest that the recent increase in MMF assets has not been for transactions purposes.[7]

An alternative method of examining MMF turnover is with an econometric equation that relates the turnover of MMFs to those economic factors which are thought to be its major determinants. Equations for noninstitutional MMF and savings deposit turnover rates are presented in Appendix 1. The results indicate that MMF turnover is similar to that of savings deposits but may reflect some additional transactions use. Both MMF and savings turnover are related to market interest rates, reflecting the movement of funds between different types of financial assets. Both series are also influenced by seasonal patterns in the public's demand for transactions balances, although the effect on MMF turnover appears to be a little stronger than for savings turnover. Finally, while the turnover of savings deposits does not appear to be related to the level of consumption expenditures, the MMF turnover data show a small but significant relationship to this measure of transactions activity.

Impact of money market funds on the narrow money supply

Even though MMFs do not appear to be widely used as transactions deposits, they may nevertheless be lowering the public's demand for M-1B by providing a good resting spot for funds not needed immediately for transactions. Most models of the transactions demand for money indicate that, as interest rates on savings deposits and market instruments increase, individuals tend to economize on their money holdings, moving funds from the interest-yielding account to a transactions account only as needed. This movement of funds reduces the average amount of transactions balances. MMFs are well suited for making this substitution, offering a unique combination of liquidity and high market yields.

To see whether MMFs are important in the money holding decision, a statistical equation representing the demand for M-1B was estimated (Appendix 2). The statistical results indicate that, as the yield on MMFs rises and as MMFs become a more significant portion of the public's holdings of savings-type assets, the demand for M-1B declines. Furthermore, the impact of MMFs on M-1B growth from the fourth quarter of 1980 through the third quarter of 1981 (on a quarterly average basis) appears to be substantial, possibly as much as 3.9 percentage points at an annual rate, although this figure is subject to considerable uncertainty.

In sum, the rapid growth of MMFs during the past year has raised important questions for monetary control, and the future development of this unique financial instrument—as well as other possible innovations—will require careful scrutiny in interpreting and using the monetary aggregates as intermediate targets.

Michael Dotsey, Steven Englander, and John C. Partlan

[6] MMF turnover was calculated from end-of-month data on assets (A) and monthly data on redemptions (R) as follows:

$$\text{Turnover}_t = \frac{R_t}{(A_t + A_{t-1}) \div 2} \cdot 12$$

[7] However, the aggregate turnover data could be misleading. For example, if MMFs experienced an inflow of funds with a high turnover rate that was counterbalanced by an equivalent or larger inflow of funds with low turnover, the average turnover rate could remain unchanged or possibly decline even though a growing volume of MMFs was being used for transactions purposes. Unfortunately, existing data sources do not allow this question to be addressed at a disaggregated level.

Appendix 1: Equations for Noninstitutional Money Market Fund and Savings Deposit Turnover Rates

The following equations represent an attempt to explain the turnover rates of noninstitutional money market funds (equation 1) and passbook savings accounts (equation 2) using an econometric approach. By comparing the factors that influence MMF and savings turnover, some light may be shed on the use of MMFs for transactions purposes. In particular, if MMFs are used to replace demand deposits, it would be expected that (1) the turnover rate for MMFs would more strongly reflect the seasonal patterns in the public's holdings of demand deposits and (2) MMF turnover would also be more closely related to overall indicators of the level of transactions—such as consumption expenditures—than savings turnover.

As shown in the accompanying list of definitions, the explanatory variables in the two equations are interest rates on MMFs and six-month Treasury bills, a series of seasonal adjustment factors for household demand deposits,[1] and a measure of consumption expenditures. The interest rate variables capture the shifting of funds between MMFs or savings deposits and alternative investments as interest rates change. The signs on these variables in equation (1) indicate that individuals make fewer redemptions from MMFs when their yield (RMMF) rises and more redemptions when Treasury bill rates (RTB) increase. Since the coefficients on these two variables are of roughly the same magnitude but of opposite sign, the spread between these rates appears to be the important factor, as was suggested by the top panel of Chart 2.[2] In equation (2) the turnover rate of savings deposits is shown to respond positively to changes in the yield on six-month Treasury bills, which determine the yield on six-month money market certificates (MMCs). If holders of savings accounts learned about and responded to the introduction of MMCs only gradually, the impact of MMCs on savings turnover would increase steadily over time. One way to capture such a gradual shift was to include the Treasury bill rate in the equation in two forms: alone and multiplied by a time trend beginning in June 1978 when MMCs were introduced. The impact of changes in the Treasury bill rate on savings turnover that results from the combination of the two RTB variables grows from 0.39 in the period prior to June 1978—*i.e.*, the coefficient on Ln(RTB)—to 1.4 in December 1980.[3]

The seasonal adjustment factors for household demand deposits are included in the equations because they reflect the need for individuals to make withdrawals from both MMFs and savings deposits to meet transactions needs that occur regularly over the course of a year, such as holiday-related expenditures and tax payments. The coefficients on this variable in the two equations are remarkably close in size. This suggests that MMFs are used in much the same way as savings deposits on a seasonal transactions basis.

The variable for consumption expenditures was included as a measure of the overall level of transactions. While the seasonal variable reflects recurrent transactions demands, the consumption variable captures those transactions needs that vary with the level of economic activity. The results from equation (2) indicate that there is little relationship between savings turnover and consumption expenditures—the coefficient is insignificant and of the wrong sign. In contrast, equation (1) suggests that there is a significant and positive relationship between MMF turnover and the level of consumption. The coefficient is not very large, however, and represents evidence of a small transactions use beyond that to which savings accounts have been put.

[1] The seasonal factors were computed by Bruce J. Summers and appeared in "Demand Deposits: A Comparison of the Behavior of Household and Business Balances", *Economic Review*, Federal Reserve Bank of Richmond (July/August 1979).

[2] The yield on six-month Treasury bills was used in the MMF turnover equation instead of the six-month MMC yield because the sample period began well before MMCs were introduced.

[3] To test whether the impact of the introduction of MMCs on savings turnover was immediate instead of gradual, the RTB variable was included in the equation multiplied by a dummy variable, which had a value of 1 from June 1978 to December 1980, and 0 otherwise. This variable was not statistically significant. In addition, a passbook savings rate was initially included in equation (2), but as this rate was virtually constant over the sample period it was also insignificant.

Appendix 1 *(continued)*

Independent variables	Equation (1) **Dependent variable:** turnover rate for noninstitutional MMFs *coefficient (t-value)*	Equation (2) **Dependent variable:** turnover rate for savings deposits *coefficient (t-value)*
Constant	2.37 (4.93)†	0.90 (0.90)
Ln (RMMF)	−1.59 (−2.87)†	
Ln (RTB)	1.78 (2.80)†	0.39 (0.78)
Ln (RTB)•T		0.03 (6.20)†
Ln (Seasonal)	7.86 (3.89)†	6.04 (2.36)*
Ln (Consumption)	1.43 (3.10)†	−0.32 (−0.57)
Coefficient for first order serial correlation	0.51 (4.62)†	0.35 (2.29)*
$\bar{R}^2$	0.29	0.79
S.E.E.	0.33	0.32
D.W.	2.22	2.13
Sample period‡	June 1976-September 1981	July 1977-December 1980

* Indicates significance at the 95 percent confidence level.

† Indicates significance at the 99 percent confidence level.

‡ The equation for savings turnover was estimated only through 1980 to avoid the effects of the nationwide introduction of NOW accounts in 1981. Savings turnover data are not available prior to July 1977.

Definitions of independent variables:

Ln	Represents the natural logarithm.
RMMF	Yield on money market funds.
RTB	Yield on six-month Treasury bills.
T	Time trend beginning in June 1978.
Seasonal	Seasonal adjustment factor for household demand deposits (averages to a value of one over the year).
Consumption	Ratio of consumption to the trend in consumption (constant dollars, not seasonally adjusted).

Appendix 2: The Demand for M-1B

To examine whether the weak growth of M-1B during 1981 was related to the very large increase in MMFs, the following demand for money equation was estimated over the period January 1972 to September 1981. The dependent variable was M-1B adjusted for the estimated transfer of funds from non-M-1B sources into NOW accounts. This series was then converted to constant-dollar terms by dividing it by the deflator for personal consumption expenditures. The independent variables were defined as shown in the list below the regression results. They included real personal income, the yield on commercial paper, and the yield on MMFs multiplied by a series of weights (W). This last variable was designed to reflect the impact of MMFs on the demand for money. The MMF yield was weighted under the assumption that it was only as individuals became aware of MMFs over time and began to regard their yields as the opportunity cost of holding transactions balances that the impact on money demand was felt. Hence, the weights were calculated as the *relative* importance of noninstitutional MMFs, compared with other savings-type components of M-2. Finally, in the expectation that the credit control program of 1980 had a transitory effect on the demand for money, a dummy variable was included for this period.[1]

Independent variables:	Dependent variable: △Ln (M÷P) Coefficient	(t-value)
Constant	−0.003	(−4.51)†
△Ln (Y÷P)	0.94*	(6.80)†
△Ln (RCP)	−0.04*	(−5.04)†
△Ln (RMMF)•W .	−0.24	(−2.92)†
D	−0.006	(−3.34)†
$\bar{R}^2$	0.48	
S.E.E.	0.004	
D.W.	2.03	
Sample period	January 1972-September 1981	

* Coefficients represent the sum of a six-month second degree polynomial distributed lag with end-point constraints.

† Indicates significance at the 99 percent confidence level.

Definitions of variables:

△Ln ..... Represents the change in the natural logarithm.
M ..... M-1B less the portion of other checkable deposits estimated as coming from sources other than demand deposits, primarily savings deposits. This adjustment was made to obtain a more accurate measure of transactions balances during the public's adjustment to the introduction of ATS and NOW accounts.
P ..... Personal consumption expenditure deflator.
Y ..... Personal income.
RCP ..... Yield on thirty-day commercial paper.
RMMF ..... Yield on money market funds.
W ..... The ratio of noninstitutional MMFs to the sum of savings and small time deposits at commercial banks and thrift institutions and noninstitutional MMFs. (Over the first nine months of 1981, this ratio increased from 5 percent to 10 percent.)
D ..... Dummy variable for the credit control period with a value of 1 for April to July 1980, −1 for August to November 1980, and 0 otherwise.

The regression results indicate that the demand for M-1B is positively related to the level of income and negatively related to market interest rates, including the yield on MMFs. However, this estimated relationship with MMFs might be an artificial result stemming from the strong growth of MMFs and the weakness of M-1B in 1981. To check this possibility, the equation was reestimated only through December 1980. The coefficients of the reestimated equation changed very little and remained significant at the 90 percent confidence level.[2] In an attempt to estimate how large the effect of MMFs might be in 1981, the results of this equation were used to project the level of M-1B through September 1981 under two alternative assumptions for the MMF variable. The first assumption used the actual values for MMF yields and the series of weights during 1981. The second assumption was that these variables remained fixed at their December 1980 levels. Both simulations used the actual 1981 values for the other independent variables.

Table 3 reports the forecast errors for the two alternative projections of M-1B. The first simulation, using the actual 1981 values of the MMF variable, is fairly accurate on balance for the nine-month period with an average underpredic-

[1] The passbook savings rate was also originally included in the equation but was not statistically significant.

[2] The results of the reestimated equation are available on request.

Appendix 2 *(continued)*

Table 3

M-1B Forecast Errors

Actual less predicted; in billions of dollars

1981	**Simulation 1:** used actual 1981 values for RMMF and W	**Simulation 2:** used December 1980 values for RMMF and W	Simulation 1 errors less Simulation 2 errors
January	−0.1	−1.2	1.1
February	−0.5	−3.2	2.7
March	0.1	−4.1	4.2
April	5.2	−0.4	5.6
May	4.4	−2.7	7.1
June	1.1	−7.3	8.4
July	0.0	−10.3	10.3
August	2.0	−10.3	12.3
September	−2.0	−15.6	13.6
Mean error: January-September	1.1	−6.1	7.2
Mean error: July-September	0.0	−12.1	12.1

tion of only $1.1 billion. In contrast, the second simulation consistently overpredicts the actual M-1B level by an average of $6.1 billion. This divergence between the two projections—over $7 billion per month on average—is attributable to the consideration that the second set of forecasts did not take into account the rapid growth of MMFs or changes in their yield. This figure can, therefore, be interpreted as a rough approximation of the average impact of MMFs on M-1B over the first three quarters of 1981. Moreover, the data in the third column of Table 3 show that the impact increased steadily over the nine-month period. This reflects the increased importance of MMFs as a component of the public's holdings of savings-type assets as the year progressed. By the third quarter of 1981 the effect of MMFs on M-1B, as measured by the difference between the two simulations, had increased to over $12 billion. However, this does not imply that $12 billion of MMFs were being used as transactions accounts in 1981-III, which could in principle be added into M-1B. Rather, the regression approach provides an estimate of the sum of two independent effects of MMF growth: the direct substitution of MMFs for transactions accounts as a means of making payments and the indirect impact of lowering the public's demand for M-1B by providing a convenient high-yielding form for holding short-term balances. Both effects reduce the level of M-1B, but only the former is actual transactions use. Furthermore, the results presented here are sensitive to the specification of the money demand equation and the sample period used for estimation. Hence, while they indicate the essential features of the relationship between MMFs and M-1B, they should be used with caution.

Original Issue Deep Discount Bonds

In response to the high and volatile levels of interest rates experienced in the United States during the past two years, borrowers in the corporate bond market have increasingly experimented with alternatives to the traditional fixed-rate, long-term bond as a means of raising funds. These alternatives include bonds with warrants, variable rates, links to commodities prices, and stock convertibility features (Box 1). Another such innovation, which has been heavily used since the spring of 1981, is the original issue deep discount bond (henceforth referred to as a discount bond). When issued, discount bonds offer coupon payments well below the market rate of return and, therefore, must be sold at a substantial discount from par. Thus, in general, the return on a discount bond held to maturity consists of both coupon payments and the appreciation from the discounted issue price to par value at maturity. However, in the extreme, a bond sold at a discount may offer no coupon (a zero coupon bond) and provide a return solely through its appreciation from the discounted value to par.

Discount bonds offer both advantages and disadvantages to borrowers and investors when compared with current coupon bonds (hereafter referred to as conventional bonds).[1] While it is difficult to place precise monetary values on the different characteristics of the bonds, it is probably true that the advantages outweigh the disadvantages for participants on both sides of the market. For investors, the (implicitly) increased call protection and lower reinvestment risk are attractive features of discount bonds, while the potentially large tax disadvantage is of no consequence to a significant groups of buyers—nontaxable entities and foreign investors. Borrowers benefit greatly from the tax treatment of these bonds, so that they, too, prefer them to conventional bonds. Therefore, investors would be willing to accept lower yields on discount bonds than on conventional bonds, and borrowers would be willing to pay higher yields. Since discount bonds have actually been sold at effective rates below those on comparable conventional bonds, issuers have definitely benefited by offering these innovative bonds. Investors also may have gained, to the extent that the market rates have exceeded the minimum rate at which they would buy discount bonds instead of conventional bonds.

This article examines how original issue discount bonds provide the various advantages and disadvantages to borrowers and lenders, with special attention being paid to the tax considerations. It also shows how the value of some of the bonds' characteristics are accentuated by high and/or volatile interest rates, thus offering a possible explanation for the fact that discount bonds have only recently become a popular means of raising funds in the bond market.

[1] The term "current coupon bonds" refers to bonds issued at or near par, with coupons reflecting the current level of market interest rates. For example, if the current level of market yields is 15 percent, then a current coupon bond would promise coupon payments of $15 per year per $100 of face value.

Background

The first publicly placed discount bond by a highly rated United States corporation was issued in early March 1981 by Martin Marietta Corporation. Prior to

Table 1

Publicly Placed Corporate Bonds

Total funds raised and funds raised with original issue discount bonds

1981	All bonds (millions of dollars)	Discount bonds (millions of dollars)	Discount bonds as a percentage of all bonds
March	3,778	256	6.8
April	3,668	781	21.3
May	2,520	169	6.7
June	4,603	490	10.6
July	1,925	327	17.0
August	905	78	8.6
September	2,198	168	7.6
October	2,582	107	4.1
November	6,560	1,601	24.4
March-November	28,739	3,977	13.8

that time, these bonds had been issued only by companies with low credit ratings or by higher rated companies through private placements. Following the Martin Marietta issue, other major corporations followed in quick succession, and by the end of July there had been twenty-one publicly placed discount issues, raising funds totaling $2.0 billion. Although the pace slowed somewhat from August through October (both on a dollar-volume basis and as a percentage of total funds raised with corporate bonds), it picked up considerably in November, when discount bonds accounted for more than 24 percent of the total funds raised publicly in the domestic bond market. For the entire March-through-November period, the comparable figure was approximately 14 percent (Table 1).

The discount bonds issued in 1981 (from March through November) varied widely with respect to coupons, prices, yields, credit ratings, and terms to maturity. Coupons ranged from 16 percent to zero, and prices from $85.50 to $25.25. The Martin Marietta issue and a recent Security Pacific Corp. offering (rated A and Aa, respectively, by Moody's Investors Service, Inc.) both had the lowest yield to maturity of any discount bond to date—13.25 percent—while another recent offer, by Lorimar (rated B), was priced to yield 20.01 percent. (Box 2 explains how yields to maturity are calculated.) In the March-through-May period, most discount bonds that were issued had thirty years to maturity; the weighted average term to maturity for that period was twenty-eight years, compared with approximately twenty years for conventional bonds. However, in the subsequent five months (through October), the weighted average term to maturity for discount bonds was similar to that for conventional issues, approximately eighteen years.

Bonds sell at more of a discount the lower the coupon and, as long as the coupon is below the market rate, the longer the term to maturity (Box 2). While some discount bonds have been issued with zero coupons and others have had very long maturities (thirty years), there has been neither a zero coupon bond issue with a maturity of longer than ten years nor a thirty-year bond with a coupon of less than 6 percent. Thus, by combining a zero coupon bond with a thirty-year maturity, there is the potential for bonds to be issued at even deeper discounts than the market has heretofore seen. As will be shown in the following sections, such bonds would tend to accentuate most of the advantages and disadvantages of discount bonds.

Tax advantage to borrower

Discount bonds that pay the same yield to maturity as conventional bonds provide distinct tax advantages to taxable borrowers. This is because of special provisions in the tax laws which apply to the treatment of the original issue discount amount. Discounts on orig-

Box 1: Other Unconventional Bonds

A number of bonds that have been issued over the past year have offered investors some combination of the characteristics of conventional bonds and those of instruments of other markets. By combining features of different markets in such "hybrid" instruments, borrowers have sought to attract investors at lower costs than with conventional bonds. A few of the types of unconventional bonds, and examples of their uses, are described below.

Variable rate bonds are bonds that periodically adjust interest payments to reflect market rates. Therefore, in contrast to fixed-rate bonds, if interest rates rise during the term of the bond, investors will not earn below-market rates for any extended period of time. Furthermore, since variable rate bonds earn approximately the market rate of interest, their prices should not vary much from par; consequently, investors have little risk of incurring capital losses if interest rates have risen and they sell the bonds before maturity. Of course, with variable rate bonds, investors give up the opportunity, for the most part, to "lock in" current rates and to earn capital gains should interest rates fall in the future. In these respects, purchasing variable rate bonds is similar to buying a series of short-term investments, such as commercial paper.

As is the case with issuing commercial paper and then turning it over repeatedly, issuers are not sure of their future borrowing costs with variable rate bonds. However, variable rate bonds offer borrowers a long-term commitment for funds, unlike a commercial paper offering and, in this respect, are similar to conventional bonds.

Variable rate bonds have been used rarely in the United States corporate bond market, though they are seen frequently in the Eurobond market. One of the few examples of a domestically issued variable rate bond is a twenty-year issue offered in February 1981 by General Felt Industries, Inc. The interest payments are adjusted quarterly and set at 133 percent of a twenty-day average of the constant maturity yields on twenty-year Treasury bonds.

Commodity linked bonds are another type of unconventional security. The principal of these bonds is convertible, at the option of the buyer, into a fixed quantity of some commodity. To the extent that the price of the commodity tracks the general level of prices in the economy, commodity linked bonds provide protection against unexpected increases in the rate of inflation.

In effect, a commodity linked bond is similar to a combination of a conventional bond and an options contract for the linked commodity. The major difference is that, in the hybrid instrument, exercise of the option also terminates the bond contract. If the conventional bond and option were purchased separately, the option could be exercised but the bond retained.

HMW Industries, Inc., issued an example of this type of bond, a silver-indexed bond with 8 percent coupons. Starting May 1, 1983, investors may redeem each $1,000 principal amount for cash equal to the market price of forty-three ounces of silver, or for the quantity of silver itself. However, since the value of forty-three ounces of silver was $472.57 at the time of the bond offering, the convertibility option would provide value to the investor only after a very considerable increase in the price of silver.

A more common alternative to conventional bonds is the *convertible bond,* which may be converted into

inal issue discount bonds are "deductible as interest and shall be prorated or amortized over the life of the obligation".[2] With a straight-line prorating procedure, borrowing firms realize a tax advantage with discount bonds *vis-à-vis* conventional bonds because the present value of the deductible interest expenses is higher with the discount bonds.

[2] *Treasury Regulations*, Section 1.163-4(a), 1971. Borrowers are allowed to prorate the discount and take it as an interest expense deduction regardless of the size of the original issue discount. However, in the tax treatment of investors, an original issue discount bond is defined as one that is sold at an original issue discount greater than or equal to ¼ percent of the redemption price at maturity multiplied by the number of complete years to maturity. Therefore, a twenty-year bond would be considered an original issue discount bond if it were sold at a price of less than or equal to $95.

This tax advantage can be illustrated with a simple example. Consider, first, a two-year $100 conventional bond with a 10 percent coupon paid annually, thus providing the following pretax cash flows to the borrower:

Period	0	1	2
Cash flow ...	$100	−$10	−$110 (*i.e.*, $100 principal repayment plus $10 coupon)

The pretax yield to maturity (and cost to the borrower) of this bond is obviously 10 percent. For tax purposes, the borrower is allowed to deduct the $10 coupon payments as interest expense.

Now consider an alternative way of raising $100: a

Box 1: Other Unconventional Bonds *(continued)*

a fixed number of shares of common stock at a set price. Typically, that price represents a premium of 10 to 20 percent over the current share price. For instance, in August 1981, Toys "R" Us, Inc., issued a bond at par, which, for each $1,000 principal amount, was convertible into 31.01 shares of common stock. Therefore the initial conversion price, or minimum price at which investors would profit by converting the bond principal into stock, was $32.25 *(i.e.,* the $1,000 principal amount divided by 31.01 shares). Since the price of Toys "R" Us stock was $29.95 at the time of the offering, the conversion price represented a 10.3 percent premium.

In the past year, there also have been a number of bond issues with *warrants* attached. Warrants are options to purchase either shares of stock at a set price or other bonds with a fixed coupon, at some future date (*i.e.,* they are essentially options contracts). When the warrants represent options to buy stock, they provide protection similar to that of convertible bonds; if the price of the corporation's stock rises above the price specified by the warrant, then investors holding bonds with warrants can purchase the stock at a discount. However, warrants are different from convertible bonds in that they are essentially separate from the bond itself; if the warrant option is exercised, the investor still retains the bond.

As an example, consider the offering by Unifi, Inc., in June 1981. The company offered notes in denominations of $1,000, each with 45 warrants. Each warrant represents a right to purchase a share of common stock at $17.625 until maturity (July 1, 1988). Since Unifi's stock was selling in the $17 to $18 range at the time of the offering, any price appreciation could be converted into an immediate gain by investors holding warrants.

Warrants representing options to buy bonds provide a different kind of potential benefit to investors. These warrants reinforce the benefits of holding long-term bonds when interest rates *fall,* since they entitle the holder to purchase another bond yielding a higher return. For instance, the warrant on the ten-year bond with 13⅜ percent coupon issued by Beneficial Corporation in January 1981 entitled the holder to purchase another 13⅜ percent bond, at par, any time before June 30, 1981. The warrants were allowed to trade separately from the bonds. If bond yields had dropped below 13⅜ percent before June 30, the bonds with coupons of 13⅜ percent would have sold at a premium. Therefore, investors would have been able to realize a capital gain on the original bond, as well as on the bond purchased with the warrant.

Of the different types of unconventional bonds mentioned, only convertible issues were used with any frequency in the past year. However, even those bonds have not comprised a major share of the total volume of funds raised in the bond market. The major reason that none of these alternative types of bonds have become very popular is that, although they offer certain advantages to investors, they also present corresponding disadvantages to borrowers. Only when the value placed on the advantage by the investor is larger than the value placed on the disadvantage by the borrower, will the borrower choose to issue the unconventional bond instead of the traditional, fixed-rate bond.

bond offering no coupon payments. To provide the investor with the same pretax yield to maturity as the conventional bond (and thus, to provide the borrower with the same pretax cost), this zero coupon bond must repay a par value of $121 at the end of the second year; this is because the value of the conventional bond's coupon payments at the end of year 2, compounded at a 10 percent rate, is $21. The pretax cash flow for the zero coupon bond is therefore:

Period	0	1	2
Cash flow ...	$100	0	−$121 (*i.e.,* $100 return of principal plus $21 discount)

For tax purposes, however, the $21 discount may be prorated between the two years, *i.e.,* $10.50 may be deducted each year by the borrowing firm as interest expense. Thus, while the pretax payment streams of the two bonds are equivalent (on a present value basis), the annual tax deductions generated by the zero coupon bond are higher than on a conventional bond, making the zero coupon bond a more desirable instrument for any taxable borrower (Table 2). A taxable borrower, therefore, would be willing to offer a *higher* pretax yield to maturity on a zero coupon bond than on a conventional bond; on bonds with equal yields to maturity, zero coupon bonds (and, in fact, all discount bonds) result in lower aftertax costs to the borrower.

The cost savings to the borrower because of this

Table 2

Comparison of Tax Deductions on Zero Coupon Bonds and Current Coupon Bonds

In dollars

Bonds	Period 1	Period 2
Zero coupon bonds	10.50	10.50
Current coupon bonds	10.00	10.00

tax advantage can be very large on discount bonds with characteristics (*i.e.,* yields, coupons, maturities, etc.) similar to those issued in recent months. Consider, for instance, two hypothetical twenty-year bonds yielding 16 percent to maturity—one is a conventional bond with a coupon rate of 16 percent, the other a discount bond with a coupon rate of 7 percent. Both bonds pay $100 at maturity. With market rates at 16 percent, the discount bond would sell at a price of $46.34; the conventional bond, of course, would sell at $100. For a corporate borrower in the 46 percent tax bracket, the aftertax cost of the 16 percent conventional bond is 8.64 percent. However, the aftertax cost of the discount bond yielding the same 16 percent would be only 7.95 percent; this is equal to the aftertax cost of a conventional bond yielding 14.72 percent before taxes. Thus, by issuing a bond with a 7 percent coupon instead of a 16 percent coupon, the issuer in effect could save 128 basis points before taxes, or 69 basis points after taxes—the difference between 8.64 percent and 7.95 percent (Table 3).

The amount of the tax saving available at a given market rate of interest depends on the amount of the discount, which in turn, depends on the coupon payments and the term to maturity. As illustrated in Table 4, lower coupons and longer terms to maturity increase the discount and the tax saving. The table shows the potential tax saving is huge—with a zero coupon thirty-year issue, borrowing costs would be 47 percent lower than on a comparable conventional bond. However, as noted earlier, borrowers have not yet fully exploited this potential tax advantage, since bonds with the longest maturities have not had the lowest coupons (*i.e.,* zero).

The size of the potential tax saving also depends on the market rate of interest; higher rates raise the potential advantage. With market rates at 10 percent (Table 4), a thirty-year zero coupon bond could save only 263 basis points, far less than the 748 basis point saving for a similar bond when the market rate is 16 percent. This relationship between the tax saving and the market rate of interest may account for the fact that borrowers have turned to discount bonds only recently, in a period in which interest rates have reached record highs.

The borrower's marginal tax rate also plays a major role in determining the size of the tax saving due to issuing discount bonds instead of conventional bonds. Higher tax rates imply larger savings. For instance, if the marginal tax rate were 40 percent instead of 46 percent, the tax saving of a thirty-year zero coupon bond yielding 16 percent (compared with a similar conventional bond) would fall to 712 basis points from 748 basis points (before taxes).

The fact that discount bonds result in a tax savings to issuers implies that borrowers should be willing to offer these bonds at higher pretax rates than comparable conventional bonds. But, paradoxically, market analysts have estimated that borrowers have been issuing discount bonds at yields to maturity 40 to 100 basis points *lower* than on comparable conventional bonds. This is because certain investors have been willing to sacrifice yield in exchange for other advantages offered by discount bonds (explained below).

Call protection

Most conventional bonds can be called after a five- to ten-year (nonrefundable) period. That is, the borrower has the option, any time after the end of the nonrefundable period, to buy back all or part of the original bond issue at par or, as is more frequently the case, at a premium.[3] Thus, if interest rates fall between the time a bond is issued and sometime after the end of the noncall period, the corporation may call the bonds and refinance its activities at lower interest rates. Similarly the investor must reinvest the refunded funds at the lower market rates. Therefore, the investor's yield to maturity on a callable bond is not assured. If the bond is called, the series of investments consisting of the original bond (to call) and a new lower yielding bond will produce an overall yield to maturity less than that of the original bond (if held to maturity).

For example, consider a twenty-year conventional bond issued at par with 16 percent coupons, callable after ten years at a price of $110. At the end of ten years, the borrower is faced with the choice of continuing its financing for another ten years with the ten-year-old conventional bond or calling that bond

[3] This premium has recently ranged from zero (*i.e.*, the bond is callable at par) to as high as 18.75 percent (*i.e.*, the bond is callable at $118.75). Frequently, the premium is scheduled to decline gradually to zero sometime before maturity.

Table 3

Comparison of Borrowing Costs on Current Coupon Bonds and Original Issue Discount Bonds Yielding 16 Percent to Maturity

Item		Current coupon bonds	Discount bonds
(1)	Term to maturity	20 years	20 years
(2)	Original price	$100	$46.34
(3)	Pretax yield to maturity	16%	16%
(4)	Pretax coupon payments	$16.00	$7.00
(5)	Aftertax coupon payments*	$8.64	$3.78
(6)	Income deduction due to prorated discount†	—	$2.68
(7)	Tax saving due to income deduction‡	—	$1.23
(8)	Periodic cash outflow§	$8.64	$2.55
(9)	Principal repayment at maturity	$100	$100
(10)	Aftertax yield to maturity	8.64%	7.95%
(11)	Pretax current coupon bond-equivalent yield to maturity‖	16%	14.72%
(12)	Pretax savings on issuing 7 percent discount bonds instead of 16 percent current coupon bonds	—	128 basis points

* Aftertax coupon payments are equal to Cx (1—t), where C is the pretax coupon payments (line 4) and t is the borrower's marginal tax rate, 46 percent.

† Income deduction due to prorated discount amount is equal to (100-P)/n, where P is the original price, $46.34 (line 2), and n is the term to maturity, twenty years (line 1).

‡ Tax saving is equal to txI, where I is the income deduction (line 6).

§ Periodic cash outflow is equal to the aftertax coupon payment (line 5) minus the tax saving due to the income deduction (line 7).

‖ Pretax current coupon bond-equivalent yield to maturity is the pretax rate a current coupon bond would need to pay to obtain the aftertax yield to maturity on line 10, or Y/(1—t), where Y is the aftertax yield to maturity.

Table 4

Comparison of Borrowing Costs on Current Coupon Bonds and Original Issue Discount Bonds

Bonds issued at various coupons, terms to maturity, and under different market rates of return

Market rate of interest (percent)	Coupon rate (percent)	Term to maturity (years)	Current coupon bond-equivalent cost (percent)	Basis point saving over current coupon bonds
16	7	20	14.72	128
16	7	30	14.30	170
16	0	20	11.44	456
16	0	30	8.52	748
10	7	20	9.80	20
10	7	30	9.68	31
10	0	20	8.67	133
10	0	30	7.37	263

Box 2: The Yield to Maturity Calculation

Bond purchases generally involve an initial cash outlay (the price of the bond), some periodic cash inflows (the coupon payments), and a large cash inflow at maturity (the principal repayment). When the price of the bond is equal to the principal repayment, the coupon rate provides a good measure of the bond's rate of return. However, when comparing the returns on bonds, some of which may be purchased at prices other than par, one should take into account the price appreciation or depreciation that will occur on the bonds. One way to do that is to calculate the bond's current yield, or the coupon payment divided by the bond price. However, the current yield does not take into account the length of time over which that appreciation or depreciation is to occur. For example, it does not differentiate between a one-year bond with 10 percent coupons that sells for $90 and a two-year bond with the same coupons and price; the current yield on both bonds is 11.11 percent. While both bonds appreciate $10 in value, the one-year bond does so in half the time and, in that sense, is better from the investor's point of view.

The yield to maturity takes into account all these factors—the coupon payments, the price appreciation or depreciation, and the period of time over which that appreciation or depreciation takes place. Implicit in the yield calculation is the assumption that all periodic payments are reinvested at the same rate; the yield to maturity represents the rate at which the initial price of the bond would have to grow so that, at maturity, it equaled the sum of the principal repayment and the value of the coupon payments (after reinvestment). In algebraic terms, the yield to maturity is the rate that satisfies the equation:

$$(1)\quad P = \frac{C_1}{(1+r/2)^1} + \frac{C_2}{(1+r/2)^2} + \cdots + \frac{C_{2n}}{(1+r/2)^{2n}} + \frac{F}{(1+r/2)^{2n}}$$

or

$$(2)\quad P = \sum_{i=1}^{2n} \frac{C_i}{(1+r/2)^i} + \frac{F}{(1+r/2)^{2n}}$$

where P is the initial price of the bond, C_i is the periodic cash flow, F is the principal repayment, and n is the number of years to maturity.*

The complexity of equation (1), or (2), does not allow one to solve explicitly for the yield, given specific values for the parameters P, F, and C_i. Instead, one must resort to a trial and error procedure, where different values of r are tested to see if they are consistent with the other given parameters. (A computer simulation program is often used to shorten the time necessary to do all the required calculations.) For example, to calculate the yield to maturity for a twenty-year bond with a coupon rate of 14 percent selling at a price of $88.08, one would try different values of r until the following equation was satisfied:

$$88.08 = \frac{7}{(1+r/2)^1} + \frac{7}{(1+r/2)^2} + \frac{7}{(1+r/2)^3} + \cdots + \frac{7}{(1+r/2)^{40}} + \frac{100}{(1+r/2)^{40}}$$

The yield to maturity for this bond is 16 percent.

From equation (1), or (2), it is obvious that, given a yield to maturity, bond face value and term to maturity, the lower the coupon payments, the lower the price at which the bond can be sold; the borrower must offer some price appreciation in exchange for the lower coupon payments. For example, a twenty-year bond with 12 percent coupons would sell at only $76.51 to yield 16 percent to maturity. Furthermore, the longer the period of time investors are to be paid below-market coupons, the lower the price the investor is willing to pay for the bond. Changing the term to maturity in the preceding example to thirty years, for instance, reduces the investor's offering price to $75.25. Therefore, bonds with the lowest coupons and longest maturities would sell at the deepest discounts and thus would present the most extreme examples of original issue discount bonds.

* By convention, yields to maturity on bonds are calculated assuming semiannual compounding—that is, the yield is calculated on a semiannual basis and then doubled to get an annual yield to maturity. Therefore, a conventional bond bought at par with a coupon yield of 16 percent also has a yield to maturity of 16 percent; this is true despite the fact that the coupons are paid in semiannual instalments of $8 each, and thus offer the potential for reinvestment and a compound-interest effect on an annual basis.

and issuing a new conventional bond with ten years to maturity. If interest rates on ten-year debt have fallen, say to 12 percent, then the corporation can certainly reduce its borrowing costs by calling the bond. However, in doing so, it reduces the twenty-year yield to maturity for the investor, from the expected 16 percent to just 15.64 percent (even with the 10 percent call premium).

The risk to the investor of an original issue discount bond being called, however, is far less than with a conventional bond, despite the fact that discount bonds are generally callable at par at any time. Because of the very low coupon payments associated with discount bonds, market rates would need to fall very substantially for the borrower to find it profitable to call the bonds. For example, a discount bond with 7 percent coupons would not be called unless interest rates fell to approximately 7 percent.[4]

The call protection advantage to the investor provided by a discount bond is associated with a corresponding *disadvantage* to the borrower. Should interest rates fall, the corporation can no longer reduce its cost by calling the bond. Thus, *ceteris paribus,* the conventional bond is preferable to the discount bond from the borrower's perspective, given the possibility that rates may decline enough to make the call provision on the conventional bond (but not the discount bond) important. Hence, without the tax considerations discussed above, the corporation would issue a discount bond only if it could do so at a lower rate than a conventional bond. While investors might be willing to accept lower yields because of the increased call protection, it is not clear *a priori* that the differential acceptable to investors is enough to compensate borrowers. Furthermore, if the call protection characteristics are the reason that discount bonds have become popular, there is no obvious reason that a completely noncallable (but otherwise) conventional bond would not be just as popular. Thus, one is led to believe that the call protection characteristics form, at best, only part of the explanation for the popularity of discount bonds.

Reinvestment risk

As mentioned previously, the return on a new conventional bond held to maturity is derived solely from coupon payments. The standard calculation of the yield to maturity of this type of bond assumes that the coupons can be reinvested at the same rate, thus achieving a compound interest effect. But the rates at which investors will be able to reinvest the future coupon payments are not known with certainty at the time the bond is purchased. Therefore, when buying conventional bonds, investors incur some reinvestment risk.

For a given yield to maturity, however, there is less reinvestment risk on a discount bond than a conventional bond. This is because less of the return on a discount bond is due to coupon payments and more is due to the price appreciation of the original investment. The growth of the price of the original investment takes place at an *assured* (implicit) rate, thus reducing the number of dollars which must be reinvested at uncertain future rates. An extreme example is the zero coupon bond, on which the yield to maturity represents the implicit compounded rate at which the original dollar investment grows to par; no coupons need be reinvested, resulting in zero reinvestment risk during the life of the investment.

Table 5 illustrates the point in the following hypothetical situation: reinvestment rates for the coupons of twenty-year bonds (originally priced to yield 16 per-

Table 5

Realized Yields to Maturity for Twenty-Year Bonds with Various Coupons

When reinvestment rates drop from 16 percent to 12 percent after ten years

Coupon (in dollars)	Realized yield to maturity (in percent)
16	14.248
15	14.254
14	14.261
13	14.270
12	14.279
11	14.290
10	14.303
9	14.319
8	14.338
7	14.362
6	14.392
5	14.435
4	14.493
3	14.581
2	14.728
1	15.029
0	16.000

[4] While one's first guess might be that interest rates would need to fall at least to the coupon rate for the refunding to be undertaken by the corporation, this is not quite the case, due to tax considerations. Firms are allowed to deduct from taxable income the difference between the bond's redemption value and its amortized value (to be discussed later), reducing the aftertax price of the bond being refunded. Thus, firms would be willing to call bonds even when the market yields are slightly above the coupon rate.

cent) are 16 percent for the first 10 years and then drop to 12 percent for the final 10 years. As the table shows, the lower the discount bond coupon rate, the higher the realized twenty-year yield. Furthermore, the relationship between changes in coupon rates and changes in realized yields is highly nonlinear; the effect on a 1 percentage point change in coupon rates is much larger at lower levels of coupon rates. Finally, it should be noted that the zero coupon bond provides the ultimate protection against reinvestment risk, guaranteeing the 16 percent return, and thereby providing 175 basis points more yield than the conventional bond, if rates should fall to 12 percent.

However, the advantage reaped by the investor in reducing reinvestment risk may result in either an advantage or disadvantage to the borrower. The effect depends on the cash flows generated by the investment project for which the corporation has borrowed funds. In general, the corporation can reduce its reinvestment risk by attempting to match the investment project's cash inflows to the firm's outflows of bond payments. Hence, if the investment project generates funds throughout the life of the bond, a conventional bond would result in a lower reinvestment risk to the firm—a discount bond would require that the firm save funds for the large payout at maturity by reinvesting those cash flows at uncertain future rates. Alternatively, a firm which expects not to receive any cash flows until the very end of the project would need to raise funds at uncertain future rates to pay the coupons on a conventional bond; a discount bond would be less risky in this situation. Therefore, depending on their cash flow positions, borrowing firms may be willing to offer either lower or higher yields on discount bonds than on conventional bonds.

Tax considerations for investors

While the call protection and reinvestment risk characteristics of discount bonds are attractive to certain investors, the tax treatment of these bonds makes them less appealing when compared with conventional bonds. This is due to the fact that investors must prorate the discount on a straight-line basis and treat this amortization as interest income each year.[5] Therefore, just as the present value of the tax deductions for the borrower is higher on a discount bond than a comparable conventional bond, the present value of the tax *liabilities* of the investor is larger, creating a tax *disadvantage.*

Nontaxable investors, however, are not subject to the negative tax implications of discount bonds. Furthermore, some of these investors are particularly attracted by the nonpecuniary advantages of discount bonds—increased call protection and lower reinvestment risk. As a result, nontaxable investors, such as pension funds, have become the principal buyers of discount bonds.

Another group of investors on whom the negative tax consequences of discount bonds would have little impact is foreign investors. As a result, these investors have also shown some interest in purchasing discount bonds. Foreign investors are subject to a 30 percent withholding tax on interest payments from United States corporate bonds. While the withholding tax applies to both the coupon payments and the prorated discount amount, the sum withheld cannot exceed the amount of the coupon. Any excess liability would be withheld from the principal repayment at maturity, if the bond were still held by the same owner. Thus, with deeply discounted bonds, foreign owners can at least delay some of their tax liabilities (until maturity), reducing the present value of those payments. Furthermore, since only the issuing corporation is required to withhold taxes, and on the earnings only of the current holder of the bond, the foreign investor can avoid the excess tax withholding liability entirely by selling the bond shortly before maturity. For example, on a zero coupon bond, no taxes can be withheld until the principal repayment. If the original holder sells the bond just before maturity, the corporation withholds (from the principal repayment) the tax liability incurred during the relatively short period of time the bond is held by the new owner (and only if the new owner is also a foreign investor). The original holder, in this case, would not have *any* tax withheld on the interest earned on the zero coupon bond.

Other considerations

Although discount bonds "guarantee" a larger portion of their returns than do conventional bonds if held to maturity, investors may also be interested in comparing the volatility of realized yields for other holding periods, given that interest rates may fluctuate and investors may decide to sell the bonds before maturity, thereby earning capital gains or losses. For a given interest rate change, deeply discounted bonds (whether or not issued originally at a discount) exhibit more volatility in holding period yields than do current coupon bonds. This is because a relatively large portion of the yield on discount bonds is paid late in the life of the bond (in the form of price appreciation); a change in interest rates affects the present value of a stream of payments that includes a large distant payment more than it does a smooth stream

[5] The treatment of an original issue discount is in contrast to the treatment of the discount on a bond issued at par but bought in the secondary market below par; the latter discount is treated as a capital gain.

Table 6

Summary of Advantages and Disadvantages of Original Issue Discount Bonds Relative to Current Coupon Bonds

Feature	Impact on borrower	Impact on investor
Tax treatment	Advantage	Disadvantage for taxable investor; of no consequence to nontaxable investor
Call protection	Disadvantage	Advantage
Reinvestment risk protection	Can be advantage, disadvantage, or of no consequence, depending on cash flows	Advantage
Intermediate holding period yield volatility	Of no consequence	Can be advantage or disadvantage, depending on investors' expectations of future interest rate movements and views on rate volatility
Credit risk	Of no consequence	Disadvantage

that includes only coupon payments (as for a conventional bond). Therefore, a discount bond's price is relatively more volatile than that of a conventional bond and, as a result, discount bond holding period yields vary over a wider range than do conventional bond yields.

The greater volatility of discount bond yields may be regarded either as an advantage or a disadvantage, depending on investors' views on the future direction of interest rates and the appropriateness (to the investor) of risk taking. If investors believe that interest rates will decline, they will probably prefer discount bonds to conventional bonds, to take advantage of the higher potential holding period yields. Similarly, if they think that interest rates will rise, they will prefer conventional bonds.[6] When investors have a "neutral" interest rate outlook, that is, when they feel that interest rates have as much of a chance of rising as they do of falling, investors will choose the conventional bonds if they are "risk averse" (*i.e.,* if they prefer less yield volatility to more, all else being equal); otherwise, they will choose the discount bond.

Another consideration in evaluating the choice between conventional and discount bonds is that the latter generally have more "credit risk", that is, the risk that the borrower may default on all or part of the coupon and principal payments. The risk is higher with discount bonds because they "pay out" more slowly than conventional bonds, since the return on discount bonds relies less on coupons (paid periodically) and more on price appreciation (realized at maturity). Therefore, investors get their return "earlier" with conventional bonds and stand to lose less if the borrower defaults. Consequently, investors to whom this risk is very important would prefer conventional bonds to discount bonds. However, this disadvantage is probably not a major consideration in judging the merits of a highly rated company's discount bond.

Summary

The many advantages and disadvantages of discount bonds relative to conventional bonds are summarized in Table 6. In deciding which type of bond to issue (invest in), borrowers (investors) must place a value, positive or negative, on each of the features which differentiate the two types of bonds. If the net result is positive (that is, if the positively valued features of discount bonds outweigh the negatively valued features), then these bonds are the appropriate instrument. Obviously, given the relatively large volume of discount bond issues since March, many market participants have come to that conclusion.

Of all the characteristics of discount bonds which differentiate them from conventional bonds, the tax treatment is undoubtedly the most important. The potential savings in borrowing costs is tremendous and tends to swamp the potential disadvantages that the

[6] This analysis only examines the choice between discount bonds and conventional bonds. In reality, investors can also choose a third type of financial investment, a sequence of short-term instruments. The conclusions reached in the text depend on the implicit assumption that the conventional bond rates are set at a level which makes investors indifferent between those bonds and a sequence of short-term investments of the same total term.

call protection and reinvestment risk characteristics pose to the issuer. This is true for two reasons. First, the call protection and reinvestment risk features are disadvantages only if interest rates decline, which may or may not happen; the tax advantage of discount bonds is effective regardless of the future course of rates. Second, even if interest rates decline substantially during the term of the bond, the total aftertax cost of issuing a conventional bond, calling it, and then issuing a new, lower yielding conventional bond, would probably still be higher than the cost of borrowing with a single discount bond for the entire term. For example, the aftertax cost of a thirty-year zero coupon bond yielding 16 percent to maturity is only 4.6 percent (for an issuer in the 46 percent marginal tax bracket). If, instead, the borrower originally issued a 16 percent conventional bond, called it after fifteen years (at par), and then issued a fifteen-year conventional bond at, say, 6 percent, the average aftertax cost over the thirty years would be approximately 5.9 percent. Therefore, even with a decline in rates from 16 percent to 6 percent, the discount bond would be less costly.

If borrowers prefer the characteristics of discount bonds to those of conventional bonds, why have discount bonds been issued at lower yields? One necessary reason is that investors also value the relative advantages of discount bonds more than their disadvantages. But this is not a sufficient condition, because the combination of preferences for discount bonds by both issuers and investors suggests only that there is a *range* of rates at which a discount bond could sell, a range which includes the rate on a comparable conventional bond.

There are a number of factors that determine where within the range the actual market rate will fall. Included in these factors are the negotiating powers of the market participants and the levels of competition among buyers and sellers. Since discount bonds are relatively new instruments, it is conceivable that not all investors and borrowers have been fully aware of the value of each of the advantages and disadvantages of the bonds. As a more complete understanding becomes widespread with the passage of time, the supply of, and demand for, these securities may shift, altering the yield at which the bonds are sold.

Andrew Silver

The SDR in Private International Finance

The considerable volatility and uncertainty in interest rate and exchange rate developments among the major countries in recent years have led borrowers and investors to seek ways to hedge against these risks. In the process, use of the special drawing right (SDR), which is a basket of the five major currencies of members of the International Monetary Fund (IMF), has become an option for some transactors. The prime attraction of the SDR is that it tends to display less interest rate and exchange rate variability over time than any of its components. Since the beginning of 1981, new instruments denominated in SDRs have become increasingly available on the private international financial markets. These innovations have substantially expanded the potential of the SDR in private international finance.

This article explores the advantages and drawbacks of the private SDR as a basket currency and the nature of the evolving markets in private SDR instruments. The article also considers the reasons for the growth of these markets, the conditions under which they are likely to persist and flourish, and the role that the official community might play in their development.

The official versus the private SDR

The official and the private SDR are two distinct instruments. The official SDR is the creation of the IMF, and it is governed by the rules of that institution. It was created on July 28, 1969 to be available to supplement the growth of official reserves when the IMF determined that there was a global need. As a result of the second amendment to the IMF Articles of Agreement, which became effective April 1, 1978, the IMF members have undertaken to collaborate with the Fund in making the SDR the principal reserve asset in the international monetary system.

The usefulness of the official SDR as a reserve asset derives from the obligation of its holders to accept it either directly or in exchange for currency when designated by the IMF. In a technical sense, the official SDR is a bookkeeping device or, more accurately, a computer entry on the books of the IMF. Effectively, however, the asset forms a means of payment among the monetary authorities of the participating IMF member countries,[1] enabling them to use their SDRs as they would a currency to meet a balance-of-payments need or in certain specified transactions. No member is, however, obliged to accept more SDRs in exchange for currency than three times its net cumulative allocation of SDRs.

The official SDR also functions as the unit of account for all transactions in the IMF. When it was created in 1969, its value was tied to the gold content of the United States dollar. This meant that, when the dollar was devalued in December 1971 and February 1973, the SDR appreciated in value against the dollar. With the advent of floating exchange rates in March 1973, the IMF decided to base the SDR on a basket of currencies. Effective July 1, 1974, sixteen currencies were

[1] In addition to the IMF member countries that have joined the Special Drawing Rights Department, the following institutions have been officially named "other holders" of SDRs by the IMF: the Andean Reserve Fund, the Arab Monetary Fund, the Bank for International Settlements, the East Caribbean Currency Authority, the International Bank for Reconstruction and Development, the International Development Association, the International Fund for Agricultural Development, the Nordic Investment Bank, and the Swiss National Bank.

chosen and assigned weights based on the importance of the issuing countries in world trade and international finance. Fixed amounts or units of each currency were derived from the percentage weights. The amounts of each currency and even the currencies themselves could be changed to reflect changes in the relative importance of countries in world trade and international finance.

To develop the SDR as the principal reserve asset in the international monetary system, the IMF decided as of January 1, 1981 to simplify the SDR by reducing the number of currencies in the basket from sixteen to five. The five chosen were also assigned weights intended to reflect their importance in world trade and international finance. The dollar weight was set at 42 percent, the German mark at 19 percent, and the French franc, Japanese yen, and British pound sterling at 13 percent each. As in the sixteen-currency basket, fixed amounts of each currency were derived from the percentage weights.[2] Because the calculation of the value of the SDR is based on fixed amounts for each currency, the percentage share of each currency in the basket will change from day to day with changes in exchange rates.[3]

Like the official SDR, the private or commercial SDR is composed of the same five currencies in the same proportions. It, too, functions as a means of payment and as a unit of account. But, whereas the official SDR exists almost entirely within the framework of the IMF, the private SDR is used in the international financial markets. Instead of being governed by the rules of the IMF, the private SDR is subject to the conventions of the marketplace. Any party may hold a private claim denominated in SDRs. The main difference is that the claim will not be treated as an SDR by the IMF. This means that the IMF will not exchange the claim for currency—that is the responsibility of the issuer (Table 1).

Although the official and the private SDR have functioned in separate markets to date, a recent agreement between the IMF and the Saudi Arabian Monetary Authority (SAMA) raises the possibility that the lines between the markets in which these two instruments function may become blurred. In this agreement, SAMA undertook to lend the IMF SDR 4 billion in 1981 and SDR 4 billion in 1982. The loan is an obligation of the IMF and is denominated in SDRs. The novelty of the agreement is that, at its option, SAMA may convert its SDR claims on the IMF into bearer notes and sell these notes to another party, official or private. If SAMA were to exercise this option, the IMF would have an SDR-denominated liability to a private party.[4] While these notes would not be SDRs in the narrow sense (they would be obligations of the General Department not the Special Drawing Rights Department of the IMF), they would be a very close relative.

The advantages and drawbacks of the SDR as a basket currency

Before examining how the private SDR works in practice, it is useful first to consider the advantages and drawbacks that the SDR as a basket currency can offer to borrowers and investors. The SDR is called a basket currency because it is composed of more than one currency. It is also called a standard basket because each currency in the basket is assigned fixed units or amounts. These units are derived from the weights attached to each currency when the basket is established or redefined.

In a standard basket, an appreciation or increase in the value of any one currency in the basket in terms of all other currencies will raise the value of the SDR in terms of each other currency. By contrast, a depreciation or decline in the value of any one currency will lower the value of the SDR in terms of each other currency. Because the movements of some currencies can be moderated or offset by the movements of other currencies, the value of the SDR in terms of a group of currencies is likely to be relatively stable.

A basket currency such as the SDR can offer potential advantages to private market participants in international borrowing and lending. Perhaps most importantly, because a basket currency averages the

[2] Every five years, beginning January 1, 1986, the IMF will review the currencies in the SDR basket and their amounts so as to take into account any changes that may have taken place in the importance of these currencies in international trade and finance. No currency in the basket will be replaced unless the value of its country's exports is exceeded by those of another country by at least 1 percent. The expectation is that the current basket will remain unchanged for some time. This is primarily because at present a large gap exists between the value of the exports of the five countries whose currencies are included in the basket and that of any other IMF member country.

[3] When the IMF changed the valuation method for the SDR, it also changed the method it had used to calculate the interest rate on the SDR. This had originally been set at a fixed rate of 1.5 percent. As of July 1, 1974, the IMF decided to base the interest rate on a formula reflecting weighted market interest rates on the five major currencies in the sixteen-currency basket. These were the same five currencies that now comprise the SDR valuation basket. Initially, the IMF attached only 60 percent of the combined market interest rate to the SDR. This percentage was increased to 80 percent on January 1, 1979 and to 100 percent on May 1, 1981. In calculating the interest rate that will apply to the SDR for each calendar quarter, the IMF currently uses market yields for three-month United States Treasury bills, three-month interbank deposits in Germany, three-month interbank money against private paper in France, the discount of two-month (private) bills in Japan, and market yields for three-month United Kingdom Treasury bills. The yields are averaged for the three-week period ending two business days before the beginning of the calendar quarter for which the SDR interest rate is determined.

[4] *IMF Survey* (April 6, 1981), pages 98-101.

relative changes in the exchange rates and interest rates of its constituent currencies, its value varies less than any of its individual currencies. Thus, it allows investors and borrowers to hedge against their expenditures or receipts.

For example, a United States corporation may buy all its imported goods and services in dollar terms, but the dollar prices of these goods and services are affected by relative exchange rate changes in the currencies of the exporting countries. By holding a basket currency as an investment, the United States corporation can partially offset the effects of exchange rate changes on its purchases of goods and services to the extent that its expenditure mix corresponds to the currency basket.

Similarly, if a United States corporation sells its products in many different countries, its returns on its sales will be dependent on relative exchange rate movements in the currencies of the countries in whose markets the products are sold. By borrowing a basket currency, the corporation can partially offset these price changes to the extent that its products are sold in the markets whose currencies comprise the basket. This may help a corporation reduce the variability of its profits and show more steady growth. Even if the prices of goods denominated in different currencies moved to offset exchange rate changes, the purchasing power of a basket of currencies would be less variable than that for an individual currency.

Investors and borrowers engaged in foreign currency dealings may also find that doing business in a basket currency is a useful technique for reducing exchange rate and interest rate risk. This may be particularly helpful in periods of exchange rate and interest rate volatility. A basket currency will reduce the risk of substantial exchange rate loss which can accompany an investment in a single currency. At the same time, however, it will minimize the likelihood of substantial gain. Since it is impossible to know ahead of time which currency among a group will perform best, a basket currency may serve as a desirable hedge, reducing the maximum that can be lost in any one transaction.

A comparable argument applies to the total return or effective yield on a basket currency. The effective yield combines the interest rate return with changes in the exchange rate or capital value. An investment in a single currency may produce a better effective yield than a basket currency but, again, this will be known only after the fact. By contrast, a basket currency will lose less than the worst performing single currency and, therefore, again serves to reduce the maximum that can be lost. These considerations suggest that the comparative economic performance of any currency basket in general, and the SDR in particular, is best looked at in terms which include some measure of variability as well as expected costs and returns.

Although some investors might find a currency basket a useful hedging or risk-reducing device, others believe that they can predict exchange rate changes. These investors will, therefore, try to seek greater profitability by accepting higher risks and concentrating their investments in single currencies. But, even for these investors, a currency basket can provide a useful function as a means to diversify the currency composition of their portfolios. This aspect of a currency basket may be particularly attractive if other investment outlets in the desired currencies are restricted by government regulations.

Finally, a basket currency may also offer advantages to those who prefer not to operate under a very aggressive portfolio management strategy. These might include central banks or quasi-governmental agencies whose managers do not wish to be accused by a finance minister or board of directors of taking undue risk with taxpayers' money.

In considering the advantages and drawbacks of the SDR, it is necessary to distinguish the SDR basket from one which is tailored to the specific needs of the borrower or investor. Clearly, a tailor-made basket could provide a more optimal combination of risk and return for any individual than the SDR basket, but the SDR basket may still have advantages.

For one, unlike a tailor-made basket, the SDR offers borrowers and investors international status as a known instrument. This is particularly important should a holder need to liquidate a basket instrument before its maturity date. In such an instance, a borrower or investor holding a tailor-made basket would likely find it difficult to sell or trade this basket, since doing so would probably require decomposing the basket beforehand and incurring certain transactions costs. A comparable problem would be less likely to arise for the holder of an SDR basket because the SDR is already an identifiable market instrument for which a buyer can presumably be found more easily.

In addition, although the private SDR can have no liquidity or redemption privileges at the IMF, the fact that the IMF sponsors a comparably valued instrument adds international status to the private market SDR. The backing of the IMF for the official SDR is of potential importance in another more tangible respect. The daily publication of an official SDR exchange rate means that a commercial bank providing an SDR-denominated loan or investment to a client can offer the choice of either the bank's own spot exchange rate for the SDR or that of the IMF. The usefulness of

the IMF rate may arise in cases where a number of banks are involved in a transaction, such as in a syndicated credit. The official exchange rate becomes potentially useful because it can allow the participating banks to standardize their valuation of the SDR. This may facilitate the task of the banks in agreeing on other terms, notably the interest rate or spread that will apply. Secondarily, the availability of the official exchange rate may tend to avoid or help resolve disputes that may arise between those engaged in private market transactions in SDR instruments.[5]

A worrisome feature of the SDR which does not affect a tailor-made basket is the possibility that the authority sponsoring the official SDR may decide to alter its valuation. This could upset the calculation that led to the use of the private SDR basket in the first place. While the likelihood of such a change

[5] Joseph Gold, *Floating Currencies, Gold, and SDRs*, IMF, Pamphlet Series No. 19 (1976), page 61.

Table 1

Units of Currencies in the Special Drawing Rights Basket

Percentage weight in basket at base period, in parentheses

Currency	Effective January 1, 1981		Effective July 1, 1978		Effective July 1, 1974	
United States dollar	0.54	(42.0)	0.40	(33.0)	0.40	(33.0)
German mark	0.46	(19.0)	0.32	(12.5)	0.38	(12.5)
Japanese yen	34.00	(13.0)	21.00	(7.5)	26.00	(7.5)
French franc	0.74	(13.0)	0.42	(7.5)	0.44	(7.5)
British pound sterling	0.071	(13.0)	0.05	(7.5)	0.045	(9.0)
Italian lira	—		52.00	(5.0)	47.00	(6.0)
Dutch guilder	—		0.14	(5.0)	0.14	(4.5)
Canadian dollar	—		0.07	(5.0)	0.071	(6.0)
Belgian franc	—		1.60	(4.0)	1.60	(3.5)
Saudi Arabian riyal	—		0.13	(3.0)	—	
Swedish krona	—		0.11	(2.0)	0.13	(2.5)
Iranian rial	—		1.70	(2.0)	—	
Australian dollar	—		0.017	(1.5)	0.012	(1.5)
Danish krone	—		—		0.11	(1.5)
Spanish peseta	—		1.50	(1.5)	1.10	(1.5)
Norwegian krone	—		0.10	(1.5)	0.099	(1.5)
Austrian schilling	—		0.28	(1.5)	0.22	(1.0)
South African rand	—		—		0.0082	(1.0)

Calculation of the SDR Value

The IMF, which publishes the official value or exchange rate for the SDR daily, and the commercial banks use the same method to calculate the value of the SDR in United States dollar terms. But the result varies depending on the spot exchange rates used. For example, on November 2, 1981, the IMF reported that the exchange value for the official SDR was $1.1596. This was based on the noon middle market rates in London provided by the Bank of England. (If the London markets are closed, the IMF obtains its exchange rates from the Federal Reserve Bank of New York; if the New York markets are closed, the Deutsche Bundesbank in Frankfurt provides the rates.) If the commercial banks had used the 10 a.m. middle market interbank rates in New York for the same date, the dollar value of the SDR would have been $1.1613. This calculation is shown in the following table:

cannot be dismissed, the importance of this issue in the case of the SDR may not be very great. This is so largely because the IMF has no interest in undermining confidence in the official SDR by initiating frequent changes in it. This is why it has specified that the currency composition of the official SDR will be reviewed only at five-year intervals and will be changed only on the basis of established principles. The private holders of SDRs should, therefore, be able to predict fairly accurately when and in which currencies any changes in the official SDR are likely to be made.

Further, agreements in private SDR instruments can easily include a clause, and typically do, outlining the terms that will apply in the event that the composition of the official SDR is changed. Broadly, parties can decide ahead of time whether to apply the concept of a frozen or a variable SDR. A frozen SDR would fix the valuation rule of the private SDR on a particular date and hold this valuation rule for the life of the agreement. A variable SDR would alter the

Table 1: Units of Currencies in the Special Drawing Rights Basket *(continued)*

Currency	Units of currency (1)	Spot rate (2)	Dollar value of components (3)	Percentage value (4)
United States dollar	0.540	1.0000	0.5400	46.50
German mark	0.460	2.2173	0.2075	17.87
Japanese yen	34.000	229.9500	0.1479	12.74
French franc	0.740	5.5765	0.1327	11.43
Pound sterling	0.071	1.8755	0.1332	11.47
Total			1.1613	100.00

To see how the percentage weight of each currency changes, even over a short-term period, compare the relative weights two days later. At this time, on November 4, 1981, the exchange value for the official SDR published by the IMF was $1.1645. The New York 10 a.m. rates yielded an exchange rate for the SDR of $1.1641, with the following percentage weights:

Currency	Units of currency (1)	Spot rate (2)	Dollar value of components (3)	Percentage value (4)
United States dollar	0.540	1.0000	0.5400	46.39
German mark	0.460	2.2090	0.2082	17.89
Japanese yen	34.000	227.4500	0.1495	12.84
French franc	0.740	5.5585	0.1331	11.43
Pound sterling	0.071	1.8775	0.1333	11.45
Total			1.1641	100.00

Explanation:

(1) The currency components of the basket.

(2) The exchange rates in terms of currency units per United States dollar except for the pound sterling which is expressed as United States dollars per pound sterling. All rates are at the 10 a.m. interbank rates in the New York markets provided by the Federal Reserve Bank of New York.

(3) The United States dollar equivalents of the currency amounts in column 1 at the exchange rates in column 2, that is, column 1 divided by column 2, except for the pound sterling, for which the amounts in the two columns are multiplied.

(4) The resulting percentage weights which change daily, based on changes in the spot exchange rates.

valuation rule of the private SDR in accordance with any changes made in the official instrument over the term of the agreement.

As a final consideration, the transactions costs or expenses involved in the use of the private SDR may differ from those involved in a tailor-made basket. For example, the borrower of a syndicated credit denominated in SDRs would be likely to incur lower transactions costs than a borrower who would have to float five separate credits in order to obtain the same currency structure of its liabilities. The transactions costs for SDR instruments would also likely be less than those for tailor-made baskets to the extent that the SDR became a better known instrument and standardized procedures for transactions in it began to develop.

The emergence of the private or commercial SDR

A private market in SDR-denominated instruments first emerged in 1975. At that time, some banks began to accept time deposits denominated in SDRs and some borrowers began to issue debt in the long-term capital markets denominated in SDRs. It was not until 1981, however, that these markets really began to develop. Probably the most important impetus to their development was the decision by the IMF to simplify the valuation basket of the official SDR from sixteen to five currencies beginning January 1, 1981. This decision not only served to facilitate public understanding of the SDR, but more importantly it meant that the commercial banks, which make markets in SDRs by holding and issuing obligations denominated in them, could for the first time fully hedge their exchange rate exposure in doing so.

Although the change in valuation was probably the most direct spur to the emergence of the private SDR, the sharp depreciation of the dollar in 1977-78 heightened the concerns of substantial dollar holders, many of whom began to seek ways to diversify the currency composition of their portfolios. In addition, the shift in United States monetary policy in October 1979, together with the United States commitment to reduce inflation, led to more variable and historically high United States interest rates. These developments, too, stimulated private market interest in the SDR as a hedging and risk-reducing mechanism.

Because the SDR is a form of foreign currency and because banks seek to control closely open or uncovered positions in foreign currency, banks would like to be able to cover themselves if they are to make markets in SDR-denominated instruments. One way banks can hedge their exposure in the case of an SDR-denominated deposit is to find a willing borrower of SDR in the amount of the deposit. Because of the difficulty in matching assets and liabilities so closely, a more likely course for the banks is to enter into transactions in the forward foreign exchange markets. In these transactions, banks buy the currencies comprising the SDR for delivery on the date the SDR liability matures, usually in one, three, or six months. Alternatively, banks can buy the currencies comprising the SDR basket in the spot market and invest them for the maturity of the liability.

To hedge their exchange rate risk fully, however, banks are dependent on well-developed forward exchange markets for each of the currencies involved. The problem was that, prior to 1981, not all the currencies in the sixteen-currency SDR basket possessed well-developed forward markets, although each was actively traded on some spot exchange markets. As a practical result, only a few banks offered SDR-denominated deposits and those that did tended to limit the amounts they would accept. Often these amounts would be on the order of SDR 3 to 5 million. In addition, some banks found it necessary to offer a somewhat lower yield on their liabilities in SDRs than on those in single currencies to protect themselves against that portion of the exchange rate risk they were unable to hedge. For their part, those investors who were willing to make SDR-denominated deposits accepted the lower yield as the price for increasing the diversity and reducing the risk of their overall portfolio. But investors got very little reduction of risk in exchange for the lower return, compared with holding a portfolio of a few major currencies.

This problem was eliminated when the five-currency basket was introduced. All five currencies in the SDR are actively traded in spot and forward exchange markets. All possess well-developed money markets. This means that, in the absence of regulation (or other arbitrage imperfections), covered interest rate parity should hold for the forward rates on each of the currencies and an interest rate close to the average interest rate obtainable on the five currencies could be offered by banks.[6]

If interest rate parity holds, banks can entirely cover their exchange rate exposure through the forward exchange markets. Consequently, they need not hold SDR-denominated assets to offset their SDR-denominated liabilities. They can buy the currencies in the SDR basket forward and simultaneously sell

[6] Covered interest rate parity means that the interest rate differential with respect to a reference currency equals the annualized percentage difference between the spot and the forward exchange rate against that currency. If, for example, the six-month interest rate on the dollar in the Eurocurrency market were 10 percent and that for the German mark 4 percent, the 6 percent differential would be the annualized forward premium of the German mark in terms of the United States dollar. The actual six-month premium would be half that, or 3 percent.

forward the currencies in which their assets are denominated. Thus, provided active forward markets exist for each of the currencies, banks with SDR-denominated liabilities can hold any currencies and cover their exposure in the forward markets to achieve a competitive return.

In calculating their interest rates, banks have adopted two methods for SDR instruments to date. In one approach, the SDR-denominated loan is priced on the basis of the United States dollar forward funding cost for six-month periods. This involves using the Eurodollar deposit rate and the premium or discount on the forward foreign exchange needed to cover the nondollar components of the loan. In the view of its proponents, this calculation provides a true market interest rate and therefore best covers exchange rate risk.

The alternative approach used thus far bases the interest rate on the weighted average of the offer rates in the Eurocurrency markets (LIBOR) for each of the SDR currencies quoted by five reference banks. The highest and lowest quotations for each currency are eliminated and the remaining three are averaged. The weights for each currency are calculated by using the dollar exchange rate quoted by the IMF to establish the dollar value of the SDR. In the view of its proponents, this method offers a relatively easier calculation than the first.

If interest rate parity holds exactly, the two rates will be equal. In practice, some market participants have found that the actual differences between the two methods are small, less than ⅛ percent.

Overview of the markets in SDRs and their growth during 1981

The new markets in SDR instruments which have been developed thus far have to a large extent paralleled those already developed in the Euromarkets for individual currencies. Most of the practices and procedures which have been adopted for the SDR are similar to their Euromarket counterparts as well. Some refinements have, of course, been required to deal with the multiple-currency nature of the SDR and the fact that the valuation basis of the official SDR can be changed. The innovations that have taken place in 1981 have been concentrated in transactions and instruments which involve commercial banks. Before considering the nature of these markets and the innovations that have created them, it is helpful to present an overview of the SDR markets and their estimated growth since the beginning of 1981 (Table 2).

Commercial bank deposits. There are no firm figures on the magnitude of the deposit market in SDRs. At the start of 1981, the market was estimated to be on the order of SDR 3 billion. A substantial portion of the growth took place the year earlier through the investments of a major international company. By the end of the year, some market specialists estimated that deposits ranged from roughly SDR 5 to 7 billion.

Syndicated credits. A market in syndicated credits rose from a base of zero to about SDR 1,185 million during 1981. A total of seven borrowers raised funds through this instrument. Three were sovereign borrowers—Sweden, the Ivory Coast, and Ireland. Two were electric utilities, one a state utility in Venezuela and the other a private utility in Spain. The sixth was a Mexican state financing agency and the seventh an African regional development bank.

Certificates of deposit. A market in SDR CDs was opened in June 1980 when Chemical Bank issued the first one through its London branch in the amount of SDR 50 million. Most SDR CDs are issued privately by the banks at the request of individual borrowers. By some market estimates, a total of SDR 400-500 million was outstanding at the end of the third quarter of 1981. Two known publicized issues took place in 1981. Both were by Japanese banks in the amount of SDR 20 million each.

Floating rate certificates of deposit. Four identified issues of SDR floating rate CDs were placed during 1981. Three were by Japanese banks, the fourth by the second largest bank in Kuwait. The size of each issue was relatively small, SDR 10 to 15 million. A total of SDR 55 million was raised. The maturities for these instruments are longer than those for straight CDs, about two to three years compared with three months.

Eurobonds. The market in SDR-denominated Eurobonds displayed virtually all its growth prior to 1981. Between 1975 and 1980, eight issues were floated, six by Scandinavian borrowers. The total amount issued was about SDR 273 million, less than ½ percent of all Eurobonds floated over this period. Only one SDR Eurobond was issued in 1981. This was for the Nordic Investment Bank for SDR 20 million.

Floating rate notes. The market for SDR floating rate notes grew from zero at the outset of the year to roughly SDR 280 million by the year-end. Four known issues were floated, two by Italian state agencies, one by a French multinational company, and one by the Spanish state railway. These instruments carry a shorter maturity than Eurobonds and differ chiefly in that they do not bear a fixed coupon or interest rate.

Table 2

Identified Public Placements of SDR Instruments in 1981

Amount in millions of special drawing rights

Instrument	Borrower	Manager	Amount	Maturity	Yield*	Date
Syndicated credit	Sweden	Morgan Guaranty	500	5 years	3/8-1/2	Q I
	Ivory Coast	Chase Manhattan	43	8 years	1 1/2	Q I
	Ireland	National Westminster	75	10 years	3/8-1/2	Q II
	Cadafe†	Chemical	47	6 years	5/8	Q III
	Fenosa†	Orion Royal	100	8 years	5/8-3/4	Q III
	Nafinsa†	Chemical	220	8 years	5/8	Q IV
	African Development Bank	Chase Manhattan	200	8 years	1/2-5/8	Q IV
Certificate of deposit	Sumitomo Bank	Chemical	20	3 months	1/8	Q I
	Sanwa Bank	Chemical	20	3 months	1/8	Q I
Floating rate certificate of deposit	Dai-Ichi Kangyo Bank	Morgan Stanley	15	2 years	1/8	Q I
	Gulf Bank	Chase Manhattan	15	3 years	1/4	Q I
	Fuji Bank	Credit Suisse First Boston	15	3 years	1/4	Q II
	Sumitomo Bank	Chemical/ Sumitomo Finance	10	3 years	1/4	Q III
Eurobond	Nordic Investment Bank	Orion Royal	20	5 years	11.5	Q I
Floating rate note	ENEL†	Dillon Read	100	5 years	1/4	Q I
	Pechiney Ugine Kuhlmann†	Banque de l'Indochine et de Suez/ Kredietbank	50	7 years	1/4	Q II
	Ferrovie dello Stato†	Dillon Read	80	4 years	1/4	Q III
	Renfe†	Orion Royal	50	8 years	1/4	Q IV

* The certificates of deposit are often priced over the three-month London Interbank Offer Rate (LIBOR), whereas the syndicated credits and floating rate notes are usually priced over the six-month LIBOR. The Eurobond yield is equal to the total yield.

† The following borrowers are identified more fully:
Cadafe: Compania Anonima de Administracion y Fomento Electrico, Venezuelan state electric utility;
Fenosa: Fuerzas Electricas del Noroeste, S.A., Spanish private-sector electric utility;
Nafinsa: Nacional Financiera, Mexican state financing agency;
ENEL: Ente Nazionale per l'Energia Ellettrica, Italian state electric utility;
Pechiney Ugine Kuhlmann: French multinational company;
Ferrovie dello Stato: Italian state railway company;
Renfe: Red Nacional de los Ferrocarriles Espanoles, Spanish state railway company.

Nature of the markets and their participants

In examining the nature of the SDR markets and the innovations that have created them, it is useful to distinguish among the participants. These may be grouped into nonbank investors, nonbank borrowers, and commercial banks. Each group will be discussed separately.

Nonbank investors. The commercial banks introduced three main innovations in early 1981 which were designed to stimulate investor interest in SDR-denominated assets. The first was a decision in March by the Brussels branch of Morgan Guaranty to make available demand deposits or current accounts in SDRs. For the first time, holders of SDR deposits were offered the means to debit and credit each others' accounts directly, without having first to convert the SDR into its component parts.

The second innovation was the decision by the two primary European clearing institutions, Euroclear and Cedel, to adapt their systems to accept assets denominated in SDRs, notably Eurobonds and floating rate notes. By this means, secondary markets could develop in these instruments which would increase their liquidity and attraction to potential investors.

The third innovation was an agreement in January by seven leading banks in London to provide a secondary market in SDR CDs and floating rate CDs. The banks were Barclays, Chemical, Citibank, Hongkong and Shanghai, Midland, National Westminster, and Standard and Chartered. Using practices already in existence for United States dollar CDs as their guide, the banks further agreed to try to standardize the procedures for transactions in SDR CDs.

Like CDs denominated in dollars, therefore, those in SDRs require minimum deposits of 1 million. This minimum is considerably less than the SDR 3 to 5 million which typically was required for SDR time deposits. Moreover, the SDR CD has the additional attraction of being negotiable. The interest rate on the SDR CD is marginally lower than that obtained on SDR deposits, by about ⅛ percent. This is the concession given by the customer for the benefit of negotiability.

Although trading practices in dollar and SDR CDs are roughly comparable, some differences have been introduced for the SDR. The major difference is that for primary issues and redemptions of SDR CDs, the currency of payment is the United States dollar and the exchange rate is that designated by the IMF. By contrast, in the secondary market, nondollar currencies may be used as the means of payment and transactions may occur at any exchange rate agreed to by the participants.

There was a short spurt of nonbank investor interest in SDR assets in the first quarter of 1981, which tapered off substantially thereafter. The strength of the dollar on the exchange markets and high dollar interest rates reduced the incentive to diversify away from dollars and the attraction of SDR assets as investments. During the first quarter of 1981, for example, the SDR depreciated by about 6.5 percent against the dollar, while the interest rate differential in favor of the dollar averaged about 330 basis points. By the end of December, the SDR had depreciated by about 8.8 percent against the dollar, while the interest rate differential had narrowed to about 90 basis points.

Although investors did not show much interest in SDR assets under such conditions of dollar strength, an examination of the economic performance of the SDR, compared with some of the other major currencies during 1981, suggests that the SDR would have offered dollar-based investors some of the advantages already outlined (Table 3).[7]

For one, the effective yield of the SDR in 1981, on an *ex post* basis, was exceeded only by that of the dollar and the Swiss franc. Had investors been able to predict accurately the performance of these two currencies, they would have gained more than on an SDR investment. But, in the absence of perfect foresight, the SDR would have been an effective hedge of exchange rate risk, particularly for those investors seeking a diversified currency portfolio.

Second, the SDR displayed less variability in its purchasing power against the dollar than any single currency in 1981. Therefore, for those United States corporations whose imports broadly came from countries whose currencies are contained in the SDR basket, the SDR would have been a useful investment instrument during 1981 in preserving relative stability in the prices the corporations had to pay for their imported goods. The same conclusions would not hold for the German corporation for whom investments in French francs and Swiss francs would have preserved relative price stability more effectively than the SDR.

Nonbank borrowers. For nonbank borrowers, innovation during 1981 centered on making available in SDRs

[7] In comparing the economic performance of the SDR with the other major currencies over both the recent period and the past six years, the valuation basket of the SDR was assumed to be the same as its current one. The interest rates applied were comparably weighted as if the SDR had existed in its current form over the longer term. Variability is measured as the standard deviation of the changes in the effective yields, using three different currencies as the reference currency: the dollar, the German mark, and the SDR. The reference currency is important because there is no variability for it. This biases the results in favor of it.

Table 3

Effective Yields on Reserve Assets

January-December 1981 (Cumulative)

One-month Eurodeposits	Dollar yield: Interest	Dollar yield: Exchange rate gain	Dollar yield: Total	Variability of nominal yield* from perspective of: United States resident (US$ basis)	German resident (DM basis)	World resident (SDR basis)
United States dollar	16.8	0	16.8	0.1	4.6	1.9
German mark	11.6	−12.8	−2.6	3.6	0.1	2.5
Swiss franc	8.6	−1.2	7.3	4.8	2.4	3.8
Japanese yen	7.4	−7.7	−0.8	3.5	4.3	2.8
British pound	13.9	−20.1	−8.9	3.7	4.2	2.9
French franc	18.4	−20.8	−6.3	3.5	1.4	2.4
SDRs	14.5	−8.7	4.6	1.7	2.6	0.1

* Variability measured as month-to-month standard deviation of changes in total yield.

Second quarter 1975-fourth quarter 1981 (Cumulative; at annual rates)

Three-month Eurodeposits	Dollar yield: Interest	Dollar yield: Exchange rate gain	Dollar yield: Total	Variability of nominal yield† from perspective of: United States resident (US$ basis)	German resident (DM basis)	World resident (SDR basis)
United States dollar	10.0	0	10.0	2.0	8.4	4.6
German mark	6.1	0.6	6.7	8.4	1.1	4.9
Swiss franc	3.5	5.2	9.0	11.6	6.2	8.4
Japanese yen	6.7	4.4	11.4	9.5	8.9	7.0
British pound	12.5	−3.4	8.7	8.1	6.8	5.6
French franc	11.8	−4.4	6.8	8.0	3.5	4.7
SDRs	9.4	−0.4	8.9	4.0	5.2	1.6

† Variability measured as quarter-to-quarter standard deviation of changes in total yield.

two instruments which were already well established in the Euromarkets. These were the syndicated credit and the floating rate note.

The Kingdom of Sweden became the first borrower of an SDR-denominated syndicated credit in early January, when it decided to raise a substantial portion of funds in SDRs as part of a joint dollar/SDR credit. Initially, the sum was set at SDR 200 million but was increased to SDR 500 million because of market interest. Six borrowers followed Sweden's initiative during 1981, but all raised considerably smaller amounts of funds. All the SDR borrowers to date appear to have been offered spreads which are in line with those offered to comparable borrowers in single currencies. For public-sector borrowers in the industrial countries, for example, Bank of England findings show average spreads dipping below ½ percent over LIBOR in the first quarter, rising slightly above this in the second quarter. The split spreads charged to both the Kingdom of Sweden and Ireland of ⅜ and ½ percent are consistent with these trends. Similarly, the 1½ percent spread which the Ivory Coast agreed to pay for its funds was in line with the spreads paid by more frequent borrowers in the Euromarkets this year. These ranged from 1⅛ percent to 2 percent during the first half of 1981.[8]

The procedures for issuing syndicated credits and floating rate notes are generally similar to those

[8] Bank of England, "International Financial Developments", *Quarterly Bulletin* (September 1981), page 343.

which apply to issues denominated in a single currency. Nevertheless, the multicurrency nature of the SDR has required the introduction of a number of important technical innovations. In addition to the ways in which the interest rate is calculated, which has been discussed, other innovations have required the need to consider (1) the currency that will be used in the event that changes are made in the SDR basket or that one or more of the SDR currencies become unavailable, (2) the currency in which the payment of interest and principal will take place, and (3) foreign exchange constraints.

(1) All the SDR loan agreements to date contain safeguard clauses specifying what will happen in the event that the IMF changes the composition of the official SDR—or ceases to use the SDR entirely—or that one or more of the currencies in the SDR basket become unavailable. For example, borrowers and lenders will have to agree whether to (a) apply the new or old definition of the SDR for the remainder of the loan, (b) prepay the loan and renegotiate its terms, (c) switch to a dollar-denominated loan, or (d) repay the loan on the basis of the original or frozen SDR basket. The ways of dealing with the various contingencies appear to have been subject to individual negotiation thus far.

(2) There does not appear to be a consensus among borrowers about which currency or currencies to use in repaying interest and principal. Most have specified that the dollar will be the payment currency. But one known borrower, France's Pechiney Ugine Kuhlmann, opted for the SDR. In practice, repaying in dollars means applying the SDR value to the dollar on the dates the payments are due. Repaying in SDRs means directly transferring the SDR from the borrower's to the creditor's bank account through specified paying banks. This eliminates foreign currency transactions costs.

(3) Some borrowers have faced foreign exchange constraints in dealing in SDRs. This was so for the French company, Pechiney Ugine Kuhlmann. Because the French franc is included in the SDR, Pechiney had to obtain official authorization to purchase and transfer abroad the foreign exchange needed to pay the principal and interest on its floating rate notes.

Although a borrower would have done better by borrowing in German marks, Swiss francs, or Japanese yen than in SDRs during 1981, in the absence of knowing ahead of time which currencies would perform relatively best, the SDR would have offered an effective hedge against exchange rate risk. Again, however, the chief attraction of the SDR to the dollar-based borrower was its small variability in purchasing power against the dollar.

There was some interest in SDR-denominated loans in 1981, largely on the part of state or quasi-governmental agencies. But borrower interest in SDR syndicated credits and floating rate notes has not been substantial. Total borrowing in these instruments has comprised less than 1 percent of the markets in these instruments to date. Moreover, the range of borrowers has been narrow. Only two have been from the private sector, Spain's Fenosa and France's Pechiney, and only one has been a nonoil-developing country, the Ivory Coast. Two of the three issuers of floating rate notes were Italian state agencies, ENEL and Ferrovie dello Stato; two of the seven issuers of syndicated credits, Mexico's Nafinsa and Venezuela's Cadafe, were from countries which were among the most active borrowers in the Eurocurrency markets in 1981.

It may be premature to try to explain the relative lack of borrower interest in the SDR thus far. Some market specialists seem to think that it is largely a question of time, education, and experience. When borrowers become more familiar with the mechanics of the SDR, they may well find that its stability, hedging, and diversification features make it a potentially useful complement to their funding needs.

Commercial banks. Commercial banks have been central to the development of the private markets in SDRs. Most notably, in addition to the innovations already highlighted, they have begun to create an interbank market in SDR assets and liabilities. This market received a boost in March when Morgan Guaranty began to offer its customers demand deposits in SDRs through its Brussels branch. Other banks in London reportedly offer these accounts as well.

The significance of demand deposit accounts in SDRs is that they enable their holders to borrow, lend, receive, and make payments in SDR-denominated units directly. This eliminates the need to convert the asset into its component parts to execute a transfer. The creation of this market opens the way to allowing the SDR to function not only as a unit of account and a store of value but also as a means of payment.

Some technical adjustments have been made to enable banks to offer these accounts. Broadly, the adjustments cover the ways in which the banks will deal with any changes in the composition of the SDR basket. The bank's response will vary depending on whether the account is a time or a demand deposit. If it is a time deposit, the bank might not alter the account until maturity, at which time it would renew the account only on the basis of the new SDR. If it is a demand deposit, the bank might cease to debit and credit the account as soon as the change were

effective. It might open a new account at this time on the basis of the new SDR, unless otherwise agreed. Under either account, any exchange rate gains or losses realized in the process of changing the account would accrue to the depositor.

One problem which the banks face in developing the interbank market in SDRs is that they use both the IMF official exchange rate and a spot exchange rate for the SDR in their transactions. The IMF valuation is attractive because it standardizes the SDR exchange rate among banks. This enables the banks to transfer deposits among themselves without incurring the foreign exchange risks which arise from the use of different spot rates to calculate the exchange value of the SDR. The disadvantage of the IMF valuation is that it is set only once a day at noon. Therefore, if the banks use this method in transactions which are concluded at other times in the day, they must either estimate the future official exchange rate or use the previous official rate and adjust the interest rate to allow for exchange rate changes.

While banks are gaining experience in dealing in SDRs, they remain confronted with a number of uncertainties. For one, until they can find a way to make interbank transfers efficiently, the expansion of the SDR markets is likely to be inhibited. Second, for the SDR markets to flourish, the banks require more lending opportunities than they have had to date. Their deposit base in SDRs has grown, but the difficulty in finding borrowers has served to constrain the growth of the SDR markets.

The increased involvement in the markets of prime name borrowers and investors would significantly contribute to the growth of these markets. In addition, a decision by the IMF to raise funds in the private markets in SDRs would clearly stimulate bank lending in SDRs. The denomination of commercial transactions in SDRs, such as the pricing of oil or air fares, would also spur the development of these markets.

Assessment and outlook

The arguments in theory and the results in practice suggest that the SDR can offer private market participants an attractive investment and borrowing instrument. Yet nonbank investor and borrower interest has been modest to date. If this notion of private SDR markets holds up so well to theoretical and practical examination, what then accounts for the moderate interest? A related question is whether the official community has a role to play in developing these markets and, if so, what this role might be.

Clearly, the private markets in SDR instruments only just began to develop in 1981. This fact alone means that the markets face start-up problems. Some of the problems are essentially technical in nature. They can probably be solved with experience and ought not to be of concern. Other problems are potentially more durable. These are of concern.

For one, while the strength of the dollar on the exchange markets and high dollar interest rates for much of 1981 quelled the demand for other currencies on the part of large dollar holders, the attractiveness of the SDR as an investment and borrowing instrument cannot hinge on the fortunes of the dollar alone. On the contrary, if the SDR is to take its place as a viable currency option for private market participants, its attractiveness must also be perceived in terms which relate to its risk-reducing, stability, and diversification features.

Second, for the SDR to hold its own in the private markets as a currency basket, it must additionally be perceived as having a net advantage over a tailor-made basket. If private market participants remain convinced that they can best serve their needs by designing their own currency baskets, there may be little hope for the SDR.

It is conceivable, however, that the SDR may provide that net advantage. Even if the SDR cannot perform better than the tailor-made basket in maximizing the trade-off between risk and return and preserving purchasing power, there may be economies of scale and reductions of transactions costs to doing business in SDRs. For this to be true, business in SDR instruments has to cumulate. This process requires time. Growth is likely to be slow because the advantages are not fully realized until there is a lot of business being done. How long it will take for a critical mass to develop and for the SDR markets to become self-sustaining is impossible to predict.

Of more immediate concern is to consider what might be the attitude of the official community toward the development of these markets. For the official community to lend its support, it must be convinced that the markets offer a net positive advantage.

To the extent that the official community views the SDR markets as a means for private participants to circumvent government regulations and acquire currencies which are otherwise difficult to obtain, it might be inclined to try to thwart their development. On the other hand, to the extent that it views the SDR markets as an indirect approach to currency diversification which presents less of a threat to domestic policy and international stability than explicit currency diversification, it may be more tolerant of the markets and willing to promote their development.

More positively, the official community might agree that the SDR markets have a useful role to play in reducing the ongoing vulnerability of the exchange

markets to shifts among different currencies. Because the SDR offers private market participants a diversified instrument, the SDR may reduce the incentive to manage a portfolio actively on the exchange markets after a transitional period. This would tend to promote exchange market stability to the extent that currency management were oriented toward short-term considerations rather than longer term fundamental developments. But to the extent that the SDR encouraged those to diversify who would otherwise not be disposed to doing so and to manage actively a portfolio of home currency and SDRs, further development of SDR markets would tend to hinder exchange market stability. The attitude of United States residents will be particularly interesting to watch in this regard.

Nonetheless, it is unlikely that the attractions of holding a diversified portfolio in times of exchange market uncertainty will be ignored for long by investors in the United States or elsewhere. Thus, if the stable portfolio composition of the SDR is attractive, development of private SDR markets would contribute to stability in the exchange markets.

As the authority sponsoring the official SDR, the IMF is best situated within the official community to encourage the use of the private SDR. Furthermore, it possesses a number of means to do so.

For example, the members of the IMF could decide to allow the IMF to borrow from the private markets in SDRs. The presence of the IMF in the SDR markets might inspire other major international institutions and private corporations to follow suit. This would do much toward enhancing the quality of borrowers in the SDR markets and contributing to their depth and breadth.

Another option available to the IMF is to encourage its member countries to borrow in SDRs in the international credit and capital markets to meet their funding needs. It would be relatively easier to encourage such borrowing if the member were receiving assistance from the IMF under a stabilization program. But, even in its regular consultations, the IMF could promote this course of action. In addition, the IMF could provide the exchange rate for the SDR more frequently than once a day. This would help develop the interbank market in SDR assets.

Currently, the SDR is used in a variety of additional ways which do not involve banks. For example, one major company uses the SDR in intercompany pricing. The Suez Canal applies the SDR as its reference unit in imposing its charges. The SDR is also used as a unit of account by many international and regional organizations, such as the Arab Monetary Fund, the Economic Community of West African States, and the Nordic Investment Bank.

With time, it is likely that the markets will find still further uses for the SDR. The fact that the private markets in SDR instruments did not grow substantially in 1981 ought not, therefore, to be cause for their dismissal. What seems more important is that market participants are gaining experience in using these instruments. When the time comes for them to draw on the comparative advantage of these markets, they will then be in a position to do so.

Dorothy Meadow Sobol

Leasing—A Financial Option for States and Localities?

The Economic Recovery Tax Act of 1981 (ERTA) opens up some new and expanded opportunities to state and local governments for innovative financing of public projects. The possibilities include leasing under the new liberalized rules, leasing under the "old" rules but with the improved investment incentives, and contracting with private businesses to provide public services. While none of these options have been much used to date, fiscal pressures on states and localities due to cutbacks in Federal aid, lower tax revenues, and higher borrowing costs will spur more experimentation.

Leasing under the special new "safe harbor" rules[1]

The tax provisions governing leasing have been relaxed considerably under ERTA (Table 1). The special new leasing rules were designed primarily to help private companies which, because of insufficient taxable income, were unable to make full use of their investment tax credits and depreciation allowances. Public institutions are also covered under these rules when investing in buses, subway cars, and other mass commuting vehicles, though investment tax credits are still not available for equipment leased to governmental units.

[1] A lease complying with the new rules is called a "safe harbor" lease because special provisions preclude the Internal Revenue Service (IRS) from applying its preexisting regulations in determining what constitutes a bona fide lease. These tests comprise the "old" rules referred to in the text.

Even without the investment tax credit, the tax savings from the depreciation deductions alone can warrant leasing by the public sector. One deal recently completed enabled the Metropolitan Transportation Authority (MTA) of New York to gain $15 million through the sale and leaseback of $102 million in equipment. Not all transit authorities, however, may be able to take full advantage of the new leasing laws; the United States Treasury Department has issued temporary regulations which preclude the use of the new rules for the portion of mass commuting vehicles bought with Federal money. Most transit authorities heretofore have received matching Federal grants for 80 percent of the cost of their rolling stock, so that the new leasing laws would apply only to the 20 percent of locally raised funds. Under these circumstances, probably only those transit systems in the larger cities would be able to put together leasing deals that were big enough to cover the legal and financial fees. Nonetheless, these circumstances could change. The Treasury's temporary regulations are still under review and subject to revision. Moreover, there could be cutbacks in the Federal capital grant program in coming years, necessitating larger contributions from localities—the larger these contributions, the greater the scope for leasing.

The basic principles for transactions between private and public enterprises under the special new rules are relatively straightforward. Consider, for example, a transit authority which buys $100 million worth of equipment and enters a sale/leaseback arrangement with a private firm P. Under the typical arrangement,

Table 1

Comparison of Main Features of "Old" and Special New Leasing Rules

"Old"	New
The lessor must have a positive cash flow and a profit from the lease independent of tax benefits.	No such requirement.
The lessee must not have an investment in the lease and must not lend any of the purchase cost to the owner.	No such restriction.
The lessee must not have a right to purchase the property at less than fair market value.	No such restriction.
The use of the property at the end of the term of the lease by a person other than the lessee must be commercially feasible.	No such requirement.
The lessor must have a minimum at-risk investment of 20 percent of the cost of the property throughout the lease term.	The lessor must have a minimum at-risk investment of 10 percent of the adjusted basis of the property throughout the lease term.

Table 2

Sale/Leaseback Example*

In millions of dollars

Year	Depreciation deductions		Total debt service	Debt service		Rental payments	Rent minus interest costs (taxable income)	
	Actual	Discounted		Interest	Principal		Actual	Discounted
0	15.0	15.0	—	—	—	—	—	—
1	22.0	19.1	15.4	13.5	1.9	15.4	1.9	1.6
2	21.0	15.9	15.4	13.2	2.2	15.4	2.2	1.6
3	21.0	13.8	15.4	12.9	2.5	15.4	2.5	1.6
4	21.0	12.0	15.4	12.5	2.9	15.4	2.9	1.6
5	—	—	15.4	12.1	3.3	15.4	3.3	1.6
6	—	—	15.4	11.6	3.8	15.4	3.8	1.6
7	—	—	15.4	11.0	4.4	15.4	4.4	1.6
8	—	—	15.4	10.4	5.0	15.4	5.0	1.6
9	—	—	15.4	9.6	5.8	15.4	5.8	1.6
10	—	—	15.4	8.7	6.7	15.4	6.7	1.6
11	—	—	15.4	7.7	7.7	15.4	7.7	1.6
12	—	—	15.4	6.6	8.8	15.4	8.8	1.6
13	—	—	15.4	5.3	10.1	15.4	10.1	1.6
14	—	—	15.4	3.8	11.6	15.4	11.6	1.6
15	—	—	15.4	2.0	13.4	15.4	13.4	1.6
Total†	100.0	75.8	230.9	140.9	90.0	230.9	90.0	24.7

* Assumptions: Property worth $100 million and eligible for five-year ACRS treatment is sold by the lessee. The buyer/lessor puts $10 million down and pays the remaining $90 million, plus interest at 15 percent, in fifteen equal annual instalments. (The lease also runs for fifteen years.) Future amounts are discounted at a 15 percent annual rate to yield present values as of year zero.

† Columns may not add up to totals due to rounding.

The Importance of the Terms Governing the Debt Service

The net tax savings possible with a sale/leaseback transaction involving a nontaxpaying lessee depends on the ability to delay paying taxes on the rental income. With rental payments set equal to the debt service and interest costs deductible, the additions to the lessor's taxable income equal the portion of the debt service which goes toward repayment of the principal (see example in the main text). The more this repayment is deferred, the less the present value of these additions to taxable income. Thus, with rental payments always set equal to debt service, the parties have no incentive to specify repayment of principal in any year of the lease but the last one. (Of course, if there were a possibility of future increases in the tax rate, the lessor might prefer to receive its taxable income at an earlier date.)

The Internal Revenue Service (IRS) is obviously not indifferent to the scheduling of the debt service and has issued regulations which limit the flexibility of the parties. The net result of the restrictions is to favor a debt service that consists of equal payments over the course of the lease. The allocation of these payments between interest and repayment of principal is the same as that for a level payment mortgage. Thus, in the early years interest costs dominate, while repayment of principal becomes significant only in later years. The actual proportions depend on the interest rate and the number of years over which the loan is being paid off.

The sensitivity of the present value of the principal repayments to the interest rate and the length of the debt service can be seen by looking at the composition of the debt service for repaying a loan over five, fifteen, and thirty years at interest rates of 10, 15, and 20 percent. The higher the interest rate, the higher are the instalments and the larger the proportion in the early years going to cover interest costs. Thus, for example, the present value of a fifteen-year repayment schedule for a $90 million loan falls from $38.6 million for a debt service based on a 10 percent interest and discount rate to $15.6 million for the 20 percent case (Table 3).

Similarly, the longer the term of the loan, the lower the present value. As the repayment of principal is spread over more years, the size of each instalment becomes smaller. Thus, the present value of the repayment of principal falls from $58.0 million to $5.4 million as the debt service is stretched from five to thirty years (using a 15 percent discount rate in both cases). Therefore, the higher the interest rate and the longer the debt service, the smaller is the amount of principal repayment in the early years.

The IRS, however, regulates the amount of interest that can be charged and the maturity of the loan. The interest rate charged by the lessee cannot exceed that which is reasonable or determined at arm's length between the parties. The length of the period of debt service cannot exceed the term of the lease. The maximum possible term is thus limited to the greater of 90 percent of the useful life of the property or 150 percent of the midpoint of the applicable asset depreciation range as set by the IRS.

Table 3

Present Values of Rental Income Net of Interest Costs on $90 Million Debt

Pretax, in millions of dollars

Length of debt service	Alternative interest rates*		
	10 percent	15 percent	20 percent
Five years	67.0	58.0	50.4
Fifteen years	38.6	24.7	15.6
Thirty years	14.9	5.4	1.9

* The same percentage was used both for the interest rate on the loan and for discounting the taxable income stream back to year zero.

the transit authority keeps possession of the equipment and has an option to buy it back at the end of the lease for one dollar. Firm P makes a downpayment to the transit authority and agrees to pay the rest of the $100 million purchase price plus interest in equal-sized instalments over fifteen years—the life of the lease. (See the discussion in the box for the restrictions governing the structuring of the debt service.) In return, firm P is allowed to apply the depreciation deductions for the equipment against its own taxable income. Although firm P charges the transit authority a rental fee, the amount is set equal to its debt service obligations.[2] Thus the rental fee and the debt-servicing payments exactly offset each other. No money actually changes hands after the initial downpayment—which, of course, the transit authority keeps.

For illustrative purposes, suppose the downpayment made by firm P is $10 million, the minimum nec-

[2] Although not a legal requirement, the matching of the rental payments to the debt service eliminates any risk of default between the lessor and the lessee. The whole transaction can thereby be reduced to just one payment—the downpayment.

essary to meet the at-risk requirement under the special rules. The rest of the purchase price, $90 million, is then repaid by firm P, along with interest at 15 percent, in fifteen equal instalments of $15.4 million per year (Table 2). With these payments, firm P has "tax title" to the assets and can claim depreciation deductions equal to the full $100 million purchase price. Assuming that the equipment qualifies for the five-year write-off under the new accelerated cost recovery system (ACRS) of ERTA, firm P will be able to lower its taxable income by $15 million the first year, $22 million the second, and $21 million in each of the three following years. The total amount of tax savings, therefore, is $46 million, given a Federal tax rate of 46 percent.

The transaction, however, has other tax implications which offset part of the tax savings from the depreciation deductions. Although no cash changes hands, the IRS recognizes the rental payments as being received by firm P and the debt service payments as being made by firm P. The transit authority is unaffected since, being a public body, it pays no taxes. But firm P must pay taxes on its rental receipts of $15.4 million per year less the tax-deductible interest charges on the debt to the transit authority. Thus, firm P's taxable income amounts to $1.9 million in the first year and then rises as interest costs fall with the repayments of principal. In effect, with the rental payments set equal to the debt service, firm P pays taxes on an amount equal to the portion of the debt service that goes toward the repayment of principal. Eventually, therefore, firm P will pay taxes on income equal to the $90 million that it borrowed. Thus, firm P gets to keep outright $4.6 million in Federal taxes saved on the $10 million excess of depreciation deductions over net taxable income. Moreover, firm P has the use of the tax savings on the other $90 million in depreciation deductions for up to fifteen years. While all the depreciation deductions come in the first five years, less than 50 percent of the taxable rental payments are generated before the eleventh year.

A simple way to calculate the net value of these tax effects is to translate all the deductions and additions to taxable income into present-value terms as of the beginning of the lease. The more delayed the receipt or loss of tax savings, the less is their present value. At an annual discount rate of 15 percent, the present value of the $100 million in depreciation deductions is equal to $75.8 million (Table 2). Discounting the net increases in taxable income yields a present value of $24.7 million. This present value calculation, therefore, shows a net, pretax gain from the transaction of $51.1 million; the aftertax benefit is about $23.5 million. Both parties have benefited: the transit authority has $10 million and firm P is left with a profit of $13.5 million. Under these assumptions of lease length and discount rate, the transit authority could negotiate for a higher downpayment. In fact, firm P could pay as much as $25.5 million and still achieve a rate of return of 15 percent.[3]

Leasing under the "old" rules

Another option available to states and localities for structures and equipment other than mass commuting vehicles is to arrange a lease under the "old" rules.[4] The restrictiveness of these rules has tended in the past to impede public-sector leasing. But the new and much more liberal depreciation provisions of ERTA may help to make such leases more profitable. Moreover, in the case of dilapidated public buildings, the new tax laws include an additional incentive that may facilitate leasing: investment tax credits are now available for rehabilitation expenses even when the refurbished building is to be leased to a public entity.[5] Accordingly, states and localities may now find it attractive to upgrade public structures by selling them to private companies which will renovate them and then lease them back to the government. In fact, Oakland, California, is exploring this alternative for one of the two buildings involved in recently announced sale/leaseback transactions.

The restrictions imposed by the "old" rules are not inconsiderable. For example, the lessor must have a positive cash flow and a profit from the lease independent of tax benefits. The net result of this rule is to lower the benefits to the lessee from leasing, as the rental charges must be set higher than they otherwise would have to be.

The lessee is also prohibited from lending money to the lessor. This rule creates two problems not existing with leases under the special new rules. First, it can raise the costs of financing the purchase of the asset. The lessee, because it is a public entity, has

[3] The $25.5 million exceeds the sum of the $10 million plus $13.5 million because the higher downpayment lowers the amount that must be borrowed from the transit authority and therefore the amount of rental income that is taxed.

[4] Not all assets, however, can be leased under the "old" rules. The IRS requires that the use of the asset by persons other than the lessee must be commercially feasible. This regulation may make it difficult to lease special purpose buildings such as fire stations and custom designed equipment such as subway cars. The effect of this restriction, however, need not be as limiting as it first appears. Minor redesigns may suffice to accommodate this stricture. Thus, for example, it may not be difficult to rebuild a school in such a way that it is easily convertible into commercial office space.

[5] The investment tax credits are equal to 15 and 20 percent of the rehabilitation cost for nonresidential buildings more than thirty or forty years old, respectively. By claiming the credits, however, the taxpayer must use depreciation rules less favorable than would otherwise be the case.

direct access to tax-exempt funding; the lessor does not.[6] Second, the lessor as well as the third-party creditor must now be concerned about the financial condition of the lessee. With the addition of an outside lender to the leasing agreement, cash must actually change hands; the rental payments can no longer be used as a wash against debt service payments. Without the rental payments, the debt would not be retired nor would the lessor earn its full return on its equity investment which must equal at least 20 percent of the purchase price throughout the lease term.

The lessee must also accept additional risk if it plans to continue using the asset beyond the lease term. Under the "old" rules, the lessor cannot sell the asset to the lessee for less than its fair market value, an amount which cannot be known in advance. The lessor, therefore, will rely on a conservative—*i.e.,* low—estimate of the resale value when calculating the rental payments needed to earn an acceptable rate of return. The lower the estimated resale value, the higher the rental charges that the lessee must pay. If the asset turns out to be more valuable, as is likely in inflationary times, the lessor receives a windfall. The lessee, however, then has to re-lease or purchase the asset at a cost that offsets part or all of the savings realized on the lease itself.

Service contracts

An alternative to leasing that offers full use of ERTA's strengthened investment incentives is the service contract. Instead of leasing equipment (*e.g.,* garbage trucks), a public entity may contract with private-sector firms to provide a service (*e.g.,* garbage collection) with their own equipment. As long as equipment is not directly involved in a lease to a governmental unit, the firm can claim the regular depreciation allowances and investment tax credits or sell them under the special new leasing rules.

The problem with service contracts, however, lies in their definition. Simply designating an agreement as a service contract does not insure that the IRS will treat it as such. The distinction between service contracts and equipment leases is, indeed, problematic. For example, how does one measure the amount of "service" that must be provided in addition to the garbage trucks to transform an equipment lease into a contract for garbage service?

The courts have not developed a single test but rather a number of different ones to help determine a threshold.[7] The distinction appears to hinge on the retention of control over the equipment as evidenced by such factors as who operates and maintains it. Thus, the substitution of a service contract for a current government activity requires more than a shift of ownership of assets to the private sector; it also means shifting employment. For instance, a firm supplying garbage collection services would presumably have its own work force to operate and maintain its trucks. Thus, a city switching from providing this service itself to contracting with an outside vendor would no longer need employees to do those jobs. To realize the full savings, therefore, total employment in the public sector would have to be reduced.

Conclusion

The ultimate usefulness of leasing for states and localities remains a matter of conjecture. Few transactions have been completed since the passage of ERTA. There are many technical details that need to be worked out for each of the alternatives—leasing under the special new rules, leasing under the "old" rules, and contracting for public services.

[6] Some lessors, however, may be able to use industrial development bond financing which offers tax-exempt financing to private-sector firms for certain types of investments.

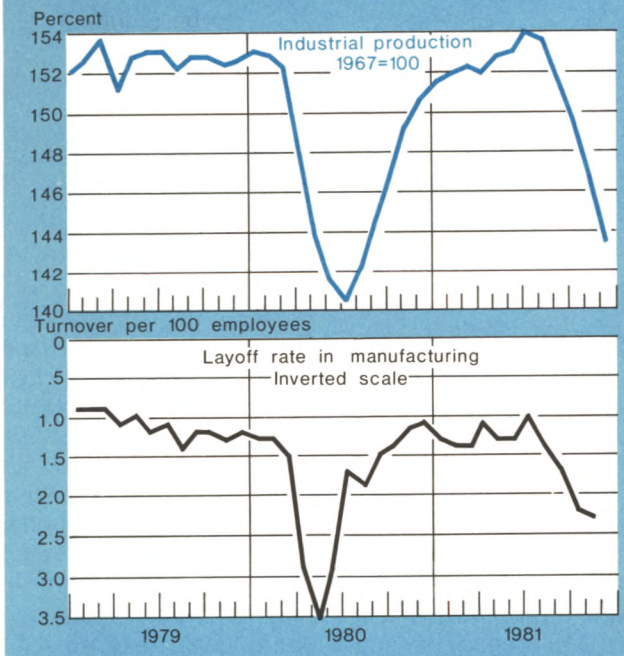
[7] See Xerox v. United States, 1980-2 U.S.T.C., ¶9530 (Ct. Cl. Trial Div.) which allowed investment tax credits for copying machines placed on government premises under service contracts.

Mark A. Willis

Current economic developments

Chart 1

Industrial activity began to turn down in late summer of 1981.



Sources: Board of Governors of the Federal Reserve System and United States Department of Labor, Bureau of Labor Statistics.

In the closing months of 1981, the economy slid deeper into recession. Symptomatic of the downturn were the drop in industrial production, the sharp rise in layoffs, and the surge in unemployment (Chart 1). The weakening in economic activity was also reflected in the financial markets. Interest rates, particularly the short-term rates, receded sharply in November from the record high levels attained earlier in the year. However, conditions in the financial markets changed in early December, and yields backed up briskly in the closing weeks of 1981 and the opening weeks of 1982.

Industrial activity has been sliding since midyear. Industrial production peaked in July, marking the end of a year-long expansion. Thus far, this recession has been unfolding at a somewhat rapid pace. Industrial output fell 6.9 percent from July to December, whereas in the seven previous postwar recessions the decline in output averaged almost 5 percent during the first five months of the downturn. At the same time, unemployment climbed sharply from 7 percent in July to 8.9 percent in December.

Signs of weakness in the economy first began to be noticeable late last spring and have become increasingly abundant since then. Net exports have gotten progressively weaker over the year, reflecting both the slackening in economic conditions abroad and the appreciation of the United States dollar in relation to other currencies that started late in 1980. A surge in mortgage interest rates that began in May carried them to a level in October and early November in excess of 18 percent. Though mortgage rates have declined since then, new housing construction re-

mains in its worst slump since World War II. Spending by state and local governments has also slipped in real terms over the course of 1981. These governmental units are being squeezed by the steep reductions of Federal spending, the austere mood of taxpayers, the recession-induced declines in tax revenues, and the extremely high rates prevailing in the municipal bond markets.

As the economy was faltering, cutbacks in consumer spending made matters worse. New car sales, in particular, fell sharply. As soon as United States automakers ended their price rebates and other sales-promotion schemes in early September, domestic car sales plummeted. Over the last three months of 1981, new domestic car sales averaged 5.1 million units at an annual rate, the lowest level in over twenty years. Smaller but still substantial declines also occurred in real consumer purchases of other kinds of goods. In real terms, spending on nondurable consumer goods peaked in August and purchases of nonautomotive durables fell further in October after holding steady in the previous two months. By the year-end, however, the decline in consumption spending appeared to have tapered off.

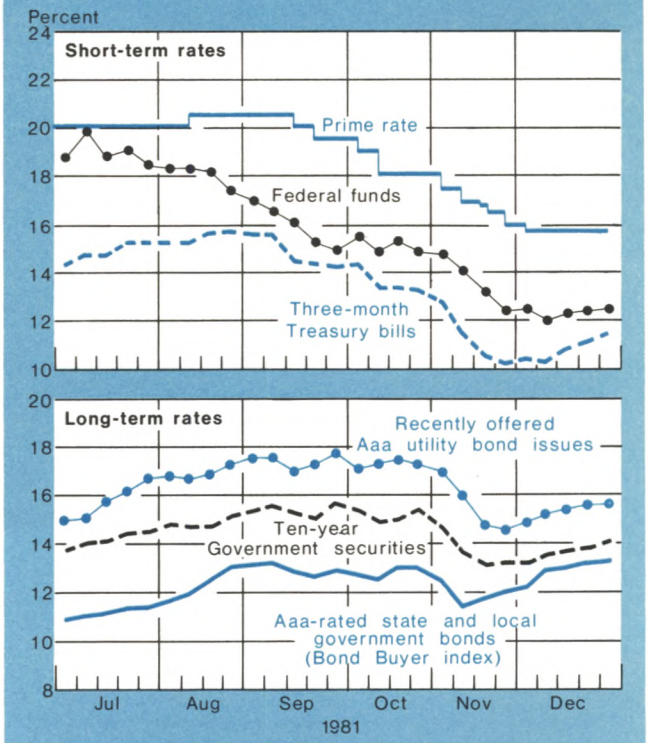
Coming in the last quarter of 1981, the downturn in consumer spending seems to have caught most businesses off guard. With the 5 percent tax cut scheduled to take effect on October 1, many observers had foreseen a pickup in consumer spending over the fourth quarter. Why the anticipated increase did not occur is still not clear. Consumers may have decided to cut back or postpone their purchases of goods in order to take advantage of the all savers certificates and other savings incentives included in the Economic Recovery Tax Act of 1981. It is also possible that the high interest rates posted earlier in the year exerted a cumulatively depressing effect on consumer spending.

Despite the close scrutiny that businesses have kept on their inventories, an imbalance has developed over recent months. Over the year ended in March 1981, total business inventories had fallen by slightly more than $2 billion in real terms. But from then until October (the latest month for which there are data), roughly $7 billion worth of inventories were amassed. Much of this increase, especially the portion accruing in recent months, was unintended, and businesses reacted quickly by curtailing production and laying off workers. Overall, the total buildup of stocks has not been unmanageably large, so that it should not take businesses too long to run down their excess inventories. Once the inventory correction has been completed, the stage will be set for an economic recovery.

In the wake of the weakening economy, interest rates tumbled (Chart 2). After peaking at 15.85 per-

Chart 2

After declining sharply in recent months interest rates backed up a bit in the final weeks of the year.



Sources: Federal Reserve Bank of New York, Board of Governors of the Federal Reserve System, and The Bond Buyer.

cent in late August, for example, the three-month Treasury bill rate plummeted more than 5 percentage points by late-November. Other short-term rates posted similarly sharp declines. In response, commercial banks lowered their prime rates. The Federal Reserve System first lowered the discount rate and reduced the surcharge on certain discount window borrowings by large banks in early November and then, one month later, lowered the discount rate further and eliminated the surcharge altogether. The rally petered out in early December. At that time, short rates bottomed out and then backed up by more than 1½ percentage points in the closing weeks of 1981.

The vigorous rally in the money markets extended over into the capital markets. There, bond prices rose sharply throughout November, climbing to their highest levels since last spring. In the process, the rate on twenty-year Government securities declined by 2½

percentage points while the Aaa rate on corporate securities fell by a bit less than 2 percentage points. New bond issues swelled. In November, gross new corporate issues amounted to $7.3 billion, almost double the monthly volume averaged over the first ten months of the year.

In early December, however, conditions changed perceptibly in the capital markets. Long-term yields bottomed out and then began to rise, though rates at the year-end were still well below the peaks attained earlier in the year. No doubt the heavy congestion of new bond issues contributed to the flattening-out of yields. Probably even more important, however, were the newly issued estimates of the Federal deficit, indicating that the Federal Government would be borrowing huge sums over the next several years.

Notwithstanding the contraction in economic activity, the growth of the monetary aggregates quickened in the last two months of 1981. In November, M-1B grew at a rapid 13.6 percent annual rate and M-2 surged 17.2 percent. In December, both M-1B and M-2 slowed down a bit from the previous month but still increased at a much faster pace than they had earlier in 1981. Over the four quarters of 1981, M-1B—adjusted for funds shifted into negotiable order of withdrawal (NOW) accounts from sources other than demand deposits—increased slightly more than 2 percent and ended up roughly 1¼ percentage points below the lower bound of its annual range. At the same time, M-2 increased about 9½ percent over the year, winding up slightly above the upper limit of its targeted range.

Interpreting the significance of M-1B and M-2 relative to their respective target ranges was complicated by the rapid pace of financial innovation during the year. Money market funds, for example, more than doubled over 1981. Attracted by the high yields offered by these mutual funds, investors drew down their demand deposits and cashed in some of their money market assets, placing the proceeds into money market funds. Because money market funds are excluded from M-1B but included in M-2, these transfers lowered the growth rate of M-1B while increasing that of M-2. (See "Money Market Mutual Funds and Monetary Control" in this issue of the *Review*.)

Natural Gas Controls and Decontrol

Natural gas is now the only major energy source in the United States subject to extensive Federal price controls. Since gas supplies about one quarter of our total energy usage, including heating more than half the homes in this country, the debate over removing controls is unavoidably contentious yet important for our long-run energy prospects. Basically, the controls hold down gas prices for certain customers, while placing restrictions on usage by others. Unfortunately, this approach does not guarantee that demand will always stay in line with supply. Although major gas shortages have been avoided in recent years, it is not clear how long current market conditions can continue. This makes it important to consider the possible consequences of decontrolling natural gas in the near future, as opposed to leaving current legislation unchanged.

Current law

The controls on natural gas have two main parts. First, the wellhead price of gas is held down to provide price protection to certain customers. However, price ceilings, if lower than the market clearing price, cause shortages because demand for a commodity at the controlled price will exceed the quantity supplied. Therefore, the other component of natural gas legislation is demand restrictions. These demand restrictions are intended to ration supply and thereby bridge the gap between supply and demand for gas.

The current system of gas price controls was established in the Natural Gas Policy Act of 1978 (NGPA). This act sets wellhead price ceilings for a number of different categories of natural gas, generally allowing higher prices for gas from newer sources and lower prices for older production sites. New sources of gas, those put into production since 1977, account for roughly 40 percent of current United States output. This gas from new sources qualified for ceiling prices averaging around $2.60 per thousand cubic feet (mcf) as of March 1981, well above the $1.70 per mcf average wellhead price for all United States production at that time. Gas from older sources qualified for a lower range of ceiling prices. A small amount of gas from categories with high production costs (mainly very deep wells) is decontrolled and as of March 1981 sold at wellhead prices ranging from $3 to well over $7.[1]

The NGPA allows for gradual lifting and partial elimination of these wellhead price ceilings. All the ceilings are allowed to rise along with inflation. Newly discovered gas, as well as gas from small "stripper" wells, is allowed an additional upward annual price adjustment of 4 percent. On January 1, 1985 price ceilings on gas from most new sources will be eliminated.[2] Moreover, price ceilings will also be removed

[1] Estimated production for new, old, and high-cost gas sources, and price ceilings for new and old categories are from the United States Department of Energy, Energy Information Administration, Analysis Report 0289, *The Natural Gas Market under the Natural Gas Policy Act* (June 1981), pages 2 and 10. Prices for high-cost gas are from Foster Associates, Inc., *Foster Bulletin on Deregulated Gas*, No. 5 (Washington, D.C.: March 1981). The average wellhead price for all natural gas is from the United States Department of Energy, Energy Information Administration, *Monthly Energy Review* (July 1981), page 85.

[2] Gas from certain shallower new production wells, however, must wait until mid-1987.

from much of the old gas that is sold under intrastate contracts. The paucity of data on the relative amounts of current production in each category, as well as the uncertainty about how rapidly the production mix of old and new gas will change, makes it impossible to estimate precisely how much gas will be decontrolled in 1985. A reasonable guess, however, is that between one half and two thirds of all domestic production will be decontrolled at that time. Even by 1990, however, a substantial fraction may still be subject to price controls under the NGPA.[3]

There are several types of demand restrictions on natural gas. Under the Powerplant and Industrial Fuel Use Act of 1978 (FUA), the amount of gas (and oil) electric utilities may burn in existing power plants is limited, and construction of new large industrial boilers and power plants fired by gas (or oil) is prohibited where coal is a feasible alternative. In addition, the NGPA "incremental pricing" rules require that interstate pipelines charge gas costs exceeding a base level to industrial customers. This pricing policy further discourages industrial use while allowing more of the benefit of wellhead price controls to be passed on to residential customers, electric utilities, and other users. The NGPA also prescribes that industry be given less priority than residential and certain other users in the event that curtailments of natural gas should become necessary. Besides these Federal restrictions on demand by industry and electric utilities, new residential hookups may be limited at the local level, often by state public utility commissions.

These restrictions on demand essentially make up a set of allocational rules which guarantees the best gas availability to existing residential customers and the worst access to large industrial users, with electric utilities, potential new residential customers, and others somewhere in between the two extremes. The large industrial users' access is directly restricted, they bear a disproportionate share of wellhead costs in the prices they pay, and their supplies are particularly vulnerable to curtailment. Existing residential customers can basically use as much gas as they choose at controlled prices. Access by electric utilities and potential new residential customers in practice depends on regulatory discretion, which in turn is influenced by current market conditions.

Market conditions

During the mid-1970s many industrial users and electric utilities were affected by natural gas curtailments, particularly during cold weather.[4] In addition, there were many restrictions on new residential hookups. Since Federal price controls prior to 1978 applied only to gas flowing through interstate pipelines, the shortages were borne by interstate customers. Had there been effective price controls on intrastate gas also, the shortages would have been more widespread because the intrastate market would have contributed to the overall excess demand for gas.

Since 1978, when current legislation went into effect, major curtailments have been avoided and gas is more available to new customers. To understand why market conditions improved requires a longer run perspective, however. Natural gas production, distribution, and consumption require a considerable amount of physical capital. Therefore, supply and demand adjust to changing circumstances gradually. Just as discovery and development operations for gas supplies can take years, homeowners and factory managers may wait for furnaces and boilers to wear out before replacing them with equipment that uses a different, cheaper type of fuel. Thus, the current state of the natural gas market reflects the cumulative impact of a number of years of changing incentives, regulations, and other factors.

One of the most important changes affecting the natural gas market over the past decade has been the steep rise in average wellhead prices (Chart 1). Between 1955 and 1970 the average wellhead gas price rose only slightly more rapidly than the general price level. However, between 1970 and 1978, the average wellhead price quintupled, rising at a 23 percent annual rate. This rise was only partly due to increases in the uncontrolled intrastate market. The Federal Power Commission also allowed interstate prices to increase rapidly, in delayed response to the developing shortages.

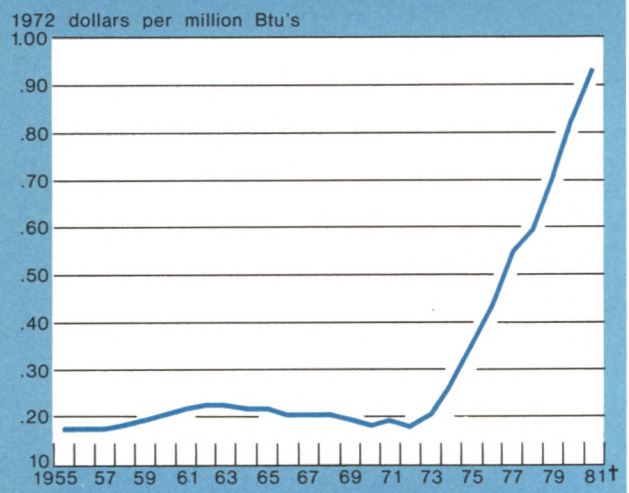
The sharp price run-up at the wellhead during the 1970s was accompanied by a marked increase in drilling activity (Chart 2). New gas well completions, which were flat on balance during 1955-70, rose over 16 percent per year between 1970 and 1978. Despite this vigorous increase in drilling, the gas supply situation deteriorated. After 1968, discoveries of gas were no

[3] According to an analysis prepared for the Federal Energy Regulatory Commission, in 1985 gas still subject to price ceilings will make up between 44 percent and 36 percent of total United States consumption (including a small fraction of imports), the range reflecting varying assumptions about regulatory enforcement and market conditions. See ICF, Incorporated, *A Preliminary Analysis of the "Gas Cushion"* (Washington D.C.: November 1979). The same study projects the 1990 proportion as varying between 34 percent and 28 percent. More recent data seem generally consistent with these aggregate projections, although the distribution across finer categories is somewhat different. See *The Natural Gas Market under the Natural Gas Policy Act*, page 10. For a similar finding, see Foster Associates, Inc., *Foster Report*, No. 1293 (December 31, 1980), pages 13-14.

[4] For example, see A.F. Bass, "Curtailments of Natural Gas Service", *Monthly Energy Review* (January 1976), pages 2-13.

Chart 1

Real Wellhead Price of Natural Gas*



* Adjusted for inflation by GNP implicit price deflator.

† Estimate based on first six months of 1981.

Sources: American Gas Association, United States Department of Commerce, and United States Department of Energy.

longer greater than production, with the result that reserves fell throughout the 1970s. Gas production declined only modestly, however, because the higher wellhead prices encouraged more intensive utilization of existing reserves. Moreover, the rate of decline in reserves began to taper off later in the decade because, with more drilling, gas discoveries began to increase again, narrowing the gap between production and additions to reserves.

The moderate decline in gas production during the 1970s resulted in a corresponding fall in the total amount of gas available for United States consumption. In addition to domestic production, the United States imports about 5 percent of its gas, primarily from Canada and Mexico. Both price and quantity supplied are determined by the Canadian and Mexican governments, and contracts are also subject to the approval of the Economic Regulatory Administration. Since imports have accounted for a fairly stable portion of all gas available to United States users, aggregate consumption trends have closely followed domestic production (Chart 3).

The price of gas to end users in the 1970s reflected the sharp increase in wellhead prices. The cost of transportation and distribution of gas to customers also accounts for a sizable fraction of the total delivered price, however, and these costs rose less than wellhead prices. As a result, while the prices paid by end users rose much faster than the general price level during the 1970s, the rates of price increase were not so rapid as at the wellhead. For residential customers, the wellhead price accounted for only about one fifth of the total delivered price in 1970 and still made up only a third in 1978. Thus, the rate of increase in delivered residential gas prices averaged only 11 percent per year during 1970-78, although this still outpaced the 6 percent average yearly rise in the gross national product (GNP) price deflator over the period. For industrial users and utilities, transportation and distribution costs make up a smaller proportion of total delivered prices. Prices to these users rose 22 percent per year in 1970-78, nearly as rapidly as at the wellhead.

Since the price of gas to end users rose faster than the general price level, gas users' incentive to conserve increased. The average gas usage per residential gas customer fell during the 1970s despite an increase in the fraction of these customers using gas for heating.[5]

On the other hand, in 1974 the price of oil rose much more than gas (Chart 4), raising the incentive for energy users to use gas rather than oil as a main fuel supply. Widespread switching from oil to gas, however, was not feasible given the limited aggregate amount of gas available. By the mid-1970s, in nearly half of all gas utility franchise areas there were restrictions on new residential hookups.[6] As a result, the number of homes converting from oil to gas declined, and despite more home building the growth of the total number of residential gas customers also slowed (Chart 5). Gas availability was an even greater problem for industrial and electric utility customers, who bore the brunt of the curtailments in the mid-1970s. Moreover, during the years following the 1974 oil price jump, the price of gas came back closer to its historical relationship with oil prices for these customers. By 1978 the number of industrial and electric utility gas customers was actually lower than at the start of the decade.

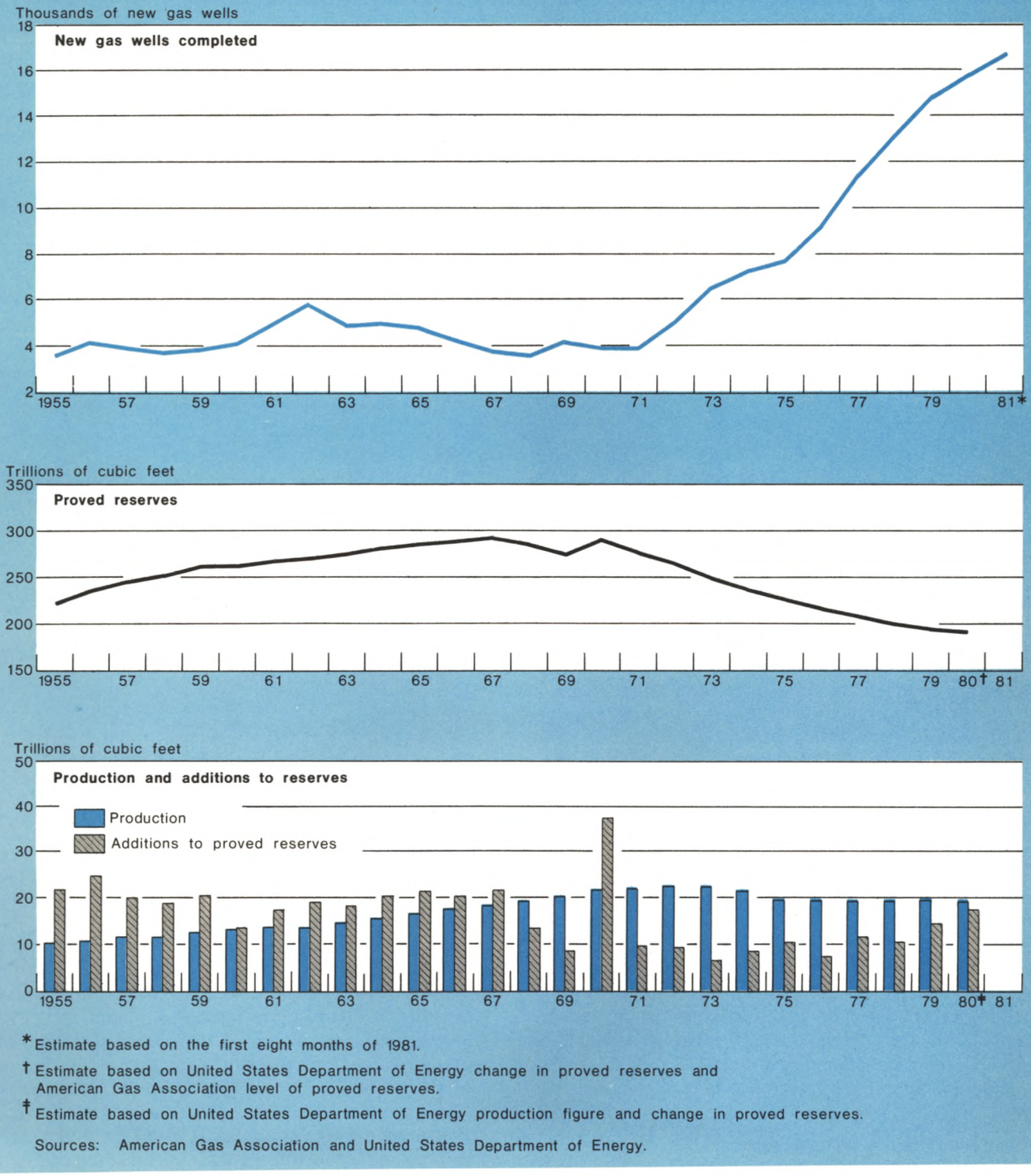
In short, during the 1970s the price of gas to final customers rose but not enough to allocate the over-

[5] In part, the decline in gas usage per residential customer reflected a shift toward more home building in warmer areas, but the decline also occurred within regions. See American Gas Association, *Gas Facts 1979 Data*, pages 70, 76, 136, 137.

[6] American Gas Association, "An Analysis of Oil-to-Gas Conversion Trends in the Residential Gas Spaceheating Market", *Energy Analysis* (September 18, 1980).

Chart 2

Trends in United States Natural Gas Supply



*Estimate based on the first eight months of 1981.

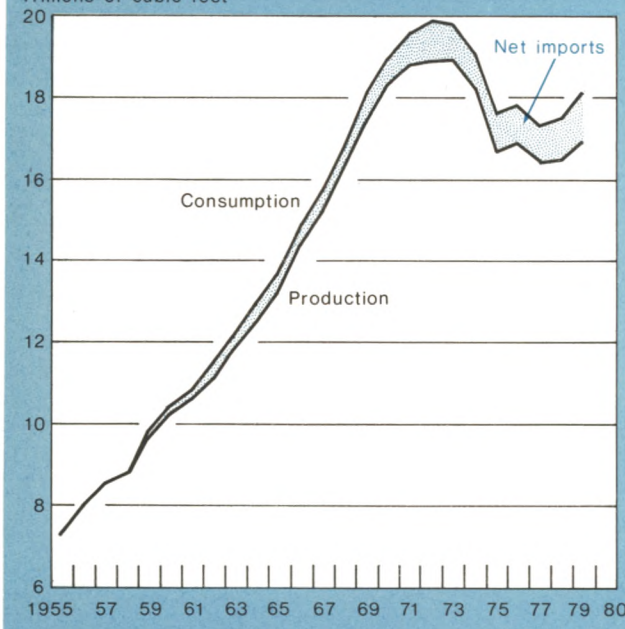
†Estimate based on United States Department of Energy change in proved reserves and American Gas Association level of proved reserves.

‡Estimate based on United States Department of Energy production figure and change in proved reserves.

Sources: American Gas Association and United States Department of Energy.

Chart 3

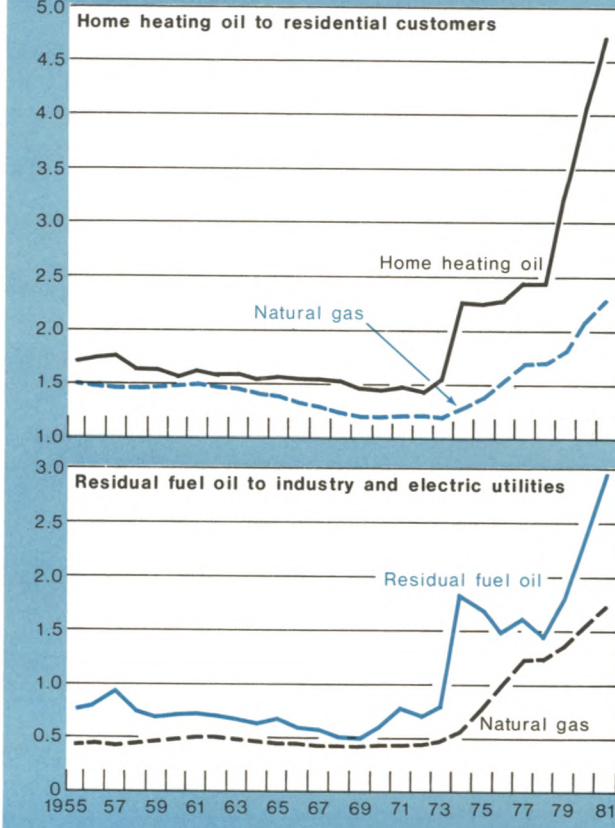
United States Natural Gas Production and Consumption



Source: American Gas Association.

Chart 4

Real Price of Natural Gas*



*Adjusted for inflation by GNP implicit price deflator.

†Observation for 1981 is an estimate based on second quarter 1981 data.

Sources: American Gas Association and United States Department of Commerce.

all supply among all potential customers. Therefore, while some conservation apparently occurred among gas users, usage restrictions and curtailments stymied any general trend toward switching to gas from costlier oil. In addition, for industrial and electric utility gas customers, the price of gas had just about caught up with oil by 1978. On balance, total residential gas consumption remained roughly flat during the 1970s (Chart 6), while industrial and electric utility consumption declined.

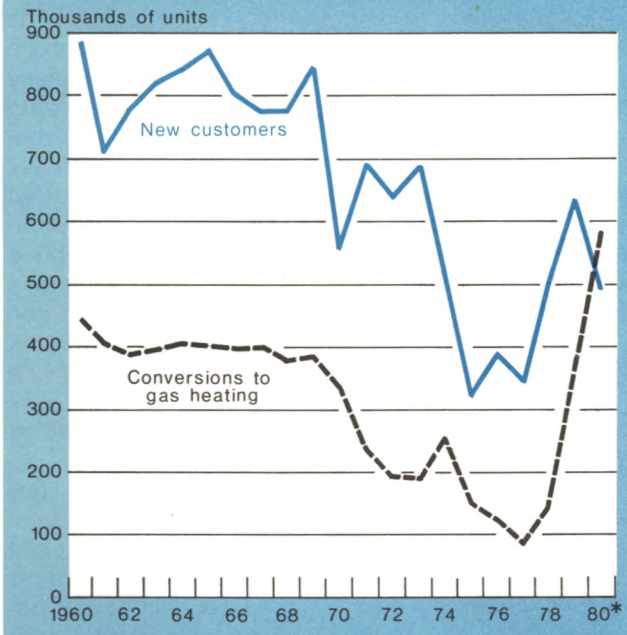
In more recent years, since current legislation passed in 1978, the shortage atmosphere in the natural gas market has been largely absent. The widespread restrictions on new residential hookups that prevailed during the mid-1970s virtually disappeared by 1980, and major curtailments have been avoided. While the FUA restricts gas usage by industry, many exemptions have been granted to electric utilities, allowing their consumption to rise in recent years.[7] In addition, natural gas inventories in underground storage, which were run down sharply in the shortage year 1976, recovered between 1977 and 1979 and have held about level each year since then.

In part, this change in market conditions represents the lagged, cumulative impact of events during the earlier years of the 1970s. The effect on drilling of the sharp wellhead price increases halted the downtrend in gas production, and output has remained flat since 1976. The gas market has continued to feel the cumulating effect on user demand of the price increases which began earlier. In addition, the constraints on gas usage during the 1970s encouraged many potential customers to commit themselves to

[7] Betsy O'Brien, *Electric Utility Demand for Natural Gas*, Working Paper, Energy Information Administration (April 1981).

Chart 5

Changes in Residential Gas Service

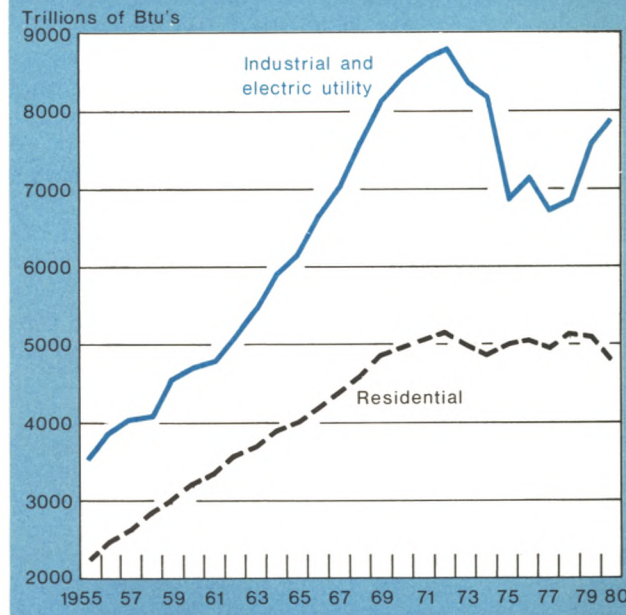


*In 1980, conversions to gas heating exceeded new gas customers, a category which includes those using gas for purposes other than space heating.
Also see footnote 10 in the text.

Source: American Gas Association.

Chart 6

Residential, Industrial, and Electric Utility Consumption of Natural Gas



Source: American Gas Association.

other sources of energy. While residential gas hookups were rationed, the use of electricity for home heating rose dramatically. Industry and electric utilities also were encouraged to turn to other sources. While industry's petroleum consumption continued to grow during the 1970s, utilities greatly expanded coal and nuclear capacity.[8]

In addition, since 1978 industrial output has remained virtually flat on balance. Moreover, home building has been depressed in recent years, reducing the pool of potential new gas customers. This slack in aggregate demand has combined with the cumulative effects from price increases and demand restrictions of earlier years to narrow the gap between supply and demand for gas, at least temporarily.

[8] For evidence on switching away from gas by industrial, commercial, and electric utility customers, see James W. McCarrick, Jr., "Reduction in Natural Gas Requirements due to Fuel Switching", *Monthly Energy Review* (December 1979).

Market prospects

The huge oil price run-up since 1978, however, has again greatly increased the relative attractiveness of gas, compared with oil. The NGPA links wellhead price ceilings for the various production categories to the general price level. While shifts in the mix of production toward higher price categories have allowed sharp average gas wellhead price increases to continue since 1978, oil prices have risen much faster, making gas comparatively cheap by historical standards. Between 1955 and 1972, for example, the price of gas to residential users averaged between 80 and 90 percent of the energy-equivalent price of home heating oil. After falling off sharply in 1974, this gas-to-oil residential price ratio recovered to about 70 percent in 1978 but by mid-1981 was about 50 percent. The ratio of gas-to-residual fuel oil prices for industry and electric utilities historically varied more, generally ranging between 75 and 100 percent. In 1974 the gas-to-oil price ratio for these users plunged sharply but was again near complete parity by 1978. Since then the ratio of gas-to-oil energy prices for industry and electric utilities fell back again, to about 60 percent in mid-1981.

Although the oil price increases since 1978 have not yet coincided with a need for increased restrictions on gas demand, it is far from certain that this can continue indefinitely. Although gas prices would continue to increase rapidly under continued controls, relative to oil the price of gas in the next few years is still likely to remain low compared with the past. For example, if it is assumed that oil prices will stay constant in real terms, then by the end of 1984 residential gas customers would be paying prices about 60 percent as high as home heating oil prices on an energy-equivalent basis. Industrial and electric utility gas prices would be equivalent to about 70 percent of the cost of residual fuel oil.[9] While it is not clear exactly what the appropriate gas-to-oil price ratio would be without controls, these projections are certainly low by historical standards, again raising the question of whether or not current market conditions can continue.

One sign that people are beginning to respond to the large current gas-to-oil price differential is that in 1980 the number of residences converting to gas heat rose dramatically (Chart 5).[10] Another early indication of the effect of the higher relative oil price is that, on the supply side, the rate of growth of gas drilling slowed considerably in 1981 despite continuing wellhead price increases, as more resources were allocated to the tremendous boom in oil drilling.[11] Particularly if home building and industrial activity revive in the near future, the demand for gas may again start to outrun supply at regulated prices. In this case, increasingly stringent usage restrictions would again be required if more disruptive curtailments are to be avoided.

If indeed a significant backlog of unsatisfied demand accumulates, then the full effects of this would become apparent at the time of scheduled partial decontrol in January 1985. With over half of all wellhead prices suddenly free to rise, gas prices could be rapidly bid up by end users trying to increase or maintain their shares of the supply.

There is little reason to think that after partial decontrol the remaining wellhead price controls would effectively limit the price increases to final users. Even with pipelines buying some gas at low prices, the prices that could be charged to end users would be essentially determined by market factors, such as the price of oil. The fact that pipelines are generally required to practice "rolled-in", or average cost, pricing would not effectively hold down prices for customers. If the averaging of decontrolled and controlled gas costs resulted in an end-user price below what would clear the market, pipelines would seek additional gas to meet demand. In the process, the price of decontrolled gas could be bid up by competing pipelines to the point where the average cost to end users cleared the market. Under partial decontrol, therefore, the main effect of average cost pricing would be to pass the benefits of price controls back to producers of decontrolled gas, rather than letting the pipelines or end users receive it.

In short, even if current legislation continues, gas customers would not be assured of protection from high prices after the start of 1985. From the end user's perspective, therefore, the foremost issue is whether controls should be lifted sooner. Earlier decontrol would allow prices to rise more rapidly prior to 1985, but this would keep shortages from developing. Potential new gas customers would be more assured of access to new hookups, and the probability of disruptive curtailments of service to existing customers would be greatly reduced. Moreover, beginning the transition to decontrol sooner, when the gap between supply and demand is still relatively small, means that a sharper price increase later may be avoided.

Whether natural gas prices are decontrolled in 1985 or earlier, a potential barrier to smooth transition between a controlled and decontrolled natural gas market is the existence of escalator clauses attached to many gas contracts. In general, these clauses specify that at the time of decontrol gas producers will be paid a price equivalent to oil, or the highest price for comparable gas then being paid.[12] Depending on the amount of unsatisfied demand at the time of decontrol, such rapid price increases could go beyond market-clearing levels. Gas prices that are too high would cause a glut on the market until contracts could be renegotiated. Therefore, these contractual barriers to proper price adjustment would need to be remedied in conjunction with decontrol.

[9] The projected gas-oil price ratios to end users are calculated by adding current real wellhead-to-end-user price mark-ups to projected late-1984 real wellhead prices and comparing these with current real oil prices.

[10] Since many of the conversions to gas space heating occurred among homeowners who were already using gas for cooking or water heating, the number of conversions in 1980 actually exceeded the total number of new gas customers, which was held down by weak home-building activity.

[11] Between 1978 and 1980, the rate of oil well completions rose over 50 percent, and oil well completions in the first half of 1981 were 40 percent higher than in the first half of 1980. By comparison, gas well completions were up 20 percent between 1978 and 1980, and rose 6 percent between the first half of 1980 and first half of 1981.

[12] Some decontrolled high-cost gas already is being sold at prices linked to the price of No. 2 fuel oil. See *Foster Bulletin on Deregulated Gas*, No. 5 (March 1981).

In addition to the questions about when and how rapidly the price of gas to end users should be allowed to adjust to market-clearing levels, there are several other issues to consider in comparing current legislation with more complete decontrol. Partial decontrol would involve a very different distribution of wellhead prices than complete decontrol. This in turn would have implications for how gas is distributed geographically and for how much and how efficiently gas is produced.

Under partial decontrol, pipelines with more cheap, price-controlled gas can bid more aggressively to secure additional supplies. For these pipelines, even very costly marginal supplies can be rolled in with the cheap gas and sold to end users at an average cost competitive with alternative fuels. This bidding edge which pipelines with cheap gas would hold represents a potentially important problem with the partial decontrol scheme. The reason is that most of the gas which will remain price controlled after 1985 is committed to interstate pipelines. These pipelines will be able to bid very high prices for decontrolled gas and still continue to supply their customers at prices competitive with other fuels. The intrastate pipelines, on the other hand, will have relatively little cheap, price-controlled gas to average in. In some cases, customers in gas-producing states would have either to pay very high prices for gas or to switch to other fuels, diverting gas supplies away from local markets and into the interstate pipelines. In other cases, the bidding advantage afforded by the cheap gas would not be large relative to the high cost of transporting gas great distances from its source. But even for the latter case more gas would be transported interstate than would occur if the ceilings on all gas were lifted. In either case, the partial decontrol scheme would result in an artificial distortion of the geographic distribution of gas supplies, adding spurious transportation costs to this energy source.

The partial decontrol scheme would also result in inefficient production priorities for gas, but whether this would lead to higher or lower output is unclear. With the partial decontrol scheme, the prices of certain categories of older gas are kept low, and this will add the extra bidding power to push up prices for newer, decontrolled gas. Since the output of gas from older sources may be less sensitive to price than new supplies, holding down the old price and raising the new could conceivably increase total production. Even if total production were higher, that same level of output could have been attained at a lower cost in terms of total manpower and equipment used. Due to its higher price, producers would be willing to use more drilling resources to recover each cubic foot of newer gas and correspondingly less resources to recover each cubic foot of older gas. Production of some older gas that would be cheaper to recover would be foregone, yet much effort and cost would go into extracting gas in higher priced categories. Overall, the average resources used per unit of gas produced would be lower if all gas of the same quality were priced the same.

In the long run, the gas production industry may be able to attract as much extra personnel and equipment as it chooses to pay for. In this long time frame, inefficient gas production priorities would mean an unnecessarily large proportion of the whole economy's resources are devoted to that industry. In the short run, however, there may be bottlenecks in expanding the resources devoted to gas production. In this case, the inefficient priorities would retard total gas output. In recent years this has become a relevant problem as limited drilling resources have been devoted to producing high-priced oil and narrow decontrolled categories of high-cost gas. Meanwhile, gas that could be recovered with proportionately less of the scarce resources goes unexploited because of price controls. It is unclear to what extent the current constraint on drilling resources will persist into 1985. If this were still a major factor, however, it would damp any positive effect on total gas production that the price tilt toward newer gas sources might have otherwise generated.

The scheduled partial decontrol scheme also may hold down current gas exploration and development activity because of the expectation of future higher prices. Especially with drilling resources limited, producers have an extra incentive to drill more for oil and high-cost decontrolled gas now and leave other gas development until after prices are decontrolled. Earlier, complete decontrol would shift more resources back toward gas exploration and development, where the payoff in terms of domestic energy production might well prove to be higher.

Price adjustment and windfall tax

If wellhead prices are decontrolled, producer revenues are likely to be substantially higher than under current legislation. How much income this would transfer to producers depends on how much and how rapidly the price of gas would rise and on how much of any extra revenue is paid in taxes. A windfall tax on gas similar to the one on crude oil, for example, would raise the Government's share.

A reasonable assumption is that after decontrol gas wellhead prices would adjust to a level that would put the price of gas delivered to electric utilities and large industrial users near the energy-equivalent price of

residual fuel oil. These large users can often switch easily between gas and residual oil, depending on which is a cheaper source of energy. In contrast, homeowners typically require a change of equipment to switch between gas and home heating oil, and this takes more time.[13]

How rapidly gas prices would adjust to this parity with residual oil is somewhat uncertain, however. Escalator clauses in contracts with producers could actually push wellhead prices up more rapidly than market forces by themselves would justify, and if pipeline companies attempted to pass on these inflated prices, a market glut could result. Assuming this problem with escalator clauses can be avoided, however, there is still the issue of how rapidly the market-clearing price would adjust. Certainly it could not rise immediately to exact parity with oil because this would generate greater conservation and production while at the same time removing the incentive for switching out of oil. It is not entirely implausible, however, that the price of gas could rise quickly to just under the residual fuel oil price, assuming enough capacity could be immediately switched from oil to gas to absorb any slack in demand generated elsewhere in the market by the price rise. Any backlog of potential residential or other gas customers seeking service at the time of decontrol would also add to the upward pressure on prices.

In practice, however, the adjustment process could turn out to be somewhat slower for several reasons. For one thing, many utilities have already been able to raise their gas usage substantially under exemptions to the FUA, reducing their leeway for increasing demand. How actively large industrial users could bid up gas prices would depend on how stringently the FUA restrictions were enforced, if that legislation were not changed. In addition, the state of demand for the output of utilities and industry could influence how actively they would seek gas. Even the weather could be important. A mild winter diverts gas from residential heating uses, while a cool summer reduces peak-load electricity demand, which is often met by gas-fired capacity. It also could take time simply to renegotiate existing contracts, some of which do not provide for price increases. Given the uncertainty about the future course of prices, buyers might decide to approach large price-hike agreements with caution.

How rapidly prices adjust has a large impact on the size of the revenue flows to gas producers in the near future. A comparison of two cases illustrates the point. Suppose that all wellhead price ceilings were lifted at the start of 1983 and that oil prices remain constant in real terms at 1981 levels. In addition, the inherent time lags in gas development make is reasonable to assume that any near-term response of production to price change would be small enough to ignore for the purpose of this illustration. For case one, assume that the process of adjustment to virtual parity between gas and residual oil energy prices were completed in two years. Under this gradual price adjustment scenario, the impact of decontrol on producer revenues before taxes would be about $4 billion in fiscal 1983 and $21 billion in fiscal 1984. Alternatively, consider a second case in which the extreme assumption is made that gas prices immediately jump to near parity with residual oil at the time of decontrol in 1983. In this case of instantaneous price adjustment, the impact of decontrol on producer revenues before taxes would be $33 billion in fiscal 1983 and $40 billion in fiscal 1984.[14]

A windfall tax on the extra producer income could be used to raise Federal revenues. If the windfall tax is assumed to be similar to the one on crude oil, the net impact on Federal revenues can be calculated for either of the price adjustment scenarios outlined above. For case one, in which prices adjust more gradually, the net impact of decontrol and a windfall tax would be to raise Federal revenues by about $1 billion in fiscal year 1983 and $7 billion in fiscal 1984. In case two, in which prices adjust instantaneously, the impact on Federal revenues would be $12 billion in fiscal year 1983 and $12 billion in fiscal 1984.[15] After 1984, the effects on Federal revenues would probably diminish, depending on how the windfall tax is constructed.

While the revenues of gas producers and of the Federal government would be raised by decontrol, consumers would pay more. The price of gas to residential customers in either of the two decontrolled price adjustment scenarios would be roughly 30 percent higher by the end of 1984 than under continued controls.[16] The difference would be that in case one

[13] While parity between gas and residual fuel oil seems the most likely outcome for the near future, in the very long run when equipment and technology can be adapted it is less clear what sort of oil-gas parity would exist. For example, if gas eventually became commonly used as automobile fuel, it could approach price parity with gasoline instead of residual fuel oil.

[14] For an explanation of how these figures were derived, see the accompanying article by Capra and Beek in this *Quarterly Review*.

[15] For details, see the accompanying article by Capra and Beek.

[16] The wellhead price in 1981 dollars is projected to be $2.70 per mmbtu with controls and $1.50 per mmbtu higher than that without controls (see the Capra-Beek article). In July 1981 the average residential gas price exceeded the average wellhead price by $2.79 per mmbtu —*Monthly Energy Review* (November 1981), page 85. Assuming this wellhead-to-residential mark-up stays constant in real terms, the $1.50 per mmbtu wellhead price impact of decontrol, if passed through penny for penny, would represent a 27 percent increase over the residential controlled price.

the residential price would adjust more gradually, increasing in real inflation-adjusted terms about 13 percent each year more rapidly in 1983-84 than under continued controls. In case two, the price to consumers would jump more initially and then level off in real terms. After 1984, the path of prices under scheduled partial decontrol would quickly begin to catch up with the hypothetical alternative path under complete decontrol of wellhead prices.

Effect of decontrol on oil imports

Higher gas prices would encourage more energy-saving measures by homeowners and businesses which use the fuel. The gas conserved, in addition to any extra gas production induced by decontrol, would be available to fill the energy requirements of current oil users who have more limited access to gas. In particular, industry and electric utilities with the ability to switch between oil and gas easily would be able to reduce oil consumption (assuming the gas usage restrictions of the FUA do not inhibit this).

The main impact on oil use of early, complete decontrol versus continued current legislation would come before 1985. After the start of 1985, scheduled partial decontrol would no longer be very effective in holding down prices to users. Moreover, it is not entirely clear whether partial decontrol would have a greater or smaller impact on gas production than complete decontrol. Prior to 1985, higher decontrolled gas prices would induce a gradual lessening of oil imports relative to what would occur under continued controls, but this difference would begin to shrink in 1985. The question of how great the impact on oil imports would be is related to the issue of how rapidly prices would adjust at the time of decontrol. The more rapidly large customers could absorb additional gas, the faster the price would rise and the greater the near-term conservation and production responses would be elsewhere in the economy.

Although the short time frame limits what sorts of energy-saving adjustments would be attributable to price decontrol, a modest impact on usage is still to be expected. Available statistical studies suggest it is reasonable to assume that each 10 percent rise in real energy prices will induce conservation of gas equivalent to about 2 percent of current consumption in the short run, increasing to perhaps 5 percent in the longer run, when more adjustments are feasible.[17] Based on this assumption, early-1983 decontrol with adjustment to residual fuel parity in two years (case one) would be consistent with enough gas conservation to reduce oil imports by about half a million barrels daily by late 1984.[18] This excludes any positive impact on production, however, which also would add to the total reduction. Alternatively, the extreme assumption of instantaneous price adjustment (case two) is consistent with a still greater drop in oil imports by late 1984, reflecting the larger initial impact of prices on conservation and production. While these are not intended to be precise estimates, they do indicate that decontrolling gas prices and usage could have a measurable impact on oil imports within a few years.

Conclusion

Between now and 1985, the natural gas market is likely to tighten, especially if oil prices stay high and the economy grows vigorously again. The transition between a controlled and a decontrolled natural gas market would be smoother if it took place before any substantial backlog of unsatisfied demand accumulated. In 1985 the partial decontrol already scheduled to occur would offer customers little continuing protection against higher prices and, in that sense at least, would be almost indistinguishable from dropping controls altogether at that time. In a way, therefore, the debate surrounding gas decontrol largely centers on the question of timing. Should consumers accept decontrol sooner to avoid the distinct possibility of recurring shortages and sharper price hikes later? Also important to consider is that artificially holding down gas prices before 1985 would discourage energy conservation and production, and thus earlier decontrol would help reduce oil imports. Moreover, even after 1985 the distortions to wellhead prices under

[17] For example, see Douglas Bohi, *Analyzing Demand Behavior, a Study of Energy Elasticities* (Baltimore, Maryland: Johns Hopkins University Press, 1981), Chapter 4.

[18] To compute the effect of higher prices on gas conservation, assume that the demand for gas is linked to price through the following formula, which assumes all other factors affecting demand are held constant:

$$\%\triangle C_t = -0.2\%\triangle P_t + 0.6\%\triangle C_{t-1}$$

where $\%\triangle C_t$ is the percentage change in gas consumption at the end of year t, and $\%\triangle P_t$ is the percentage change in the average price of gas for year t as a whole. If decontrol starts in 1983, so that there is no impact on consumption in 1982 (*i.e.*, $\%\triangle C_{82} = 0$), then the above equation can be written as

$$\%\triangle C_{84} = -0.2\%\triangle P_{84} - 0.12\%\triangle P_{83}$$

Based on 1980 data, the 1984 wellhead to end-user mark-up is projected to average around $1.80 per mmbtu in 1981 dollars for all users. Given the other assumptions (outlined in footnote 15), the percentage impact on consumption at the end of 1984 can be calculated under the alternative price adjustment scenarios (percentages based on midpoints):

Price scenario	*Case one*	*Case two*
$\%\triangle P_{83}$.....	8.2	37.6
$\%\triangle P_{84}$.....	22.8	31.1
$\%\triangle C_{84}$.....	5.5	10.7

Assuming a base of 20 quadrillion btu's, these convert to a conservation equivalent of 483,000 barrels of residual fuel oil daily for case one and 935,000 barrels per day in case two.

current legislation not only would encourage inefficient production priorities but also could cause disruptive reallocations of gas supplies in some areas. Although it would mean higher prices now for current customers, speeding the elimination of price controls and usage restrictions on gas would promote more efficient use of this energy resource and avoid a possibly more difficult transition later.

Paul Bennett and Deborah Kuenstner

Combining Decontrol of Natural Gas with a New Tax on Producer Revenues

An issue frequently discussed in connection with the decontrol of natural gas is the imposition of a tax on the increased revenues of gas producers. The additional Federal revenues could, in theory, be used to reduce the Federal deficits projected for 1983 and 1984 or could even be earmarked for special purposes, such as the social security trust funds, to alleviate prospective deficits in the late 1980s. The Federal revenue impact of a new tax on decontrolled natural gas involves a number of factors that can easily be overlooked in a cursory discussion of the issue. The purpose of this note is to review these factors and to provide an analysis of the net revenue effects under two alternative scenarios for the response of natural gas prices to a law that (for the purposes of discussion) would lift all controls on January 1, 1983.

The analysis reveals that, if natural gas prices were gradually to respond to decontrol, the projected net revenue impact of combining decontrol with a new tax similar to the windfall profit tax on oil would be to increase Federal revenues by about $1 billion in fiscal year 1983 and $7 billion in 1984. This estimate assumes that gas prices would rise to the energy equivalent of residual fuel oil by the final quarter of calendar year 1984, eight quarters after price controls are lifted. If natural gas prices were to respond more rapidly, the revenue effect would be somewhat larger. For example, in the extreme case of an immediate or instantaneous jump in natural gas prices to the energy-equivalent fuel oil price, the projected revenue effect could be about $12 billion in fiscal years 1983 and 1984.

The structure of a new tax

A Federal tax imposed in connection with rapid decontrol of natural gas could take many forms. Insofar as the basic structure is concerned, most analysts assume that a tax, if enacted, would be imposed on the difference between the price at the wellhead of decontrolled natural gas and some base price. However, in theory, a tax could be imposed in many different ways—including a tax on the total price of natural gas under decontrol or on the number of cubic feet produced. For the purposes of this analysis, we have assumed the tax would be applied at the wellhead to the difference between the price of gas under decontrol and a projection of gas prices in 1983 and 1984 under current law.

Once the basic structure of the tax is determined, numerous other details must be decided such as the tax rate(s), the deductibility of certain expenses such as state severance taxes, and the conditions for exemption from the tax. Some of these questions would clearly be major items of dispute if the Congress were to act on a tax, and there is no way to forecast the precise nature of the legislative compromises that are likely to evolve as a result of the debate. In general, most analysts have assumed a tax would be modeled on the windfall profit tax on crude oil. The basic thrust of that tax—from the standpoint of the revenue impact—was simple:

- There were alternative tax rates for various categories of newly discovered and previously discovered oil, ranging from 30 percent to 70 percent. The rates varied not only with the

type of oil but also with characteristics of the producer. For independent producers (typically producers not involved in refining or retailing), the tax rates were generally lower. The average of the various rates appears to be about 50 percent.[1]

- State severance taxes on the difference between the price of decontrolled oil and a base price were deductible from the amount of producer revenue subject to tax, and the windfall profit tax itself was a deductible expense for the computation of corporate income tax.

- Oil produced on certain Indian and Alaskan lands and on certain properties held for charitable and public purposes was exempt from the tax and, under recent changes, independent producer stripper production (oil from a property from which average daily production has been ten barrels or less for any consecutive twelve-month period after 1972) will be exempt after December 31, 1982.

The calculations in this analysis assume an average tax rate on all categories of natural gas production of 50 percent. From the standpoint of formulating a specific tax law, the applicable tax rates are an important question. However, even if the tax were to have different rates for different categories of gas, it still could be converted for estimating purposes into an equivalent tax with a single average rate.

We have assumed state severance taxes on the difference between the decontrolled and base prices would be a deductible expense for the purposes of computing a new Federal tax on the increased producer revenues. For the purposes of this analysis, state severance taxes have been assumed to equal 5.5 percent of the increased producer revenues.[2] Finally, the volume of gas produced on Alaskan and Indian lands is negligible, so that an assumed exemption has no effect on the revenue estimates. No other exemptions were assumed.

[1] See Carol Belal and Phil Clark, "Windfall Profit Tax Liability for 1980", *Statistics of Income Bulletin* (United States Treasury, Fall 1981).

[2] In particular, we have assumed an average state severance rate of 7 percent. (The current average is somewhat smaller, but pending legislative changes in Louisiana where a proposal to shift from a tax on the volume of gas produced to the value of gas produced would raise the average.) The assumed 5.5 percent deduction reflects the fact that natural gas production on outer continental shelf lands (approximately 20 percent of United States production) is not subject to state severance taxes.

The total Federal revenues from a tax on decontrolled natural gas will depend primarily on how the market price of gas behaves following decontrol and to a lesser extent on how the overall economy behaves. A faster rise in the price of gas after decontrol means greater revenues. In addition, as the economy adjusts to higher gas prices, indirect effects on the overall price level and on real economic activity may result in changes in nominal incomes that would affect projected corporate and individual income tax collections. A potential third factor is the volume of gas produced. However, as discussed in the preceding article by Bennett and Kuenstner, major shifts are unlikely in the short period (1983-84) covered by the revenue estimate in this analysis. The discussion that follows will focus first on the direct Federal revenue effects of a new tax under two alternative scenarios for the response of natural gas prices to complete decontrol on January 1, 1983. The indirect revenue effects that could result from changes in the general price level and in real economic activity will then be discussed. Estimates of the direct and indirect effects will then be summed to arrive at an estimate of the projected net Federal revenue impact. Finally, the possible revenue effects for 1985 and beyond will be discussed briefly.

Gas prices and direct revenue effects

An estimate of the net revenue effect of a new tax on decontrolled natural gas must necessarily begin with the estimated increase in producer revenues, which in turn is based on projected gas prices. Clearly, there is considerable uncertainty about the effect of decontrol on gas prices. For the purposes of analysis, two alternative scenarios have been constructed. The "gradual response scenario" assumes that, after decontrol, gas prices would increase steadily but gradually so that wellhead prices would reach the energy equivalent of residual fuel oil prices by the eighth quarter after decontrol. As discussed in the accompanying article by Bennett and Kuenstner, the gradual response scenario may result from the existence of long-term contracts, uncertainty and inertia among fuel users and suppliers, and the existence of plentiful stocks. A more rapid response could occur if electric utilities and large industrial users with dual-fired capacity were to bid up the price of gas after price restrictions and fuel use restrictions were eliminated. The "immediate response" alternative represents an extreme assumption for this more rapid response, with gas prices instantaneously jumping to the energy equivalent of residual fuel oil.

Under current law, gas prices have been projected to rise from $1.79 per thousand cubic feet (mcf) in the

Table 1

Projected Natural Gas Prices

In dollars, per thousand cubic feet

Calendar year and quarter	Current law		Decontrol Gradual response		Decontrol Immediate response	
	Real*	Nominal	Real	Nominal	Real	Nominal
1981 - II	1.79	1.79	1.79	1.79	1.79	1.79
1982 - IV	2.14	2.39	2.14	2.39	2.14	2.39
1983 - I	2.20	2.48	2.32	2.61	4.20	4.72
1983 - II	2.26	2.58	2.53	2.88	4.20	4.79
1983 - III	2.33	2.69	2.75	3.18	4.20	4.85
1983 - IV	2.40	2.81	2.99	3.50	4.20	4.91
1984 - I	2.47	2.91	3.26	3.84	4.20	4.95
1984 - II	2.55	3.04	3.54	4.22	4.20	5.00
1984 - III	2.62	3.15	3.86	4.65	4.20	5.06
1984 - IV	2.70	3.29	4.20	5.11	4.20	5.11
Fiscal 1983	2.23	2.54	2.44	2.76	3.69	4.18
Fiscal 1984	2.51	2.98	3.41	4.05	4.20	4.98

* Expressed in 1981 - II dollars.

second quarter of calendar year 1981 to $3.29 in the fourth quarter of 1984.[3] For the gradual response scenario, prices begin to rise above the current law projection starting in the first quarter of calendar year 1983 and eventually reach the energy-equivalent price of residual fuel oil, or $5.11 per mcf, in the fourth quarter of 1984. For the immediate response scenario, the price of gas is assumed to jump to the projected energy-equivalent price of residual fuel oil in the first quarter of calendar year 1983—or $4.72 per mcf—and then to remain constant in real terms thereafter (Table 1).

Assuming production of 20 billion mcf per year, the projected increases in producer revenues in fiscal years 1983 and 1984 because of decontrol are $4 billion and $21 billion under the gradual response scenario and $33 billion and $40 billion under the immediate response scenario. The deductibility of state severance taxes reduces the producer revenues subject to the hypothetical 50 percent gas tax. As shown in Table 2, the direct revenue effects would be $2 billion in 1983 and would rise to $10 billion in 1984 under the gradual response scenario. An instantaneous jump in prices would result in greater direct revenues —$16 billion in 1983 and $19 billion in 1984.

Decontrol, the economy, and Federal revenues

Some advocates of decontrol have suggested that even without a new tax, the decontrol of natural gas will lead to a significant increase in Federal revenues since the gas producers who would be receiving higher prices face a 46 percent marginal tax rate on the additional corporate profits. However, this suggestion reflects only a partial analysis of the near-term economic effects of decontrol, implicitly leaving other incomes unchanged. The ultimate outcome with respect to total incomes and revenues may be considerably more complicated.

[3] The wellhead price for the end of 1984 under continued controls was assumed to be $2.70 per million British thermal units (mmbtu) in 1981 dollars. This figure was derived from an estimate by ICF, Inc., *A Preliminary Analysis of the Gas Cushion,* page 11, which was adjusted by assuming production of one quadrillion btu's of high-cost gas at $6 per mmbtu. For the late 1984 wellhead price under decontrol, a residual oil price to electric utilities of $5.40 per mmbtu (the average for January 1981) was assumed, and a wellhead-to-user mark-up of $1.16 was projected using the difference between actual midyear delivered gas prices and wellhead prices. Subtracting the mark-up from the residual oil energy price gave a wellhead price of $4.20 per mmbtu (in 1981 dollars), just over $1.50 per mmbtu higher than under continued controls. The data for these calculations came from the *Monthly Energy Review* (November 1981). An analogous calculation with data from the American Gas Association, *Gas Facts, 1980 Data,* on wellhead prices and delivered prices to industrial and electric utility users, as well as a slightly higher residual price appropriate to this broader sector, gave a late 1984 price gap just under $1.50 per mmbtu (in 1981 dollars). Inflation was assumed to be 7.7 percent in 1982, 5.5 percent in 1983, and 4.4 percent in 1984. This put the $1.50 in 1981 dollars equivalent into a projected actual current gap of $1.80 in current dollars at the end of 1984.

The increase in gas prices would exert upward pressure on the price level, especially if an increase in inflationary expectations were to result. On the other hand, other factors such as the effects of monetary restraint, the lower profits of industries that currently use natural gas, and the lower real disposable income of consumers might lead to a lower level of real gross national product (GNP) than would have been the case in the absence of decontrol. The size and net result of these secondary economic effects represent a major question in estimating revenues, since nominal incomes—ultimately nominal GNP—represent the major determinant of individual and corporate tax collections.

Secondary economic effects are relevant not only for the question of estimating revenues without a new tax on natural gas but also for estimates of the net revenue impact of a new tax. In this analysis, as in the windfall profit tax on oil, it has been assumed that a new tax on the producer revenues resulting from decontrol would be a deductible expense for the purposes of computing Federal corporate tax liability. Consequently, if decontrol results in simply a redistribution of aggregate nominal incomes (particularly corporate profits) rather than an increase in the overall levels, then the net revenue effect of the tax would include a reduction of other Federal revenues because of the deductibility of the new tax.

Two extreme assumptions could be made about the effects of gas decontrol on nominal GNP:

- In the first case, the secondary effects could be assumed to be negligible. In this instance, corporate profits would increase by the difference in prices (between the current law and decontrolled cases) multiplied by the volume of gas produced. If this were—hypothetically—$1 billion, then corporate profits taxes could be expected to increase by $0.46 billion without a new tax. With a 50 percent tax, the revenues from the tax would be $0.5 billion and corporate profits taxes would increase by $0.23 billion, because of the $0.5 billion (net) increase in corporate profits. The total Federal revenue impact would be an increase of $0.73 billion.

- An alternative assumption would be that nominal GNP would remain unchanged as a result of gas decontrol, with the increase in prices being offset by lower real output. In this instance, a $1 billion increase in producer revenues would result in essentially no net change in Federal tax revenues in the absence of a new tax. With a 50 percent tax, the direct revenues from the new tax would be $0.5 billion, but corporate profits taxes would be reduced by $0.23 billion (46 percent of $0.5 billion) because of the deductibility of the gas tax, for a net Federal revenue increase of $0.27 billion.

In the past, Treasury revenue estimates and Congressional revenue estimates made by the staff of the Joint Committee on Taxation (JCT) have made the latter (static income) assumption. For example, the JCT revenue estimate for the oil windfall profit tax contained cumulative tax liabilities of $410.5 billion in 1979-90 from the tax but a reduction in other tax liabilities of $182.8 billion (44.5 percent of $410.5 billion) because of the deductibility of windfall profit tax payments from income.[4]

The size of the indirect effects

The magnitude of the secondary effects is primarily an empirical question and depends on a number of factors. Also, the lags involved in estimating the effects on the general price level and on real activity are varied and complex. To obtain an approximation of these effects three experiments were run on a large-scale econometric model, the Federal Reserve-MIT-Penn (FMP) model. The three experiments represented a baseline projection for current policies and projections of the two alternative scenarios for gas prices under full decontrol that were discussed previously. For the three experiments the same money growth assumption was used.

Under the gradual response scenario, the estimated effect of decontrol on nominal GNP (the critical variable for estimating Federal revenues) is negligible for fiscal year 1983, an increase of less than 1/10 percent. Slightly higher prices, compared with the baseline projection, are offset by lower economic growth. In fiscal year 1984, nominal GNP is higher by 2/10 percent. Under the immediate response scenario, nominal GNP is higher than the baseline projection by 5/10 percent for fiscal year 1983. In 1984, the increase is only 3/10 percent, primarily because of the lagged effects on real activity, as shown below:

	Gradual response			Immediate response		
Fiscal year	Nominal GNP*	Real GNP*	Federal revenues†	Nominal GNP*	Real GNP*	Federal revenues†
1983....	—	—	—	+0.5	−0.5	+3.8
1984....	+0.2	−0.4	+1.9	+0.3	−1.4	+2.2

* In percent. † In billions of dollars.

[4] See the Conference Report on the Crude Oil Windfall Profit Tax Act of 1980.

The net revenue effect of a tax on decontrolled natural gas

The net revenues resulting from a tax on decontrolled natural gas includes both the direct and indirect effects. The direct effects under the two price scenarios were already discussed and shown in Table 2. Indirect effects can be decomposed into the effect of the deductibility of a new tax, assuming no change in nominal GNP, and the effects on corporate and individual tax collections of the projected changes in GNP resulting from decontrol.

As shown in Table 3, the deductibility of the new tax would result in a reduction in taxes of $1.0 billion in 1983 and $4.6 billion in 1984 under the gradual response scenario and more substantial reductions under the immediate response scenario. The Treasury and JCT estimating approach would combine these projected reductions with the estimate for direct revenues to arrive at a net Federal revenue impact of $1 billion in 1983 and $6 billion in 1984 under the gradual response scenario. The comparable figures under the immediate response scenario would be $8 billion in 1983 and $10 billion in 1984.

Another indirect effect, however, might be considered—namely, the revenue effect of a somewhat higher nominal GNP induced by the somewhat higher near-term price levels resulting from decontrol. As shown in Table 3, if this additional indirect effect is taken into account, the net increase in revenues under the gradual response scenario is still about $1 billion in 1983 and is raised to about $7 billion in 1984. Including the indirect effects of decontrol on nominal GNP and incomes means that the combined net Federal revenue impact of decontrol and a new tax could be as much as $12 billion in 1983 and in 1984 under the more extreme immediate response scenario.

It should be noted that it is only appropriate to include the second indirect effect if the alternatives to be considered are current law versus both gas decontrol and a new tax. If the economic effects of decontrol are included in the baseline economic scenario because a decision for decontrol were assumed to have already been made, then the alternatives would be a new tax or no new tax (with decontrol assumed for both alternatives). To be more specific, if the Administration were to propose decontrol without a tax, then the economic effects of decontrol shown in the "Revenue effect of higher GNP" (Table 3) would already be included in the estimates of individual and corporate taxes. If the Congress were then to initiate a new tax, the appropriate estimate of the revenue impact of the tax would be the estimate using the Treasury-JCT method.

Table 2

Estimate of the Direct Revenue Effects of Gas Decontrol

By fiscal years, in billions of dollars

Item	1983	1984
Gradual price response scenario		
Producer revenues	4.4	21.4
State severance tax deduction (5.5%)	−0.2	−1.2
Gas tax base	4.2	20.2
Direct Federal revenues (50%)	2.1	10.1
Immediate price response scenario		
Producer revenues	32.8	40.0
State severance tax deduction (5.5%)	−1.8	−2.2
Gas tax base	31.0	37.8
Direct Federal revenues (50%)	15.5	18.9

Table 3

Estimate of the Revenue Effects of Gas Decontrol

By fiscal years, in billions of dollars

Item	1983	1984
Gradual price response scenario		
Producer revenues	4.4	21.4
State severance tax deduction (5.5%)	−0.2	−1.2
Gas tax base	4.2	20.2
Direct Federal revenues (50%)	2.1	10.1
Indirect effect of deductibility on other taxes	−1.0	−4.6
Net Federal revenue impact (Treasury-Joint Committee on Taxation method)	**1.1**	**5.5**
Revenue effect of higher GNP	—	+1.9
Net Federal revenue impact	**1.1**	**7.4**
Immediate price response scenario		
Producer revenues	32.8	40.0
State severance tax deduction (5.5%)	−1.8	−2.2
Gas tax base	31.0	37.8
Direct Federal revenues (50%)	15.5	18.9
Indirect effect of deductibility on other taxes	−7.1	−8.7
Net Federal revenue impact (Treasury-Joint Committee on Taxation method)	**8.4**	**10.2**
Revenue effect of higher GNP	+3.8	+2.2
Net Federal revenue impact	**12.2**	**12.4**

1985 and beyond

The revenue effects of a tax after 1984 depend on the structure of the tax and possibly on an estimate of what would happen to gas prices when, under current law, some gas prices are decontrolled. As discussed in the accompanying article by Bennett and Kuenstner, the prices of those categories of natural gas that will be decontrolled under current law may escalate greatly and rapidly in 1985. Within a short time after the start of 1985, average gas prices under current law could be approximately equal to the average prices that would be in effect if all gas prices were decontrolled two years earlier, at the start of 1983. If this were the case, then revenues from a tax on producer revenues that was based on the difference between gas prices under decontrol and prices under current law could decrease dramatically in 1985, phasing down to virtually zero in 1986. On the other hand, the tax on producer revenues after 1984 could be keyed to an extrapolation of the pre-1985 controls path, for the purpose of computing tax liability. However, as shown in Table 1, even the price path under controls rises substantially in real terms. An extrapolation of the price path in Table 1 reaches oil equivalence by the end of 1987. Consequently, if the tax were keyed to such an extrapolation, Federal revenues could be expected to peak in fiscal year 1984 and then decrease to approximately zero by fiscal year 1988.

James R. Capra and David C. Beek

August-October 1981 Interim Report
(This report was released to the Congress and to the press on December 3, 1981.)

Treasury and Federal Reserve Foreign Exchange Operations

In early August the year-long advance of the dollar in the exchange markets reached its peak. Until then, the dollar was in persistently strong demand against most major currencies, bolstered by an improving outlook for United States inflation, positive worldwide sentiment toward the Reagan administration's economic program, a favorable United States current account performance, and large interest differentials favoring dollar investments. At the same time, many industrial countries abroad experienced economic and political difficulties which depressed market sentiment toward their currencies. By August 10 the dollar had risen some 45 percent from its level a year earlier to reach a five-year high of DM 2.5773 against the German mark, while registering sizable increases against other currencies as well.

Subsequently, some of the factors that had spurred bidding for the dollar began to appear less compelling than before. The international enthusiasm which followed Congressional passage of the Administration's tax and expenditure program started to wane. Market participants remained impressed by the Administration's goals of stimulating private savings and investment and reducing the government's role in the economy. But participants in the exchanges, as in the United States domestic financial markets, expressed skepticism that the fiscal package approved by the Congress would in fact succeed adequately in reducing the Federal budget deficit. The prospect of continuing sizable Treasury financing requirements raised serious concerns.

By late summer, also, there was growing evidence of sluggish United States economic activity and market participants expressed concern that the Federal Reserve might be forced to relax its policy of monetary restraint under the weight of growing political criticism of high interest rates at a time of little or no United States economic growth. United States short-term interest rates did in fact begin to ease, even though monetary policy continued tight. Between August and early October the Federal funds rate dropped about 500 basis points, the rate on three-month Eurodollar deposits declined about 300 basis points, and the Federal Reserve progressively reduced its surcharge on large banks that frequently borrow at the discount window from 4 percent to 2 percent.

Abroad, the domestic economies of major industrial countries were also generally stagnant. Nonetheless, most countries were experiencing accelerating inflation, partly owing to the prolonged weakness of their currencies in the exchanges. The authorities in some nations—notably France, Switzerland, and the United Kingdom—raised their interest rates while others, feeling they had little room to ease monetary policy so as to provide some stimulus to their flagging economies,

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Table 1
United States Treasury Securities Foreign Currency Denominated

In millions of dollars equivalent; issues (+) or redemptions (−)

Issues	Amount of commitment July 31, 1981	August through October 31, 1981	Amount of commitment October 31, 1981
Public series			
Germany	5,233.6	−680.3	4,553.3
Switzerland	458.5	-0-	458.5
Total	5,692.1	−680.3	5,011.8

Data are on a value-date basis.

Table 2
Net Profits (+) and Losses (−) on United States Treasury and Federal Reserve Current Foreign Exchange Operations

In millions of dollars

Period	Federal Reserve	United States Treasury: Exchange Stabilization Fund	United States Treasury: General account
August 1 through October 31, 1981	-0-	-0-	+ 24.3
Valuation profits and losses on outstanding assets and liabilities as of October 31, 1981	−316.5	−1,200.4	+856.0

Data are on a value-date basis.

opted to hold monetary conditions firm. As a result, short-term interest differentials favoring the dollar narrowed sharply.

Moreover, a number of balance-of-payments developments here and abroad were interpreted in the market as signaling a reversal in current account positions that in recent years had been favorable to the United States. This country's trade account posted a wide deficit in August, and the current account was expected to move from surplus to deficit sometime during 1982 in view of the sharp appreciation of the dollar and the sluggishness of most foreign economies. At the same time, Japan's current account moved strongly into surplus. Germany's net exports had expanded to the point of bringing monthly current account figures close to balance, and German officials as well as private forecasters began to talk of a sharp turnaround in Germany's external position.

Throughout the summer, expectations intensified that divergent policies and economic trends among European Monetary System (EMS) countries, particularly Germany and France, would force a realignment of the joint float. These expectations generated large speculative flows which imposed major strains on the joint float. To keep their currencies within the agreed limits, EMS central banks intervened by selling large amounts of dollars in addition to EMS currencies during August and September. Then on October 4 the EMS currencies were realigned, with the German mark and Dutch guilder each revalued 5½ percent and the French franc and Italian lira each devalued 3 percent in relation to the other participating currencies whose central rates remained unchanged. After the realignment the German mark traded near the bottom of the joint float while the French franc rose toward the top, and for a time substantial reflows of capital occurred.

From mid-August through early October these various considerations led to widespread and occasionally substantial selling pressure on the dollar and produced a major decline in dollar rates. From its peak levels the dollar declined by as much as 17 percent against the Swiss franc, 15½ percent against the German mark, 7¾ percent against sterling, 5¾ percent against the Japanese yen, and 4 percent against the Canadian dollar.

After reaching a low point on October 9, however, the dollar came into renewed demand. Commercial buy orders emerged in large amounts in a number of centers to take advantage of what were regarded as favorable dollar rates both for investments and current payments. From time to time there were also substantial purchases of dollars by non-Group of Ten central banks. In addition, recurrent episodes of geopolitical tension, especially in Poland and the Middle East, generated sharp demands for dollars essentially because political and security concerns were seen in the exchanges as potentially less destabilizing to the United States than to most countries abroad. Thus, market participants remained relatively optimistic about the United States overall prospects and continued to regard the United States as an attractive outlet for capital investment.

Also during October, developments suggested that interest rate differentials favorable to the dollar would not erode as rapidly as had been expected. In the United States, short-term interest rates declined further toward the month end as evidence mounted of a softer than expected economy. On October 30 the Federal Reserve responded to the lower level of market interest

rates by reducing the discount rate 1 percentage point to 13 percent. But, by this time, recessionary tendencies in many European countries had deepened and market participants came to expect that foreign monetary authorities would take advantage of further declines in United States interest rates to ease their own domestic monetary conditions. Moreover, as analysts took account of shifting economic growth prospects here and abroad, many began revising their current account forecasts, predicting less deterioration than previously in the 1982 current account for the United States and less improvement in the current accounts of other countries. Adding to this sense of caution were the widening deficits on invisibles in Germany and Japan, partly reflecting the influence of mounting interest payments on foreign borrowings.

In these circumstances, despite the renewed decline in short-term United States interest rates during the last days of the month, the dollar proved resilient in the exchanges and ended the period up from its lows. On balance, over the three months the dollar declined nearly 16 percent against the Swiss franc, 10½ percent against the German mark, and about 3¼ percent against the Japanese yen. With respect to the Canadian dollar and pound sterling, the dollar ended the period down 2¾ percent and 2¼ percent, respectively.

During the August-October period there were occasions when the market experienced unusually sudden and sharp exchange rate movements mainly related to political events. These episodes occurred largely during the European trading session and were quickly reversed. The United States authorities did not intervene in the market for their own account during the period.

Foreign central banks did intervene during the period in dollars and in sizable amounts. In this connection, the Trading Desk at the New York Federal Reserve intervened on occasion as agent for other central banks in the New York market.

On September 1 the United States Treasury paid off $680.3 million equivalent of its German mark-denominated securities. After this redemption the Treasury had outstanding $5,011.8 million equivalent of foreign currency notes (public series)—$4,553.3 million equivalent denominated in German marks and $458.5 million equivalent denominated in Swiss francs.

In the three-month period from August through October, the Federal Reserve and the Exchange Stabilization Fund realized no profits or losses from exchange transactions, while the Treasury's general account gained $24.3 million, reflecting the profit which occurred upon the redemption of the German mark-denominated securities. As of October 31, valuation losses on outstanding foreign currency balances were $316.5 million for the Federal Reserve and $1,200.4 million for the Exchange Stabilization Fund. The Treasury's general account had valuation gains of $856 million related to outstanding issues of securities denominated in foreign currencies.

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