MASTER

FINANCING RESIDENTIAL ENERGY CONSERVATION IN THE STATE OF WASHINGTON

Prepared For
Washington Energy Extension Service
Washington State University
and
Washington State Energy Office

by

Richard S. Mack, Project Director
Associate Professor of Economics

and

Wayne A. Fairburn, Project Co-Director
Assistant Professor of Business Administration

under a subcontract
to

CENTRAL WASHINGTON UNIVERSITY

Energy Studies Center
Ellensburg, Washington 98926

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I. Introduction:

The Washington Energy Extension Service Finance Program was commissioned for the overall purpose of facilitating and assessing the development of energy-related loan policies by financial institutions. Explicit objectives of the project are to:

1. Identify financial problems of small energy consumers in the domestic installation of energy saving technologies.
2. Identify the financial options currently available in the State of Washington.
3. In concert with the financial institutions of the state, develop and analyze recommended additional programs which will benefit both consumers and financial institutions.

In accordance with the purposes listed above, the first working report detailed the current need and availability of funds for domestic installation of energy-saving technology and developed a number of policies for further consideration by the financial sector.

Feedback from the first working report confirmed the need for quantitative assessment of the impact of energy lending programs upon the profitability of the adopting financial institutions. Accordingly, the second working report developed and applied a methodology by which institutional costs and benefits could be measured. We believe this application to be the first determination of quantitative, market-based, differential risk measures for commercial bank functional activities. These risk measures are intended to enable commercial banks to better evaluate the relative costs and benefits of competing loan and investment programs by providing objectively determinable risk premiums.

This final report of the WEES Finance Program extends the rate of return analysis to include the overall required rates of return necessary to justify various commercial bank functional activities; with judicious implementation this methodology can be a substitute for the subjective risk assessment techniques currently utilized in the commercial banking sector. This report also considers changes which have occurred in the development of financial options related to energy conservation measures. Material from previous reports is updated. Numerous changes which have occurred in the economic and legal environment since the inception of the project will also be described and analyzed.

II. Loan Practices

The purpose of this section is to discuss general lending policies of financial institutions. When asked about specific loan programs devoted to energy conservation, financial institutions in the State of Washington have almost unanimously responded that while they may have no specific program they are very interested in making nearly any type of "good loan". A "good loan" can be defined as a loan which meets the credit standards of the institution. The loan is profitable in the sense that it offers a prospective rate of return commensurate with the risk incurred. The general types of characteristics which are considered for the purpose of making loans are as follows:

1. Amount and Purpose of Loan
2. Payment Record
3. Income Level
4. Employment History
5. Length of Time at Residence
6. References and Reputation
7. Equity in the Purchase
8. Collateral

The above facts about a credit applicant are evaluated with an eye toward judging future credit behavior. Other common credit evaluation tools are the so-called Four C's of credit, which have for many years been quoted in textbooks, speeches, and articles. These "four horsemen" of credit are character, capacity, capital, and conditions. They are not mutually exclusive terms, and, since these terms are highly subjective, they cannot be revealed by direct inquiry. Consequently, it is best that they be considered as general concepts rather than as specific, determinable attributes.

Generally speaking, a loan application either meets the standards of the financial institution or it does not. Interest rates are assigned which are commensurate with the prospective degree of risk. A loan proposal which has been rejected can seldom be made attractive by the addition of collateral or additional guarantees. The financial institution may ask for collateral or guarantees when making a loan; however, if there is a high probability of their being needed, the loan should probably not be made in the first place.

Energy Conservation Loans - Types

Loans which may be used for the purchase of items directly related to energy conservation, can be classified either as consumer installment credit or mortgages. The following is a listing of the more popular types of consumer installment credit which have been or could be used for energy conservation purposes:

1. Auto Loans - smaller autos, diesel autos, motorcycles, etc.
2. Home Improvement Loans - storm windows, wall and attic insulation, heat pumps, solar, etc.
3. Revolving Credit - bank credit cards, bank check credit; typically for purchases under $500.
4. Other - personal loans, sailboat loans, energy efficient appliances, etc.

Commercial banks are easily the most important institutions involved with consumer installment credit. As of February, 1978, commercial banks held approximately 49% of all consumer installment credit, followed by finance companies with 20%, and credit unions with 17%.[1] Commercial banks as of February, 1978, held 58% of all auto loans and 49% of all home improvement loans.[2] In comparison with total loans of insured commercial banks on September 30, 1977, auto loans comprised 8.2%, residential home improvement loans made up 1.2%, credit cards and related plans made up 2.8%, while loans for other retail consumer goods excluding mobile homes were 1.4% of total loans.[3]

While commercial banks clearly predominate in the granting of consumer installment credit, the picture is somewhat different in the mortgage market. Of the total mortgage debt outstanding at year end 1977 and held by major financial institutions, commercial banks held 23.8%, mutual savings banks 11.9%, savings and loan associations had 51.4%, and life insurance companies 12.9%. Clearly the savings and loan associations are the largest single factors in the mortgage market as noted in Table I.

Table I: MORTGAGE DEBT OUTSTANDING
Percentage of Total, end of period

TYPE OF HOLDER	1977	1976	1975	1974
Major Financial Institutions				
Commercial Banks	17.3	17.0	17.0	17.8
Mutual Savings Banks	8.6	9.2	9.6	10.1
Savings and Loan Associations	37.4	36.3	34.8	33.6
Life Insurance Companies	9.4	10.3	11.1	11.6
Federal and Related Agencies				
GNMA	0.3	0.5	0.9	0.7
FmHA	0.1	0.1	0.1	0.2
FHA/VA	0.5	0.6	0.6	0.5
FNMA	3.3	3.7	4.0	4.0
FLB	2.2	2.2	2.1	1.9
FHLMC	0.3	0.5	0.6	0.6
Mortgage Pools or Trusts*	6.9	5.6	4.3	3.2
Individuals and Others	13.5	14.1	14.9	15.9
Total **	100.0	100.0	100.0	100.0

* outstanding principal balances of mortages backing securities insured by GNMA, FHLC, FmHA.

** does not add to exactly 100% due to rounding

Source: Federal Reserve Bulletin, April, 1978.

III. Direct Energy Programs of Washington State Financial Institutions

On a national basis, relatively few financial institutions have developed structured energy programs. Most of these efforts resulted from crisis situations such as the oil embargo of 1973 and the winter shortages of 1976-77. These programs involved reduced interest rates, premiums, and extended terms; of these, many were short-lived since they were designed as short-term promotional offerings.

In the State of Washington, several explicit energy-conservation programs have been initiated during the past five years. All but two have "run their course" as promotional programs. Current programs are: 1) home improvement flat rate reduction at Pacific National Bank and 2) the structured program of Seattle Trust and Savings Bank.

Pacific National Bank, with branches in each of the WEES target areas, centers an energy program upon a reduction in interest rates of 1% for home improvement loans which are used for energy conservation purposes. These include capital improvements in the form of the following improvements: new roof, insulation, heating system replacement or repair, storm windows, storm doors, new siding, and solar heating devices. The loans require a lien on real estate for amounts greater than $3500; a lien is optional on loans of lesser amounts.

The Seattle Trust and Savings Bank announced a new program of energy conservation lending in July 1976. The program is comprehensive and has been nationally credited as "the most sophisticated, well-designed conservation effort yet mounted by a bank."[4]

Four types of loans are offered: home ownership, home improvement, auto, and boat. To qualify for interest rate reductions of 1/4% to 3/4% or for extended terms, the borrower must satisfy certain energy conservation criteria.

As the residential energy loan program was originally formulated, a point system allowed for the combining of a threshold level of energy conserving devices. Points were given for each type of device, either existing or to be installed; a minimum number of points were required for each stage of interest rate reduction. In the case of new homes, high value older homes, and solar installations, a package of heat retention features was a prerequisite for the "Energy Conservation" or "Solar Supplementary" loan. The point system has recently been discontinued; qualifications now include a required level of ceiling insulation plus a choice of one installation from a number of energy conserving practices.

To qualify in the home improvement category, the borrower must spend at least 30% of the loan for energy efficiency improvements; similarly, the borrower must spend at least 50% of the loan on solar devices or on heat loss improvements to qualify for the solar supplementary loan. Physical certification of energy features is accomplished by direct inspection.

For auto and boat installments, parallel functional criteria have been established. If an automobile has an EPA Highway Rating of at least 25 mpg, the annual percentage interest rate is reduced by 1/2%; diesel powered vehicles (at least 25 mpg) qualify for the lower rates as well as the extension of payments from five to six year terms. Similarly, sail and diesel powered pleasure boats qualify for a 3/4% reduction in the interest rate.

It is noted that practically all financial institutions surveyed are willing to make loans on energy-conserving equipment under terms of general loan policies. Several banks have pamphlets promoting energy conservation in the home; these are not treated in this report as being specific energy programs.

Several programs which offer additional financial options are being initiated at the time of this report. Due to the eventual breadth of coverage of these programs, they will be described in depth in section XI of this report. As these public utility programs associated with The Energy Conservation Policy Act are still subject to constitutional challenge and administrative revision, it would be inappropriate to include them in this section of on-going programs.

IV. Reasons for the Dearth of Energy Loan Programs

There is a structure of reasoning behind the lack of energy-specific programs. This section will consider: (A) The relationship of energy loans to derived consumer demand; (B) Institutional difficulty involved in treating energy loans as consumer installment credit; and (C) Methodological problems associated with energy related measures.

A. Consumer Motivation and Market Demand

Nearly all services provided by financial institutions have their basis in the satisfaction of customer wants. Demand for energy related finance is derived from the demand for energy-conserving products; therefore it is appropriate to reflect upon reasons why many energy conservation measures have met with relatively slow acceptance among consumers:

1. Total Expenditures are Small - While energy costs in absolute terms are expected to rise more rapidly than most categories of household expenditures, energy costs are small relative to other household expenditure categories, especially in the Pacific Northwest.
2. Inelastic Demand - Energy costs are necessities for which few substitutes exist in the short run; when prices for energy rise, consumption does not fall proportionately. People become used to the gradual upward movement of energy prices, perhaps becoming desensitized to anything short of sudden catastrophic rises which severely upset household budgets.
3. Lack of Knowledge - People commonly lack information as to which conservation measures will be the best from the wide array which are possible at any point in time.

4. Fear of Misinformation - Misinformation may come from either disreputable firms seeking to exploit consumers or from basically honest firms operating on incorrect information. Both result in consumer distrust.

5. High Cost - Many energy conservation measures are perceived by consumers as being too expensive, for reasons including:

   a. Short Time Horizon - The homeowner may be reluctant to expend funds on energy conserving improvements which may not be recoverable upon resale.

   b. Competition from other Expenditures - Compared to furniture, entertainment, and vacation, energy conservation measures are not particularly attractive to many people.

   c. Inopportune Time - Some energy conservation measures may be expensive when considered individually, but rather inexpensive if performed in conjunction with other planned expenditures. For example, wall insulation is considerably cheaper when installed during construction than as a retrofit operation.

6. Lack of Financing - Many desired energy conservation measures cannot be purchased by consumers out of existing resources and must therefore be financed. Many consumers lack the general knowledge that many of these purchases can be financed, as well as the specific knowledge of financial options and programs.

B. Difficulties Involved with Consumer Installment Credit:

1. Lack of Profitability - Most conservation projects and products cost less than $1000. Depending upon the costs to the particular financial institution involved, many of these loans are simply

not profitable when all costs of operation are included. While small direct personal loans are not generally profitable, especially in light of the 12% interest rate ceiling in Washington State, small loans can be quite profitable when handled through the use of bank credit cards.

2. Cumbersome Size - While many energy conservation projects may be unprofitable if financed by direct personal loans, they are more expensive than the credit limit for most holders of bank credit cards. This problem, it would appear, could be remedied relatively easily by raising the credit limits of qualifying card holders by either ordinary or by special procedures instituted by the bank. The fixed costs of such loans would be markedly less than if handled in the same manner as direct personal loans.

3. Declining Marginal Value - With adequate information about the energy saving potential for each possible conservation product or project, the consumer would rationally be expected to place the highest priority upon those projects which promised to offer the greatest benefits compared to cost. This means that the average and marginal rates of return per dollar spent on energy conservation decline as more dollars are spent. It is interesting to contrast this declining rate of return to the consumer as investment outlays are expanded with the opposite effect of increasing profitability to the financial institution as average loan size grows.

4. Uncertain Demand - An important question to many financial institutions is whether there would be enough profitable demand for energy conserving loans to justify a special energy loan program.

Given the comparatively low costs of energy in Washington State relative to most other areas of the country, the incentives for sizeable energy conservation investments by consumers are limited. However, future energy costs are slated to rise rapidly, thus drawing much closer to the day when many advanced conservation devices such as photovoltiac cells, solar panels are likely to become commonplace.

5. Community Leadership - Financial institutions have long been cornerstones of the communities which they serve. They have exercised leadership roles in a wide range of worthwhile community activities. Energy conservation is a recent national priority in which they could play a vital role, indeed some financial institutions have already done so. Several factors however, may serve to lessen this potential enthusiam:

   a. The home improvement loan business (necessary for retrofit conservation items) has an image inferior to that of most other types of loans. A few unscrupulous operators have in the past given the home improvement contracting business a poor reputation. Therefore, financial institutions are reluctant to become "certifiers" of home improvement contractors to insure that quality work is performed.

   b. Energy conservation programs may be only one of many such public service areas (a necessary classification if they are not particularly profitable) in which financial institutions could become involved. Because of their own unique image and policies, some financial institutions may choose to place priorities upon other important social responsibility programs.

c. If energy conservation should be perceived as being politically controversial, then financial institutions would have little to gain by supporting energy conservation and much to lose. This particular example must be considered as a distinctly remote possibility, however. Strong bi-partisan support for energy conservation would obviously make it a much more attractive idea to promote.

d. Although a special energy program may be profitable when adopted by only one institution in a market area, it is questionable if the level of profitability would be maintained when several or many financial institutions in the same area were to also adopt energy loan programs. Obviously if all programs in the same market area were highly similar, competition would preclude any unique profitability attributable to energy conservation. On the other hand, there may be several special types of programs which could be uniquely tailored to the special character and purposes of each individual financial institution.

6. <u>Desire to Make "No Strings Attached" Financing</u> - Financial institutions need to make profitable loans to survive. It is not in their direct best interest to place additional constraints upon the borrower relating to energy conservation other than credit standards necessary for "a good loan". While financial institutions may use such devices as reduced interest rates for attracting new business, the public should not grow to expect reduced interest rates as being an obligation of these institutions

simply because energy conservation is "in the national interest." Financial institutions have not as a group enjoyed profit rates which are above those of other types of businesses, after adjustment for risk. Thus, energy loan programs which may be adopted must be expected to show the potential for earning normal rates of return for the sponsoring financial institutions.

C. Methodological Problems Involved with Energy-Related Mortgages:

Two primary considerations in mortgage decision-making are the appraisal value of the property and the ability to repay of the applicant. Over the last five years several external changes have occurred which markedly affect these decision-making criteria: the doubling of energy costs, inflation of the general price index, and strong inflation in housing costs. These external changes have in turn triggered an additional event which has impact on the financing of dwellings; specifically, the transition toward incorporating greater levels of energy-saving technology both in new construction and in retrofitting applications.

The current outlook upon energy-saving technology may be considered "transitional" due to only partial acceptance of these methods by consumers, financial institutions, and regulatory agencies. Although we have entered the phase of considering these innovations, studies of technical change in the housing industry project continuing lags before these technologies are generally accepted by all phases of the industry. It has been estimated that 17 years are required for an economically feasible technology to spread throughout the housing industry.[5] Due to the structure of the housing industry technical changes proceed in a piecemeal manner; that is, the status of the industry as regional, competitive, horizontally stratified, and financially sensitive all tend to slow the general acceptance of new technology.

The transitional status of energy saving technology has several impacts upon residential financing, both upon appraised value and upon ability to pay. Appraised valuation has traditionally been based upon direct market value (based upon comparable sales), upon replacement cost, or upon the income approach. All of these methods are affected by the uncertainty of a transitional phase in technology. As the incorporation of energy saving technology is relatively new, there is little current indication by the market of the eventual market value of each dollar invested. In the case of retrofitting, such investments are often "invisible" to the real estate market or are considered to be "over-improvements".[6] Lender caution is appropriate when appraisal is viewed from a basis of replication cost, due to the possibility that solar and retrofitting technologies will continue to improve and will bring increased efficiency and reduced replacement cost. Technological change over the last five years would tend to justify such caution.

Financial institutions are faced with other energy-related spinoffs which have impact upon loan-making criteria. Specifically, the high cost of energy, coupled with increases in construction costs and property taxes are changing the traditional relationships between income and ability to pay. With the expected trebling of energy costs in the Northwest within the next decade, such additional relationships are expected to continue to be in a state of flux.

Several solutions to the problems of appraisal value and ability to repay have been recommended in the literature of the energy, financial, and real estate sectors. Most of these solutions are based upon the concept of capitalizing the value of the energy savings technology over its useful life and adding these into the appraised value of the structure. Such capitalized income approaches have been predominately used for appraising commercial income properties, but have been uncommon for residential applications. Accordingly, such income approaches to appraisal have been recommended which would adjust comparable sales valuations to incorporate the long run worth of energy savings.[7] In this manner, reformulations of appraised value implicitly incorporates elements of repayment ability into the lending criteria.

In surveys, representatives of the mortgage industry appear to be quite open-minded about such methodologies; however, several difficulties with the technique are underlined. First, due to the high degree of mobility of the American population, the average owner-occupied mortgage runs for six to seven years; with such rates of mobility, the long-run valuation framework does not currently exist in the viewpoint of many consumers; this long run viewpoint is necessary to the application of life-cycle costing.[8] Similar problems arise from the uncertainty over those variables which have impact upon life cycle costing, namely, the prices of alternative energy sources in the distant future as well as the cost of similar energy-saving technology in the immediate and in the distant future.

V. Policies For Further Consideration

In view of the constraints listed in Section IV, the policies which merit further consideration are limited to those which are based on the following characteristics:

1. The policies do not require any long-run change of values on the part of either the customer, the lender, or the public.
2. Policies have met with some degree of success either in Washington State or in other regions of the country.
3. Policies do not require major federal or state subsidies.
4. Policies can be instituted within a period of months.
5. Policies require no substantial rehiring or retraining of institutional staff.
6. Policies can be profitable either directly or indirectly to the lending institution.

The list of possible energy programs which follows has been gleaned from a variety of sources, both formal and informal, both in-state and out-of-state. One of the most comprehensive sources is <u>Innovative Financing: Banks and Energy Consumption</u>, a 1977 report to ERDA.[9] Since the listed policies are not necessarily mutually exclusive, some overlap exists, particularly with respect to some of the positive and negative aspects of the programs. With these qualifications in mind, the discussion of lending policies for further consideration will be divided into three parts: Section A will enumerate policies which can be initiated and carried out by individual institutions, acting alone. Section B includes those potential policies which would require a coordinated effort among several lending institutions. Section C includes policies which are not discussed in detail, but which may be used in conjunction with those programs of Sections A and B.

A. Policies Originated by Individual Institutions Acting Alone

1. Mortgage Interest Rate Reductions - Lending institutions could offer reduced interest rates on homes which (1) meet specified standards of energy efficiency or (2) could be brought to these standards of energy efficiency. Energy efficiency could be defined as a "package" of certain features (insulation, double glazing, etc.); the programs of several banks take this approach. Alternatively, energy efficiency stated in terms of heat loss per square foot or in terms of maximum energy requirement could act as an incentive for alternative energy sources. Adjustments for energy efficiency need not be necessarily made to the interest rate, as incentives could also be established based upon: (1) reduced down payments; (2) alteration of payment terms; (3) alteration of the borrower's credit limit.

The primary difficulty with implementing this approach is the potential requirement for the evaluation of energy efficiency by the lending institution. It is realized that such a certification process is time consuming, costly, and may become a barrier to making mortgages. Similarly, unless the lending institution accepts energy efficiency standards set by some other party, staff resources must be employed to ascertain the required levels of energy efficiency, or the required "package" of energy features. A certification process would only become necessary if substantial numbers of customers received loans for energy conservation purposes but did not accomplish their stated objectives -- an unlikely possibility if these borrowers otherwise met the "good loan" criteria established by the institution for all customers.

2. Flat-Rate Reduction of Interest on Home Improvement Loans

Banks would offer reductions in interest rates for home improvement loans, providing that the money is used for an approved list of conservation devices. Currently, Seattle Trust and Savings and Pacific National Bank have operational programs.

Implementation is based upon the installation or purchase of a definitive "package" of energy-conserving devices; a minimum "package" must be agreed upon prior to approval of the flat-rate reduction. Certification of purchase may be accomplished by self-certification or by inspection by bank personnel or by sub-contracted inspectors.

Difficulties in implementation: In addition to the philosophical discomfort of placing "ties" on the use of borrowed money, there is the requirement that the lender train staff to be knowledgeable in matters of what measures are eligible, what further measures are compatible, and where the limit of "package approval" is drawn. Similarly, if voluntary certification is not employed, there will be additional costs of employing or contracting an audit team.

Although flat rate reductions would be most manageable in forms of home improvement loans for specified devices, flat rate reductions could also be given for attaining specified levels of low heat loss. Such a program would entail considerably greater audit costs.

3. Variable Rate Interest Reductions/Home Improvement

In this program, lenders offer a range of interest-rate reduction, depending upon the level of conservation attained by the borrower's project. The basic difference from the flat-rate program involves the flexibility with which additional interest incentives can be offered for the attainment of further levels of energy conservation. Levels of conservation can be defined by actual measures, such as reduction of heat loss, or by an iterative list of conservation items purchased.

Difficulties in Implementation: This program would incorporate all of the difficulties enumerated in the flat-rate program, and would be marginally more costly due to:

(1) Additional knowledgeability requirements involved in the initial establishment of the relationship between conservation and interest rate reduction.

(2) Further requirements that the bank perform in the capacity of "energy counselor" to the borrower.

(3) Due to the complexity of the variable rate criteria, the low cost of voluntary compliance would likely give way to the higher costs of required lender inspection.

4. Gifts and Cash Rebate

Banks could offer cash rebates or premiums based upon the features or size of an energy-related loan. This measure would likely be less expensive to the financial institution, than would interest rate reductions, particularly in the case of long term loans. Thus, this measure would offer to buy the first storm window, rolls of insulation, etc.

5. Contractor Line of Credit

Lenders would provide home-improvement contractors and sellers of energy related goods and services with a line of credit which could be offered to the consumer. The lenders could arrange with qualified contractors to offer bank card loans on small amounts and "convenient bank access" on larger loans. This would be nearly identical to the existing relationships between home improvement contractors and banks where banks purchase the dealer paper.

As for implementational difficulties, the procedural aspects would be complex but not unfamiliar to banks; additionally, implicit certification of contractors may be philosophically uncomfortable to some types of institutions.

6. Group Marketing

By offering finance programs for energy items to groups of consumers who are employed by or belong to large private and public institutions, the costs of loan administration could be reduced by relying upon payroll deductions, group-directed marketing campaigns, etc. The employer could help reduce costs by: assisting in credit checking, filing preliminary applications, or allowing for repayment by means of payroll deductions.

B. A Policy Which Requires a Coordinated Effort Among Financial Institutions:

Energy Loan Pool

This program would parallel the pools established for urban rehabilitation, in that the sources of funds for a program of low interest loans would be a revolving loan pool, with funds contributed by participants in a predetermined ratio.[10] The rationale for pooling is not for purposes of funding high-risk loans, as it is in urban mortgage pools and rehabilitation loans; rather, the purpose is to spread the cost of a reduced interest rate. Like urban rehabilitation pooling, the pool would revolve as loans were paid off; secondary markets could be looked to if demand exceeded the revolving rate.

C. Minor Energy-Related Programs Which Could be Developed Adjunctive to the Previously Described Programs:

1. Develop "after market" conservation loans for customers with existing mortgages and with established credit. This program could be profitably linked with a number of interest reduction approaches.
2. Perform informational liason services with respect to existing and forthcoming public sector financial incentives (tax credits, property tax exemptions, etc.) This private sector liason would be parallel to the promotions of Keogh and IRA accounts.
3. Offer "mortgage add-ons" to cover the transitional costs of upgrading homes to qualify for reduced rate mortgages.
4. Participation in Integrated Marketing Approaches which would bring a number of energy-conserving activities onto one functional location. This concept of an energy center would combine the following functions: finance, do-it-yourself hardwares, technical guidance, qualified contractors, and a wide range of energy-conserving products from a variety of manufacturers.

5. Coordination of marketing strategies with utilities, retrofit contractors, and retailers of energy conserving equipment. This approach is currently under study by Seattle City Light.
6. Conservation materials may be included in mailings to credit card, savings, checking, and loan customers.
7. Conservation items may be offered as new account premiums and as savings deposit incentives.
8. Lobby space may be provided for energy related literature and educational displays provided by financial or public sector institutions.
9. Existing appraisal practices may be modified to more accurately reflect the value of energy conserving installations.
10. Credit evaluation practices may be modified to reflect the greater payback capability of customers with an "energy efficient lifestyle".
11. The dollar amount of each energy-related loan can be increased by requiring total energy packages.
12. As indirect lenders, financial institutions could provide lending support to the programs of utilities, with the utilities functioning as program marketers and administrative facilitators.

D. Feedback from Financial Institutions with Respect to Recommended Policies

Both formal and informal feedback from the list of recommended policies pointed towards several areas of consensus. First, the two programs which were viewed as desirable by the majority of bank officers surveyed were mortgage interest rate reductions and flat rate reduction of interest on energy-related home improvement loans. Variable rate reductions, dependent upon the level of conservation attained, were found to be unacceptable due to the additional administrative burden involved in determining conservation levels. Use of gifts and cash rebates were found to be undesirable for related reasons of administrative costs. The financial community was closely split on the extension of contractor lines of credit. At the time that the feedback was solicited, it was not deemed likely that contractor credit would eventually play a major role in the National Energy Plan.

A general area of feedback confirmed findings of the Isakson and Haney study, that a major concern of lenders is the need for consistency in government energy policies.[11] Similarly, concern was repeatedly expressed over the administrative costs which accompany programs which entail federal level involvement in secondary markets and in tax credit approaches.

A recurrent concern expressed by the financial community involved the lack of basic data on the projected costs and profitability of energy-related loans. In mailed surveys questions involving cost and profitability most frequently evoked responses of "don't know" and of "insufficient information." Accordingly, the primary effort of the second working report surrounded the development, testing and application of a methodology to determine the required rates of return on institutional programs. The section which follows further defines need by both the private and the public sector for required rate of return data.

VI. Private and Public Sector Need for Data on Program Rates of Return

A. Private Sector Requirements for Rate of Return Data

Financial institutions in our society are subject to many of the same forces of competition as are other sectors of the economy. Motivation toward innovation in the financial sector is similarly based upon the striving after economic profits; profits are necessary to enable individual institutions to attract and maintain funds. That is, like any other enterprise, a financial institution must maintain a rate of return which is at least sufficient to satisfy stockholders of the institution and to attract sufficient additional capital to enable the firm to grow. In purely private sector businesses, "turning a profit" represents the essence of the firm's social responsibility, since the existence of profits indicates a level of operating efficiency which is satisfactory vis-a-vis the competition.

The adoption by financial institutions of the energy loan programs which were suggested in the first working report depends primarily upon the potential effect which these programs have upon the profitability of the adopting institution. That is, any reduction in interest rate initiated for purposes of attracting the consumer must be justified by either a lower risk element, by lower administrative costs, or by less costly sources of funds. If the reduced interest rate is not justified by one of these elements, the financial sector is, in essence, operating this particular program at a rate of return which is less than that return received on parallel conventional loans.

The importance of the required rate of return on functional activities is appropriately illustrated by the case of The Franklin National Bank. Though the failure of Franklin was due to several causes, Franklin consistently underestimated its cost of funds, reinvesting them at a lower rate than their cost.[12] Thus, if the goal is to secure adoption by financial institutions of energy conservation loan programs, then one must be able to assess before the fact the desirability of these programs to the institutions. Such requests will then be fair in the sense that they do not impose financial hardships upon adopters.

B. Public Sector Need for Rate of Return Data

If the reduction in interest rates is not justified by reduction in risk or cost of energy loans, then the private sector will not be internally motivated to offer such loans. This decision would be rational from the viewpoint of the decision criteria of our economic ideology. Programs which cannot be justified within individual institutions in the private sector may, however, have overwhelming merit when viewed from the framework of the total society. This is indeed the case when spill-over benefits occur. Briefly, a spillover benefit, or positive externality, is said to exist when a transaction which is undertaken by private parties benefits other individuals who have not taken part in the private transaction. As an example, the borrowing of funds and the purchase of an energy-conserving device are private transactions. From these transactions, benefits accrue to the private parties: profit to the financial institution, profit to the manufacturer and seller of the device, and reduction in direct energy costs to the owner of the device. However, benefits also accrue beyond those which were directly involved in the transaction. Namely, due to this hypothesized reduction in energy use, the public as a whole may benefit from a reduction in energy imports, a corresponding improvement in the balance of payments, a resulting increase in the value of the dollar, etc. These are the benefits which "spill over" from the private transaction to the public at large.

In cases where spillover benefits are large, yet private sector profitability does not exist, it is often appropriate for the public sector to subsidize the private transaction to the extent that the spillover benefits are induced. In terms of public policy towards energy loans, if private sector incentives cannot bring about adoption of reduced rate loans, it may, depending upon perceived public benefits, be appropriate to subsidize. If this is the case, then it is imperative that marginal rate of return information exists such that the appropriate subsidy can be ascertained. Literature on public policy towards the private sector abounds with examples of program failures associated with cases of under-subsidization as well as cases of misallocation of public funds associated with the granting of subsidies beyond those which are marginally necessary. The marginal required rate of return is a primary element of information which is necessary to avoid those aforementioned pitfalls of public policy.

Thus, the need for rates of return on various categories of loans is twofold. First, knowledge of the true marginal required rate of return is necessary to the financial institutions in order that a rational profit-maximizing decision can be forthcoming. Secondly, if the private sector does not provide a sufficient quantity of that financial service, the public sector policymakers must know the marginal required rate of return in order that proper compensation can be offered to the financial sector.

The section which follows will develop a model which estimates the risk-adjusted required rates of return for five key bank functions. The functions considered are those of real estate mortgage loans, installment loans, credit card loans, commercial (including agricultural) and other loans, and investments (including Federal Funds sold, purchased commercial paper, bankers acceptances, purchased certificates of deposit, and commodity credit corporation certificates of interest). To our knowledge, this task has not been attempted previously.

VII. Development of the Required Rate of Return Model

A. Institutional Objectives and the Required Rate of Return

In this section it shall be assumed that the maximization of the wealth of the shareholders of the financial institution is the goal of management.[13] The primary purpose of this section is the determination of the required rate of return for the primary functional activities (Real-Estate mortgage loans installment loans, credit card loans, commercial loans, and investments) of commercial banks. This required rate of return is of importance to a commercial bank since it constitutes the minimum rate of return necessary on new investment in order to maintain the market value of the firm (and therefore shareholder wealth). This concept of the required rate of return, also known as the cost of capital, or hurdle rate, is central to the allocation of capital among various competing alternatives within the firm. Analogous to the allocation of resources within the overall economy through the price system, the required rate of return or cost of capital constitutes the allocation mechanism within the firm. It is based upon the simple concept of the necessity for the firm to earn at least as high a rate of return on the new funds employed as the cost of those same funds. For example, if it was determined that new capital cost the firm six percent, then any employment of these funds at a lesser rate in an energy loan program will obviously result in reduction in the wealth of the owners.

In the "real world", determination of this required rate of return is not as easy as the statements above may imply. The overall cost of capital to the firm is the weighted average of the marginal costs of the individual sources of funds with which the firm intends to finance in the future. The costs of the individual sources of debt and equity are the rates of return required by investors in consideration of the risk level of the firm and the risk and return of alternative investments available elsewhere. Some of the issues which make the required rate of return difficult to compute for the primary functional areas of commercial banking are listed below:

1. The determination of the required rate of return on equity is complicated by the fact that the expected rate of return anticipated by investors in the bank's equity is difficult to measure; much of this due to the greater uncertainty associated with stockholder return as compared to the fixed obligations of debt securities.
2. The stream of future returns or benefits from each functional activity is uncertain and therefore risky.
3. The returns associated with each commercial bank functional activity must be computed as though each were a mini-firm engaging only in that activity. Returns to equity holders are made up of both dividends and capital gains, two quite operationally useful concepts when publicly traded securities are involved. That is, cash dividends as well as capital gains (or losses) can be observed for the past when a market for equities exists. (This does not, however, mean that future expected returns are necessarily the same as past realized returns.) When the anticipated rate of return on equity (the cost of equity capital) for a functional activity of a bank is estimated, past realized rates of return are not observable since the capital gain (or loss) component of equity return depends upon having a market value at two points in time for each functional activity. Since a present market value depends upon the expectation of future returns which are unobservable, and since realized returns depend upon past market values which were not observable, one cannot directly observe either realized past rates of return (for the

purpose of projecting into the future) or present market value for the purpose of inferring future expected rates of return. This dilemma has not been resolved in the field of finance. The approach which will be followed in this paper involves using as a proxy for market value an observable variable which it is felt should be highly correlated with market value. This approach has been used to estimate the cost of capital for the mail division of the airline industry.[14]

B. The Capital Asset Pricing Model

The Sharpe-Lintner[15] form of the capital asset pricing model will be used for determining the required rate of return for the primary functional activities of commercial banks. This model evolved from the earlier work of Markowitz[16] which rigorously demonstrated the power of diversification to reduce risks in portfolios of securities without reducing expected returns. The Markowitz contribution to portfolio theory utilized the mean-variance parameters to show how efficient portfolios could be constructed. Subsequent work by Mossin[17], as well as the previously mentioned work of Sharpe, Lintner, and others,developed the implications for the pricing of capital assets (and the securities representing claims on these assets) if participants in the security and capital markets were to diversify portfolios according to the two parameters of mean and variance.

The capital asset pricing model[18] (CAPM) thus provides a framework for analyzing the market equilibrium tradeoff between expected return and risk. The CAPM develops a clear distinction between risk (as measured by the variance of returns) which is diversifiable through combination with other assets and between risk which is undiversifiable. The undiversifiable risk is frequently referred to as systematic or market risk. This represents fluctuations in return due to the broad movements of the market as a whole;

this risk cannot be eliminated in a portfolio since nearly all securities move with the market, though to different degrees. The "beta coefficient", as it is popularly referred to in investment literature, measures the degree of undiversifiable risk present in a security or portfolio. The expected rate of return on a security or portfolio above the risk-free rate is shown by the CAPM to be equal to the risk-free rate plus the beta coefficient times the excess return of the market as a whole over that of the risk-free rate.

The non-market portion of the total risk can be eliminated through diversification with other securities. Since it can be eliminated, an efficient market should pay no premium for bearing it. In essence, the CAPM demonstrates that risk premiums (excess rates of return above the risk-free rate) are proportional to the level of nondiversifiable risk embodied in the security or portfolio. Extensive empirical testing has confirmed this relationship to a surprising degree.[19] That modern capital market theory is becoming widely accepted by practitioners can be seen by the inclusion of "beta" coefficient data in many stock market services during the last few years. The Value Line Investment Service and Merrill Lynch,Pierce, Fenner, and Smith were among the first adopters; Wells Fargo National Bank has fully implemented capital market theory principles in its management of trust funds.

C. The Capital Asset Pricing Model--Analytic Section

The ensuing section assumes that the reader has an understanding of portfolio theory.[20] If market participants diversified according to the tenets of mean-variance portfolio theory and the market were highly efficient (an assumption well supported by the facts), then assets (as well as the paper claims on these assets called securities) would be priced according to the following expression of the capital asset pricing model (CAPM):[21]

$$E(R_j) = R_F + B_j [E(R_M) - R_F] \qquad (1)$$

where $E(R_j)$ = the expected rate of return on equity of asset j

R_F = the interest rate on a risk-free security

$E(R_M)$ = the expected return on the market portfolio

B_j = the systematic risk of asset or security j which is more precisely the co-variance between R_j and R_M divided by the variance of R_M.

$B_j = \text{Cov}(R_j, R_M)/\text{Var } R_M$

For publicly traded companies, the calculation of expected return on equity is relatively straightforward. The long-run historical rates of return available on the New York Stock Exchange have provided reasonable estimates of expected returns in the market, $E(R_M)$.[22] The risk-free rate, R_F, is usually approximated by the government rate on Treasury Bills. The historical beta coefficient calculated from realized market and security returns over previous time periods is usually satisfactory since beta coefficients are quite stable over time at the portfolio level.[23]

The capital asset pricing model (CAPM) of equation (1) can be readily applied for publicly traded companies when the conventions mentioned above are adopted. It should be noted that all factors other than B_j are constants applying to all firms in the market. Therefore, if B_j is reasonably stable over time, a meaningful expression of the required rate of return on equity for security j can be made. The CAPM demonstrates that the required rate of return is linearly related to the level of nondiversifiable risk as measured by the beta coefficient, B_j. For example, airline stocks typically have above average B's (typically ranging between 1.5 and 2.0), while public utilities have B's of between .5 and .8.[24] The market average is generally best represented by the Standard and Poor's

500 Index or the New York Stock Exchange Composite Index, both of which have B's of approximately 1.0.

Securities such as airline transport stocks thus have greater expected or required rates of return than utility stocks because of their higher levels of nondiversifiable risk. Over long periods of time, investors holding diversified portfolios of higher risk stocks have realized higher returns remarkably consistent with equation (1).[25] Portfolios of high beta stocks typically rise faster than the market averages in up markets, but fall faster in down markets. The CAPM explains the apparently extraordinary performance of certain so-called "go-go" mutual funds during the mid and late 1960's as being due merely to the fact that they held very high levels of systematic risk during a rising market. Their subsequent precipitous declines were shocking to many, yet are explained easily by reference to the CAPM which shows that high beta portfolios will fall proportionately faster than the market when a decline in the market ensues.

VIII. Application

A. Methods, Assumptions, and Adjustments

The CAPM can be applied to determine the required rates of return on individual capital budgeting projects as well as for separate operating divisions of a firm. Here, as for securities, the required rate of return is also proportional to the level of nondiversifiable or systematic risk. The individual project or division, unlike the publicly traded security, usually has no well-established separate market valuation. Hence, even if the periodic net contribution by the division or by the project to the firm as a whole can be ascertained, its change in capitalized value during the same period of time (a necessary component of total return) still must be estimated in order to arrive at an accurate picture of total periodic return.

The most difficult task hampering the determination of required rates of return for individual capital budgeting projects and for separate operating divisions of a firm is the estimation of that component of total return which is caused by the change in market value of that project or division. While to some the change in capitalized value may at first glance seem unimportant, it should be understood that this is a most important concept of valuation. Changes in capitalized value are the result of changes as perceived by the market in the future earning prospects of these projects and operating divisions. Were future prospects unimportant, one might observe (in the absence of risk considerations) one dollar of present IBM or Xerox earnings being valued equally with one dollar of AT&T earnings. The fact is that the market obviously impounds both growth prospects and risk in a major way into the present market value of securities; thus an investor's return in a security is made up of both the security's periodic return (cash dividends) as well as changes in value (which give rise to capital gains). The payment of cash dividends of course depends upon earnings.

The estimation of required rates of return for primary commercial bank functions depends upon estimating both periodic returns as well as changes in value. These return estimates should parallel as closely as possible those which could be realized by investing in firms specialized in only one of these functional activities--for example, a bank which made commercial loans exclusively. It would obviously be difficult if not impossible to find a commercial bank with publicly traded securities which would meet the criterion of making only commercial loans. Thus, direct observation of the change in capitalized value for the commercial loan function of a commercial bank (or any other function for that matter) is not possible, yet is highly important to the computation of expected future return. This dilemma necessitates a method for estimating the periodic change in value of the functional activity.

Gordon and Halpern[26] suggest using an observable non-market variable as a proxy for estimating the unobservable divisional market value. They demonstrate that under rather reasonable assumptions, the growth rate in divisional earnings should provide a very useful measure of divisional systematic risk. Though the explanatory power was not as high as had been desired, they found the correlation between the non-market based earnings growth variable and the market based systematic risk measure to be significant at the .001 level for a sample of 49 companies. The methodology followed in this paper is based upon that suggested by Gordon and Halpern.

B. Data

The data used for estimating the required rates of return on commercial bank functional activities was obtained from the Federal Reserve Banks of San Francisco and New York. The earnings yields for the following five functions were obtained for the years 1971 through 1977:

1. real estate mortgage loans
2. installment loans
3. credit card loans
4. commercial and other loans
5. investments

Because of data difficulties due to earnings near zero (giving rise to intractably large percentage changes), credit card loans were not analyzed. Three size groups of banks were analyzed separately for each of the remaining four functional areas.

1. deposits up to $50 million
2. deposits from $50 to $200 million
3. deposits over $200 million

The data came from banks in all twelve Federal Reserve Districts and was based upon large samples, approximately 500 banks for the smallest total deposit size group, 300 for the medium category and around 100 banks for the largest total deposit size category.

The functions for which adequate earnings data were available constitute nearly all of commercial bank earnings when totaled together. These functions were treated as divisions for purposes of this analysis.

C. Methodology

The yearly percentage change in earnings for each of four functional areas was calculated starting with the years 1971 and ending with 1977. For each function, there were thus six earnings change percentages, the first being the percentage change which occurred from 1971 to 1972. Let this growth rate in earnings for function j during period t be denoted

$$G_{jt} = \frac{E_t - E_{t-1}}{E_t-1} \quad (2)$$

where E_{t-1} represents earnings for that function the year previous to year t. These yearly functional earning growth rates were regressed on corresponding annual market growth rates, G_{Mt}

$$G_{jt} = \hat{\alpha}_j + \hat{c}_j \quad G_{Mt} \qquad (3)$$

where α_j and $\hat{c}_j$ are the estimated y-axis intercept and slope respectively of the estimated regression line. The market growth rates were estimated by summing the Standard and Poor's 500 Composite Index periodic return and the average dividend/price ratio prevailing on the New York Stock Exchange during the corresponding time period.

The estimate of systematic risk for function j, $\hat{B}_j$, was calculated as

$$\hat{B}_j = \lambda_0 + \lambda_1 \quad \hat{c}_j \qquad (4)$$

where λ_0 = .278 and λ_1 = .584 were given by the results of the Gordon and Halpern study and $\hat{C}_j$ is the slope parameter estimate in the previous regression of G_{jt} on G_{Mt}. Finally, the estimate of the required rate of return on equity for each functional activity j is given by equation (5) where

$$E(\hat{R}_j) = R_F + \hat{B}_j \quad [E(R_M) - R_F] \qquad (5)$$

and R_F = the 3-month Treasury Bill rate as the proxy for the risk-free rate

$\hat{B}_j$ = the estimate of systematic risk for commercial bank function j

$E(R_M)$ = the expected return of the market

As discussed previously in connection with equation (1), note that except for the estimate of $\hat{B}_j$, which is unique for each functional activity, the other terms of equation (5) are market constants. These will apply to all firms, industries, divisions, and functions alike. Thus given the expectations for the risk-free rate and the market return, the required rate of return on equity will depend only upon the estimated level of systematic risk present in each bank functional activity.

IX. Findings

Table 1 presents the results of the determination of the required rates of return on equity for four key commercial bank functional activities. As discussed in the methodology section, the required equity rate of return, $E(R_j)$ for function j, was calculated using the following formulation of the capital asset pricing model (CAPM):

$$E(\hat{R}_j) = R_F + \hat{B}_j \,(E(R_M) - R_F)$$

where R_F, the risk-free rate, was estimated by taking the mean three-month Treasury Bill rate over the 1972-1977 time period. The value for $E(R_M)$ was estimated by the mean of the sum of both the 1972-1977 annual capital gain (taken from the Standard and Poor's 500 Composite Index) and the corresponding dividend yield for the period (the average dividend yield on the New York Stock Exchange).

Table 1
Commercial Bank Functional Activities
Required Rates of Return on Equity*

	Commercial Bank Total Deposit Size Classes		
	Deposits up to $50 Million	Deposits $50-200 Million	Deposits over $200 Million
Real Estate Mortgage Loans	.06347	.06439	.06422
Installment Loans	.06369	.06468	.07101
Commercial and Other Loans	.05278	.04797	.04631
Investments	.06001	.06004	.06267

*assuming R_F = .05634 and $E(R_M)$ = .07080 where both R_F and $E(R_M)$ equal their mean annual values over the period 1972-1977.

The functional activity which was estimated to require the highest rate of return on equity was the category of installment loans; this was true of all three deposit size classes of commercial banks. The next highest required return functions in descending order were real estate mortgage loans, followed by investments, and finally the commercial and other loans category. One of the most striking results of the analysis is the identical order in which the required rates of return fell for all three deposit size classes. Since these three deposit categories constitute independent samples with identical Federal Reserve Bank data treatment conventions, the required return orderings among functions can be considered a strong finding.

Another finding was that the required rate of return appears to be an increasing function of bank size, while commercial loan required rates of return appear to be inversely related to bank size. No clear deposit size trend appeared to be present for the real estate mortgage loan or for the investment function.

According to data supplied by the Federal Reserve, the smaller banks are more heavily specialized in installment loans (which are primarily made to consumers) than are the large banks. In 1977, for example, installment loans constituted 13.91 percent of total assets for the sample of banks with deposits under $50 million, while installment loans made up 12.68 percent of total assets for the banks with deposits of between $50 and $200 million, and only 9.66 percent for the banks with deposits over $200 million. In the commercial loan category, the situation is reversed, with commercial and other loans making up 20.96 percent of total assets for the smaller banks, 21.66 percent for the medium banks, and 26.58 percent for the largest category of banks. Whether by choice or by necessity, the smaller banks have emphasized installment loans while the larger banks have, perhaps by choice, concentrated more heavily on the commercial and other loans category. The average size of commercial loans also appears to be directly related to bank size, amounting to $7,897, $14,671, and $35,647 for the smaller, medium, and larger bank size categories respectively during the year 1977. Further indication of this point is seen by the fewer number of commercial loans made per person (218 per person for the smaller banks vs. 65 per person for the large banks and 142 for the medium size banks) for the large banks. In summary, it would seem, perhaps not surprisingly, that in comparison to the smaller banks, large banks tend to (1) concentrate more heavily on the larger commercial loans which are most likely (2) made to larger companies and to (3) allocate more personnel to servicing these fewer but individually larger loan accounts.

Table 2 - Commercial Bank Functional Activities Estimates of Systematic Risk, $\hat{B}$

Deposit Size Classes

	up to $50 Million	$50 to $200 Million	Over $200 Million
Real Estate Mtg. Loans	.49301	.55653	.54507
Installment Loans	.50846	.57653	1.01472
Commercial and Other Loans	-.24634	-.57887	-.69351
Investments	.25935	.25591	.43746

The data contained in Table 2 shows the estimated levels of systematic risk, $\hat{B}_j$, present in each of the four commercial bank functional areas. All systematic risk levels appear to be very low in comparison to corporations in general which have an average beta level of approximately 1.0. These functional estimates of beta are somewhat low in comparison with the banking industry beta estimate of 0.81 performed in a study by Rosenberg and Guy.[27] However, the $\hat{B}_j$ estimates of the present study could be expected to differ from the Rosenberg and Guy study for several of the following reasons:

1. The $\hat{B}_j$ estimates for each commercial bank total deposit size category of the present study displayed the identical functional activity risk rankings.

2. The number of banks in the sample was large (approximately 500, 300, and 100 respectively for the small, medium, and large total deposit size categories).
3. The $\hat{B}_j$ estimates of the present working paper depend upon the parameter estimates for λ_0 and λ_1 of the Gordon and Halpern study.
4. The Rosenberg and Guy study used monthly returns for computing their industry beta estimates, while both the present working paper and the Gordon and Halpern study used annualized data. The monthly vs. annualized data should not in theory cause estimation discrepancies but in practice frequently do.

Perhaps the most interesting aspect of the $\hat{B}_j$ estimates was the negative values encountered for the commercial loan functional activity. The negative covariance of commercial loan returns with corporate pre-tax profits substantially reduces the rate of return necessary to justify the commercial loan function as compared to the other bank functions. While this finding is less than conclusive at this time, it would tend to suggest that commercial banks should not necessarily emphasize the installment loan function at the expense of commercial loan activities because of higher installment loan expected rates of return, since on a risk-adjusted basis the commercial loan category need not achieve as high a rate of return as installment loans in order to be equally profitable. It should be pointed out that the differential risk levels encountered between bank functional activities are due very little to different default rates between functions as one might initially be inclined to think. The risk level differentials are in fact due to the varying degrees of systematic risk (which cannot be diversified away through combination with other securities) present in the functions.

While the absolute level of the B_j estimates of Table 2 may differ from the Rosenberg and Guy study, they do in general confirm the lower level of risk present in banking compared to most other industries. The important point of the present working paper estimates of $\hat{\beta}_j$ is the consistent relative risk levels between the four functions for all three commercial bank deposit size categories. Given the estimates of R_F and $E(R_M)$ (which do not necessarily have to be their actual mean values of previous years as assumed here), the capital asset pricing model then gives quantifiable risk adjusted required rates of return on equity for each bank functional activity. With modification for the cost of debt, risk-adjusted discount rates appropriate for each functional activity can be calculated for use at the decision-making and policy formulation level of the bank. Insufficient publicly available data exists at the present time for the determination of a required rate of return on equity for energy conservation loans as a separate category.

The immediately preceding discussion dealt with determination of the required rate of return on equity for various commercial bank functional activities. Required rates of return on equity are useful for highlighting risk differentials between functional activities. These figures are found in Table 1 where it is clear that for all three bank size categories, installment loans were the highest risk category, followed by real estate mortgage loans, and investments, with commercial loans being the least risky.

Overall Functional Required Rates of Return

Time value of money is a well established concept in the modern business world. As major financial institutions, commercial banks in particular must use the time value of money concept countless times each day, indeed each hour and minute, when dealing with the public, with each other, and with regulatory bodies. The time value of money, however, is not a single rate which applies to all businesses, projects, and loan maturities alike, but instead a rate which must be adjusted upward if greater risk is present and downward for lesser risk.

The present section will demonstrate how a risk-adjusted overall required rate of return can be calculated for various commercial bank functions. The overall rate will be the discount or hurdle rate appropriate to each functional activity and will therefore be the proper rate for distributing funds within the commercial bank between competing functional activities. Just as the price system allocates resources among competing uses within the economy, so the functional activity required rates of return provide a price system internal to the commercial bank for allocating funds among competing functions. Simply stated, the riskier functions will require higher expected returns on fund uses than less risky functions. The present framework, as opposed to a subjective allocation technique, serves to make risk differentials explicit and objectively determinable for the various bank functions.

Table 3A shows the framework by which the overall required rate of return or hurdle rate can be calculated for each functional activity. Table 3A shows the calculation for the specific example of real estate mortgage loans for the smallest bank size category. The required rate of return for each functional activity can be seen to be a weighted average of the costs of the individual financing sources of the commercial bank. Column (1) details the particular financing sources, column (2) their respective 1977 dollar amounts, and column (3) their relative proportions. Column (3) thus provides the relative weights of the various sources based upon their book value (balance

Table 3 A Small Bank Functional Activity Required Rate of Return Methodology[1]

(1) Fund Sources[2]	(2) Dollar Amounts	(3) Relative Proportions	(4) Before-Tax Cost	(5) After-Tax Cost	(6) Weighted Cost
Demand Deposits	$ 9,065,181	.30150	.02724	.01481	.00446
Time Deposits	17,780,290	.59136	.06275	.03412	.02018
Borrowed Money & Federal Funds Purchased	200,118	.00666	.05549	.03017	.00020
Other Non-Deposit Funds Purchased	114,448	.00381	.05212	.02834	.00011
Other Liabilities[3]	294,471	.00979	0.00	0.00	0.00
Capital Notes & Debentures	111,707	.00372	.07468	.04061	.00015
Preferred Stock	4,828	.00016	.01429	.01429	.00000
Common Equity	2,495,919	.08301	.06347[4]	.06347[4]	.00527
Total	30,066,962	1.00000	Overall Required Rate of Return		.03037

[1]Figures here calculate the required rate of return for the Real Estate Mortgage Loan function for banks with deposits up to $50 million.

[2]Source: Functional Cost Analysis, Federal Reserve Bank, 1977.

[3]Non-interest bearing

[4]Cost for Real Estate Mortgage Loans

sheet) amounts. The common equity market values would have been preferable to their book value for establishing weights, however market values were not available. Column (4) shows the before-tax costs of each source which were calculated from data supplied by the Federal Reserve. One key financing source, the cost of common equity, was previously calculated in this report. For each functional activity and bank size category, the risk-adjusted cost of equity capital can be found in Table 1 of the present report. The cost of common equity in columns (4) and (5) of Table 3 comes from the real estate loan figure for the smallest size category of commercial banks. Column (5) gives the costs of each source adjusted for the effective average statutory Federal tax rates in effect during 1977. Note that since preferred stock and common equity are considered distributions of profits rather than costs of doing business, their before-tax and after-tax costs are the same. Column (6) provides the weighted cost of each source of funds and is the product of columns (3) and (5). The sum of column (6) gives the overall required rate of return for real estate mortgage loans for banks with deposits up to $50 million, the smallest bank size category.

Tables 3B and 3C calculate the overall required rate of return for the real estate mortgage loan function for the medium ($50 million to $200 million in deposits) and large (over $200 million in deposits) banks, respectively. Calculations in these tables are performed in identical fashion to Table 3A with appropriate figures calculated from Federal Reserve data for these commercial bank size classes. As in Table 3A, the costs of common equity are taken from Table 1.

Table 4 shows the overall risk adjusted required rates of return for each major commercial bank functional activity. The figures in Table 4 are

Table 3 B Medium Bank Functional Activity Required Rate of Return Methodology[1]

(1) Fund Sources[2]	(2) Dollar Amounts	(3) Relative Proportions	(4) Before-Tax Cost	(5) After-Tax Cost	(6) Weighted Cost
Demand Deposits	$30,751,911	.29119	.02578	.01344	.00391
Time Deposits	61,521,574	.58255	.06200	.03231	.01882
Borrowed Money & Federal Funds Purchased	1,977,989	.01873	.05294	.02759	.00052
Other Non-Deposit Funds Purchased	1,276,989	.01209	.05749	.02996	.00036
Other Liabilities[3]	1,157,973	.01096	0.00	0.00	0.00
Capital Notes & Debentures	409,654	.00388	.07715	.04021	.00016
Preferred Stock	34,006	.00032	.02011	.02011	.00001
Common Equity	8,477,378	.08027	.06439[4]	.06439[4]	.00517
Total	105,607,474	1.00000	Overall Required Rate of Return		.02895

[1]Figures here calculate the required rate of return for the Real Estate Mortgage Loan function for banks with deposits from $50 million to $200 million.

[2]Source: Functional Cost Analysis, Federal Reserve Bank, 1977.

[3]Non-interest bearing

[4]Cost for Real Estate Mortgage

Table 3 C Large Bank Functional Activity Required Rate of Return Methodology[1]

(1) Fund Sources[2]	(2) Dollar Amounts	(3) Relative Proportions	(4) Before-Tax Cost	(5) After-Tax Cost	(6) Weighted Cost
Demand Deposits	$244,298,411	.32324	.02581	.01360	.00440
Time Deposits	374,511,651	.49553	.06014	.03169	.01570
Borrowed Money & Federal Funds Purchased	33,154,198	.04387	.05567	.02928	.00128
Other Non-Deposit Funds Purchased	28,697,257	.03797	.05371	.02831	.00107
Other Liabilities[3]	16,815,511	.02225	0.00	0.00	0.00
Capital Notes & Debentures	5,691,659	.00753	.07424	.03913	.00029
Preferred Stock	21,544	.00003	.10425	.10425	.00000
Common Equity	52,586,680	.06958	.06422[4]	.06422[4]	.00447
Total	775,776,911	1.00000	Overall Required Rate of Return		.02721

[1]Figures here calculate the required rate of return for the Real Estate Mortgage Loans function for banks with deposits over $200 million.

[2]Source: Functional Cost Analysis, Federal Reserve Bank, 1977.

[3]Non-interest bearing

[4]Cost for Real Estate Mortgage Loans

Table 4 Overall Required Rates of Return for Commercial Banks by Function and by Size*

	A Smaller Banks (Deposits under $50 million)	B Medium Banks (Deposits $50 million to $200 million)	C Larger Banks (Deposits over $200 million)
Real Estate Mortgage Loans	3.037%	2.895%	2.721%
Installment Loans	3.039	2.897	2.768
Commercial and Other Loans	2.948	2.763	2.596
Investments	3.008	2.860	2.710

* The following assumptions are implicitly incorporated:

1. An assumed risk-free interest rate of 5.634%, the mean value over the period 1972-1977.

2. An assumed expected rate of return in the equity market of 7.080% with no new issue transaction costs. This rate is the mean of the 1972-1977 values as discussed incident to Table 1.

3. Average 1977 statutory Federal tax rates were used; they were from the smallest to largest bank size classes respectively 45.623%, 47.299%, and 47.882%.

4. These required rates of return were calculated using book weighted proportions and assume that banks intend to finance with these same proportions of funds in the future.

calculated using the methodology of Tables 3A, 3B, and 3C with the corresponding costs of common equity for each function taken from Table 1. For example, the first row in Table 4, real estate mortgage loans, is calculated in Tables 3A, 3B, and 3C, while the remaining figures in Table 4 are calculated like Tables 3A, 3B, and 3C except that corresponding entries for the cost of common equity in these tables come from Table 1. Table 4 indicates that the overall required rate of return is lowest for the commercial loan category, followed in order of increasing required return by investments, real estate mortgage loans, with installment loans requiring the highest rate of return.

The overall required rates of return, calculated by commercial bank function, provide the yardstick by which competing fund uses can be allocated within the bank. This methodology can be followed by an individual bank wishing to calculate its functional activity required rate of return. It must be used cautiously, however, since the fund costs are based upon recent costs which are here used as the estimates of future fund costs. If fund costs in the future are expected to be different from their past costs, then the revised estimates are more appropriate than the historical costs. The same situation applies to the relative proportions which each fund source makes up as shown in column 3 of Tables 3A, 3B, and 3C. These are based upon proportions which prevailed during 1977; if a bank intends to finance in different proportions in the future, then the expected proportions should be substituted for the 1977 values.

The three-month Treasury bill rates were used as a proxy for the risk-free interest rate. Their seven year mean yield, 5.634%, was used in the required rate of return calculations. Currently, (Dec. 1978) these same securities are yielding approximately 9.5%, a considerably higher rate. The use of this rate in the capital asset pricing model for calculation of the cost of equity capital, a long run concept, would be inappropriate since the three-month Treasury bill rate can fluctuate radically in the short run due to changes in Federal Reserve policy. The required rate of return for bank functional activities is intended for use with long range decisions and should not be altered in response to short-term interest rate fluctuations unless they are reflective of substantial shifts in long range expectations.

X. Implications for Energy-Loan Policies

1. Institutional size: In both real estate and installment activities, a higher rate of return is required at large banks than at either of the smaller scale categories. The implication to be drawn from this finding is that smaller institutions appear to have more leeway in granting reduced interest loans. That is, the required rate of return is less; therefore it is more likely that a smaller category of banks can offer reduced interest loans without requiring public subsidy. This finding does not imply that all efforts to institute energy loan programs at major regional banks should be foregone for purposes of approaching only smaller banks; however, the receptivity of smaller banks should be more encouraging than that of regional banks.

2. Implications for commercial loans

   Since required rates of return are lower on commercial loans for large banks than for smaller banks, large banks would be better suited to making commercial energy conservation loans than energy oriented consumer loans. This would be particularly apparent in a locality characterized by strong competition among banks. The commercial variety of energy loans could emphasize: contractor lines of credit, flooring of inventory for merchants selling energy efficient appliances and automobiles, as well as business loans for plant and capital equipment modernization programs to achieve energy efficiency for industrial processes. Also, lease financing programs may in many cases fall under this same category of programs, since leases constitute an alternative to intermediate and long-term business loans and are becoming an increasingly important banking activity.

3. Implications for installment loans

Smaller banks were shown in the Findings Section of this report to have lower required rates of return on installment loans than were the larger banks. These smaller banks should therefore be better suited to develop the more consumer oriented types of energy loan programs than the large banks. These types of loans are for such things as home insulation, storm windows, energy saving appliances and fuel efficient automobiles, both financed through "dealer paper" as well as directly.

XI. Significant Changes in the Energy-Finance Environment

Over the duration of this project changes have occurred which will have both positive and negative effects upon the operating environment of energy financing by the traditional institutions.

Four areas of change which will have marked impact are:

A. Programs of zero interest loans by privately owned utilities in two of the target areas.

B. Passage of the National Energy Conservation Policy Act; this act includes provisions for:
   a) utility arranged retrofitting and finance.
   b) government sponsored solar loans guaranteed by GNMA and FNMA
   c) retrofitting grants to low income households

C. Passage of the Energy Tax act of 1978, which includes tax credits for home retrofitting.

D. Significant changes in the level of interest rates as a result of macroeconomic stabilization policy by the Federal Reserve System.

In general, the programs of zero interest loans will have a favorable impact upon the area of energy-retrofit financing, but a negative influence on energy loans by financial institutions. Provisions of the Energy Act of 1978 (B) and (C) are expected to have a positive influence upon the availability of energy-related loans through traditional financial institutions. The immediate impact of macroeconomic stabilization policy, although relatively short-run, has been negative.

As substantial changes will likely come from these external factors, each program will be described in detail. Analysis of probable effects will follow these descriptions.

A. Programs of Zero Interest Loans

On August 7, 1978, Puget Sound Power and Light Company, The Washington Water Power Company and Pacific Power and Light Company filed applications with The Washington Utilities and Transportation Commission by which the companies will finance certain modes of insulation of single-family and duplex residential buildings heated primarily by electricity. Approval was received on October 6, 1978. Puget Power included in its program the costs of certain energy saving lighting modifications for the company's commercial and industrial, commercial and institutional customers who utilize electric energy as the primary source of cooling.

Generally the programs would allow applicants to pay for materials and labor (used to weatherize buildings and, with Puget Power, modify lighting installations,) through ten-year, no interest loans, secured by promissory notes and mortgages. The three companies agree that funds loaned for the designated weatherization projects must be cost justified in each instance; that is, the "acquisition of electricity" by weatherization must be at a cost less than equal production by new generation.

Because the long run cost of providing future demands for electricity is greater than the cost of obtaining equivalent amounts of energy through weatherization and lighting modification, all rate payers are benefited. The average cost of generation is lower than it would be if a new plant had to be built because ratepayers are obliged to support the investments in interest-free loans only until participants repay the loans, whereas if Puget Power, Washington or Pacific Power and Light had to invest in new plant construction, rate-payers would have to support such a plant, by higher rates, in perpetuity.

It should be noted that costs and benefits resulting from such programs are not linear functions of conservation effort. That is, given long run increases in demand, capital expansion must eventually take place; these zero interest loan programs are appropriate as stop gap measures.

1. Puget Power

Puget Sound Power and Light Company predicts its local growth to average about 5.3 percent over the next 15 years, necessitating a cost effective program; that is, the program's marginal cost is less than the marginal cost of power. However, it is impossible to warrant that a specific level of energy savings will be achieved, since extraneous factors such as life style and energy use habits cannot be fully controlled or anticipated.

Generally, Puget proposes to perform energy analysis for its electric space heating and cooling customers in all classes who request such analysis for the purpose of determining what weatherization measures would be cost effective in structures served by Puget and owned by its customers. Such measures may include any or all of the following:

1. added ceiling insulation
2. attic ventilation

3. added wall insulation
4. added floor insulation
5. storm/insulated windows and doors
6. caulking of windows and doors
7. weather stripping of windows and doors
8. water heater insulation wrap
9. automatic thermostats
10. insulation of heating ducts

With regard to financing, the customers' financial obligation will be to repay Puget Power without interest for the cost of the labor and materials associated with installing the weatherization measures. This obligation would be evidenced by the customer executing a Conservation Agreement, which states that the customer (residential or commercial owner) has contracted service with Puget Power for weatherization measures; that the customer will accept proposals from contractors acceptable to Puget, including a list of necessary improvements and the contractor's estimated labor and material charges. Included in the conservation agreement is an agreement that the owner is limited to repaying, without interest, the contractor's actual labor and material charges: 1) no earlier than ten years from the date of the agreement (amended by The Washington Utilities Commission to include an unratified option to repay any part of the loan at any time) 2) if the premises cease to be served by Puget and 3) if the owner voluntarily or by law transfers or executes a real estate contract in fee simple or contract his interest in the premises.

Second, the owner's obligation would be evidenced by a real estate mortgage and promissory note, due and payable upon the same conditions as mentioned above.

All weatherization work will be performed by independent contractors to be chosen by the customer and who meet Pugets minimum standards as to materials, methods of installation, and business practices. Puget will conduct random inspections of such contractors finished work for the purpose of determining whether such contractors should continue to receive their approval for future work under the program.

Puget anticipates that the program can be completed in five years, assuming a substantial portion of qualifying customers elect to participate. It will complete energy analysis based upon the order in which requests are received, and that Puget will give priority to low income elderly customers who elect to utilize the program. If demand should temporarily exceed the available supply of either materials or contractors, the program would be delayed accordingly.

2. The Washington Water Power Company

Under the terms of its proposal Washington Water Power would conduct a home energy analysis when requested by an electric residential customer. The analysis would determine the cost effectiveness of installing weatherization materials. If the customer agrees and is eligible, installations would be accomplished by local licensed contractors. Both the WWP and the contractor/installer would warrant the materials and workmanship.

The WWP proposal includes, subject to cost benefit analysis, ceiling and floor insulation, storm doors and weather stripping, storm window insulation and water heating insulation blankets. Only dwellings using electricity as a primary heating source prior to August 25, 1978 will be eligible for the program.

Under the same contract with the Washington Utilities and Transportation Commission as Puget Power and Pacific Power and Light, the Washington Water Power Company agrees to pay the installed weatherization costs. The participating customers will repay the costs of materials and labor, interest free, during any time of the ten year period or, if they choose, at the end of the ten year period, or at the time they sell the house to a new owner, whichever comes first. Other costs attached to conducting the program will ultimately be included within the rate structure of the company's electric service. However, a cost/benefit test will be made in each installation to establish that the cost of the kilowatt hours recaptured is sufficiently less than the cost of producing equivalent energy through new production.

WWP emphasizes low income customers who could not otherwise afford the monetary outlay or severe payback requirements of conventional weatherization programs.

Like Puget Power and Pacific Power and Light, WWP expects to complete their weatherization program over a period of five years.

3. Pacific Power and Light

Pacific Power and Light's program is virtually identical to

Puget Power's and Washington Water Power's. Under the terms of its proposal, Pacific Power and Light would conduct, upon request, home energy analysis for its all-electric residential customers and determine the cost effectiveness of weatherization materials. Again, if the customer qualifies, installation would be completed by local licensed contractors and would be warranted by Pacific Power.

Pacific Power's proposal includes ceiling and floor insulation, storm doors and weather stripping, storm windows and water heater insulation blankets. Only residential dwellings using electricity as a primary heating source prior to August 25, 1978 will be eligible for this program.

With regard to its interest free loans, the contract stipulations are identical for Pacific Power and Light. Pacific agrees to pay the installed weatherization costs and the customer will repay the costs of materials and labor, interest free, during any time of the ten year period, or at the time the house is sold or title transferred. Similarily, a cost/benefit test will be made in each installation to establish that the cost of the kilowatt hours recaptured is less than the cost of producing equivalent energy through new production.

B. Provisions of the National Energy Conservation Policy Act

The National Energy Conservation Policy Act was signed on November 9, 1978. Key provisions include a utility conservation program for residential buildings, weatherization grants for low-income families, and energy conservation and solar energy financing programs.[28]

1. Utility Conservation Program for Residential Buildings

Electric and gas utilities must inform customers of suggested energy conservation and solar energy measures, and provide estimates of the energy savings and costs of such measures. These measures include: insulation, storm windows and doors, caulking and weatherstripping, replacement furnaces, furnace efficiency modifications, clock thermostats, solar hot water heaters, and solar heating and air conditioning systems.

A utility must inspect the customer's residence upon request to determine which conservation and solar energy measures would be cost effective. The utility must also provide lists of lenders, suppliers and contractors and offer to arrange for the installation or financing of conservation and solar measures by listed firms. Except in certain cases, utilities are prohibited from directly installing such materials or actually making loans. One exception is that utilities may install furnace modifications and thermostats if customers desire; the prohibition of financing does not apply to loans under $300. Similarily, financing programs in effect before enactment of this act may be continued; this is expected to be the case for the private utility programs described in section A.

2. Weatherization Grants for Low-Income Families

The legislation extends to 1980 a grant program for states to purchase and install materials to weatherize homes occupied by low-income families, particularly the elderly and handicapped. "Low-income" families are defined as families with incomes of

125 percent or below that of the Federally-established poverty level. The maximum grant expenditure for any dwelling unit is $800. Grants can be used for both owner-occupied and renter-occupied residences. Appropriations authorized for this program are $200 million in both fiscal years 1979 and 1980.

A separate $25 million grant program under the Farmers Home Administration has been established to finance the weatherization of dwelling units of low-income families located in rural areas. Parts of the Yakima target area could apply for FHA grants.

3. Energy Conservation Financing Program

The Government National Mortgage Association (GNMA), under HUD, is directed to purchase and sell home improvement loans for energy conservation measures -- with priority given to elderly and moderate income families. Moderate income is defined as 100 percent or less of the median income for the area. A loan cannot exceed $2500.

Two GNMA programs will be established with a total purchase authority of $5 billion. A $3 billion fund is provided for reduced interest loans to moderate income borrowers. A $2 billion stand-by fund is provided for non-subsidized loans that may be used where credit is not otherwise available for such purposes.

4. Solar Energy Financing Program

The GNMA also will be authorized to purchase up to $100 million of reduced interest loans to homeowners and builders for the purchase and installation of solar heating and cooling equipment in residential dwellings. Support for up to $8,000 per unit will be provided. The financing program will be available for 5 years with loan repayments due within 15 years.

5. <u>Other Residential Financing Programs</u>

The legislation authorizes the Department of Housing and Urban Development (HUD) to insure loans for energy conserving improvements to multi-family housing and to make grants and establish standards for such improvements to Federally-assisted housing. HUD is also authorized funds to make energy conserving improvements to public housing. The mortgage limits for housing insured by FHA or the Farmers Home Administration (FmHA) may be increased, as a result of the NEA, to account for the increased cost of solar energy systems and other provisions direct that the minimum energy conservation standards governing new housing insured by FHA or FmHA be strengthened. DOE and HUD are also required to conduct studies of energy conservation in apartment buildings and the possible needs for mandatory standards governing all existing residential buildings.

C. Energy Tax Act of 1978

Sec. 101 of The Energy Tax Act of 1978 provides for indirect subsidy of retrofitting and of renewable energy installations in the form of tax credits. A non-refundable credit of up to $300 is provided for 15 percent of the first $2000 which is invested in qualifying equipment. The qualifying property includes insulation, caulking, weatherstripping, modified flue dampeners, storm or thermal windows and doors, revised furnace ignition systems and clock thermostats. The equipment must have been installed between April 20, 1977 and December 31, 1985 in a principle residence which was constructed prior to April 20, 1977. Vacation homes are not included in the credit; condominiums and co-operatives are included only if they are used as principle residences.

As for renewable energy source equipment, installation on both new and existing residences may qualify for a non-refundable credit for investment in solar wind, geothermal, or other renewable sources of energy which are used to heat or cool a home or provide hot water. Thirty percent of the first $2,000 and twenty percent of the next $8,000 may be credited for a maximum of $2,200. The same range of installation dates apply.

D. Effect of Macro Economic Stabilization Policies

Monetary policy affects price level and output through control over credit expansion. As demand deposits comprise 78% of the money supply, control over the quantity of money requires influencing the availability and the cost of credit. Accordingly, monetary policy under conditions of recession calls for an expansion of loanable funds and the associated decline in interest rates; on the other hand, inflationary conditions require a contraction of loanable fund availability with a corresponding increase in interest rates. These changes occur in the short-run and are a response to the perceived current and projected economic environment.

Within the duration of this project, monetary policy has been extremely contractionary. The prime interest rate, the fee which banks charge their most credit-worthy borrowers, increased from 7.9% in January 1978 to a current December 1978 high of 11 3/4%. Despite increases in the prime rate, the growth in credit market debt continued through the first three quarters of calendar 1978; in this period credit market debt, including business loans, home mortgages and consumer credit, has grown at an annual rate of 14%. Credit growth in these three quarters, in the face of steadily rising interest rates, is attributed to a "real" cost of money (adjusted for inflation) of close to the zero rate. As the Federal Reserve System persisted in a tight money policy, in the fourth quarter the prime rate rose above the practically double-digit inflation rate and a credit squeeze was first noted in the smaller regional banks.

The effects of the first stages of this credit tightness differed from traditional tight money results because of the existence of special Treasury Bill certificates which allowed savings institutions to gain funds by offering rates competitive with Treasury Bills. Thus mortgage lenders were protected from "disintermediation" -- an outflow of funds from mortgage uses. By the middle of the fourth quarter Treasury Bill yields were so high as to reduce the level of mortgage fund protection.

The results of tight money policies have been manifested in larger down payments, shorter maturities and stricter collateral requirements. However, tightness has not reached the extent of the previous "credit crunch" during which some banks had to renege on prior loan committments.

The result of money market tightness on all categories of energy related loans is mildly negative. Energy related consumer installment loans were conceptualized and initiated two years ago in a period of fund availability. Under conditions of excess loanable funds, reduction in interest rates below those of traditional consumer installment credit was both an appropriate marketing strategy and an appropriate activity towards favorably affecting the national social priority of energy conservation. However, as interest rates bumped into State consumer credit ceilings, an obvious tightening of loan availability has occurred, resulting from the rational rechanneling of funds. Similarly, with the short-term reductions in the availability of funds for long-term mortgages, it is inevitable that the willingness to take perceived risks in committing additional funds for the inclusion of solar heating or innovative energy-saving construction techniques is accordingly reduced. Contractionary monetary policies have also been responsible for the shift in bank marketing emphasis from loan services such as energy programs to the deposit services associated with the expansion of fund sources.

The outlook is for a continued tightness of money in the short run; few financial experts foresee any marked reduction in interest rates until the second to third quarter transition in 1979. Due to the previously described changes in the secondary mortgage market and in utility co-ordinated loans, the energy finance market can be expected to rebound from high interest rates considerably more quickly than it would have in the absence of such provisions.

E. Effects of External Charges upon Availability of Conservation Finance

Zero-Interest Loans: For qualifying households in the two target areas (Yakima, Spokane) where this program is being initiated, utility-financed retrofitting is undoubtably the preferred method of finance. First, retrofitting purchased at zero interest allows the consumer all of the benefits measured in reduced utility bills and increased comfort at no finance cost. Furthermore, if a rate of inflation greater than zero is projected for the payback period, the loan will be repaid in dollars of less value. If a rate of inflation of 7.2% is assumed, the homeowner will repay the loan in dollars which are worth one-half of current value; thus, in real terms, only one half of the principle will be repaid. Although retrofitting projections of 22,000 homes may appear to be a high estimate, it is obvious that many rational homeowners will accept this method of financing as a means of increasing their well being. If this method of finance is used by qualifying consumers, more private sector finance will be available for homes which are not electricity heated.

The National Energy Conservation Act: Although directives for application of this law have not yet been issued, the utility-arranged retrofitting and finance will further increase options available for financing. Wide promotion of such programs is expected to be available at little margin cost through the bi-monthly billing by utilities. Furthermore, technical expertise to give estimates of energy savings and associated costs is available to most utilities at a lower marginal cost than such personnel would cost financial institutions.

If the financing of such programs is done through contractor line of credit or customer group credit, the interest rates could be expected to be only slightly below market installment credit rates; this would depend upon the scale of the project. On the other hand, if constitutional challenges allow public utilities in Washington State to directly provide financing, expected interest charges would be below the rates charged by financial institutions; this is due to the relatively low costs of raising capital by the utilities.

The directive to increase the limits of secondary market guarantees also provides financing of additional conservation at relatively little marginal cost. Lifting of previous loan ceilings for solar financing markedly reduces one of the barriers to solar installations which was delineated in the First Working Report. Similarly, additional GNMA purchase authority and the continuation of retrofitting grants to low-income households will result in further conservation, although the viability of such programs in terms of benefit/cost analysis has as yet not been determined. Passage of the residential energy component of the Tax Act of 1978 has been expected since April of 1977. The existence of a system of tax credits for retrofitting is obviously a significant incentive. By offering a tax credit, part of the impact of retrofitting costs is shifted from the consumer to the general taxpayer. Again, the net benefit or cost of this activity has not as yet been determined; although, due to the nature of tax credits, this provision will have regressive effects. Similarly, the ability to deduct interest payments from income adds a note of regressivity to all finance.

In combination, these recent changes in the energy-financial environment broaden the options available to the consumer. From a criterion of energy conservation, the changes are beneficial, as alternatives are now available that were previously not provided purely through the traditional financial institutions. A significantly greater effort in conservation will evolve from these efforts.

However, from the criterion of net social welfare, little can be said, since these measures represent a currently indeterminant trade-off of costs from the consumer to the public at large. Determination of the approximate parameters of this trade-off awaits the completion of a considerable amount of research; recommended efforts in this direction are made in the following section.

XII. Recommendations for Further Inquiry

Findings of this project, coupled with recent changes in the entire energy-finance environment, indicate a need for further research in both sector-specific and general areas. Financial sector inquiries can further extend knowledge of the internal elements of energy finance, such as the effects on institutional profitability and requirements for an equitable relationship between the financial institutions and the public as a whole. Similarly, further inquiry into the general area of energy-finance relationships must approach both the efficiency and the equity elements of the interaction among financial institutions, energy institutions, the government and the general public. Each of these will be briefly outlined below:

A. Areas of further inquiry within the financial sector.

1. Personal characteristics of energy loan applicants

For purposes of predicting late payment and default rates on energy loans, a methodology should be designed which would differentiate between the personal characteristics of energy loan applicants and those of parallel conventional loan applicants. Such an analysis would facilitate a closer estimation of the costs of loan administration and would accordingly help delineate the optimal differential between the interest rates charged for energy vs. conventional loans.

2. Required vs. Realized Rates of Return

An important yardstick for determination of energy loan profitability would be the anticipated differential between required and realized rates of return. This report has laid the methodological groundwork for the calculation of risk-adjusted equity and overall required rates of return for each bank function. However, before being fully implemented the realized rates of return for bank functional activities should be compared to the required rates of return as detailed in this report.

3. National Data

Though of recent origin, information relating specifically to energy loans should also be gathered on a national basis to determine the required as well as realized rates of return on various categories of energy loans. To accomplish this, a national survey would be appropriate to generate a sufficiently large sample size of banks having previous energy loan experience in these activities.

B. Areas of further inquiry into the relationship among the financial, energy, governmental and public sectors.

1. In order to properly assess the changes described in Section XI, a study of the relative cost of capital is needed. Specifically, if the financing of conservation measures is to be accomplished by the utilities, a measure of the efficiency of capital allocation may be made by comparing the cost of capital of utilities to that of financial institutions and to that of public sector institutions.
2. As the program of tax credits represents a transfer of funds from the public to the consumer, the marginal cost of such an approach should be determined for purposes of comparison.
3. With reference to the justification for zero-interest loans by privately owned utilities, studies of the opportunity costs of conservation as compared to the alternative of further generation should be deepened.

4. Continuing emphasis on conservation measures will exhaust the most productive of such efforts, leaving a group of options of reduced marginal productivity. Accordingly, as more residential conservation measures are taken, continuing analysis of the rate of return and relative productivity should be maintained. Similarly, changes of opportunity costs among financial options must be monitored.

Notes:

1. Federal Reserve Bulletin, April 1978
2. Ibid
3. Ibid
4. Innovative Financing: Banks and Energy Conservation (Final report, prepared for the Architectural and Engineering Systems Branch, ERDA, Washington, D.C. by the Real Estate Research Corporation, Chicago, Ill.) May 1977. P. 43.
5. Gerald McCue, William R. Ewald, and the Midwest Research Institute, Creating The Human Environment; (Chicago, University of Illinois Press), 1970. P. 71.
6. David Barrett, Peter Epstein, and Charles M. Haar, Financing the Solar Home: Understanding and Improving Mortgage Market Receptivity to Energy Conservation and Housing Innovation (Cambridge, Mass., Regional and Urban Planning Implementation, Inc. 1976) P. 111.
7. Wade R. Ragas and Jack M. Wyatt, II, "Residential Energy Capitalization Technique and Single-Family Home Underwriting," The Real Estate Appraiser, January, February, 1978.
8. Rosalie T. Ruegg, "Life Cycle Costs". Ashrae Journal, November, 1976.
9. Real Estate Research Corp., Innovative Financing, PP. 56-72
10. Real Estate Research Corp., Innovative Financing, pp. 66
11. Isakson and Haney, "Lending Impacts Upon Energy Conservation in Buildings," Executive Summary, FEA Contract No. CR-04-60598-00, February, 1977.
12. Sanford Rose, "What Really Went Wrong at Franklin National," Fortune, October, 1974, p. 118.
13. Other goals such as profit maximization, market share, or firm size could be proposed as well; however, wealth maximization is felt by most authorities to be superior since it focuses upon the value of the firm as reflected in the market and embodies the concepts of time value of money as well as risk, thus being operationally tractable. For a fuller discussion of normative management goals, see James C. VanHorne, Financial Management and Policy, 4th edition (Englewood Cliffs, N.J.: Prentice-Hall, 1977), pp. 6-9.
14. See Myron J. Gordon and Paul J. Halpern, "Cost of Capital for a Division of a Firm," Journal of Finance, 29 (September 1974), pp. 1153-64.
15. See William F. Sharpe, "Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk," Journal of Finance, September, 1964. Also John Lintner, "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets," Review of Economics and Statistics, February, 1965; and "Security Prices, Risk and Maximal Gains from Diversification," Journal of Finance, December, 1965.
16. See Harry Markowitz, "Portfolio Selection," Journal of Finance, March, 1952.
17. Jan Mossin, "Equilibrium in a Capital Asset Market," Econometrica, October, 1966.
18. For a fuller discussion including necessary assumptions, see William F. Sharpe, Portfolio Analysis and Capital Markets, (New York: McGraw-Hill, 1970).
19. For example in William F. Sharpe and Guy M. Cooper, "Risk-Return Classes of New York Stock Exchange Common Stocks," Financial Analysts Journal, 28 (March-April 1972) and also Fischer Black, Michael C. Jensen, and Myron Scholes, "The Capital Asset Pricing Model; Some Empirical Tests," in Studies in the Theory of Capital Markets, M. C. Jensen, ed. (New York: Praeger Publishers, Inc., 1972).

20. The reader may wish to consult the two-part article written at an introductory level by Franco Modigliani and Gerald A. Pogue, "An Introduction to Risk and Return," in the Financial Analysts Journal (March-April and May-June, 1974). For a fuller discussion see William F. Sharpe, Portfolio Analysis and Capital Markets (New York: McGraw-Hill, 1970) or Jack C. Francis and Stephen H. Archer, Portfolio Analysis (Englewood Cliffs, N.J.: Prentice-Hall, 1971).
21. For a short proof of this mean-variance security valuation theorem, see Mark E. Rubinstein, "A Mean-Variance Synthesis of Corporate Financial Theory," Journal of Finance, March, 1973.
22. See L. Fisher and J. H. Lorie, "Rates of Return on Investments in Common Stock: The Year-by-Year Record, 1926-1965," Journal of Business, XXXVII, No. 1 (January, 1964).
23. See Marshall E. Blume, "Betas and Their Regression Tendencies," Journal of Finance, XXX, No. 3 (June 1975). Also see Robert A. Levy, "On the Short Term Stationarity of Beta Coefficients," Financial Analysts Journal, 27, No. 6 (Nov.-Dec., 1971).
24. See Barr Rosenberg and James Guy, "Prediction of Beta from Investment Fundamentals," Financial Analysts Journal, 32, No. 4 (July-August 1976).
25. For results of extensive CAPM tests, see William F. Sharpe and Guy M. Cooper, "Risk-Return Classes of New York Stock Exchange Common Stocks," Financial Analysts Journal, 28 (March-April 1972) and also Fisher Black, Michael C. Jensen, and Myron Scholes, "The Capital Asset Pricing Model; Some Empirical Tests," in Studies in the Theory of Capital Markets, M. C. Jensen, ed. (New York: Praeger Publishers, Inc., 1972).
26. Myron J. Gordon and Paul J. Halpern, "Cost of Capital for a Division of a Firm," Journal of Finance, 29 (September, 1974).
27. Barr Rosenberg and James Guy, "Prediction of Beta from Investment Fundamentals," Financial Analysts Journal, 32, No. 4 (July-August 1976), pp. 62-70.
28. This section is compiled from "National Energy Act," a Department of Energy press release, October 20, 1978, Washington, D.C.