REPORT BY THE U.S.

General Accounting Office

The Effect Of Premium Increases On Achieving The National Flood Insurance Program's Objectives

This report examines the impact that rate increases have had on achieving the National Flood Insurance Program's objective of reducing Federal expenditures on disaster assistance. This objective is more achievable if there is wide participation in the program. Since January 1981, the program's rates have been increased three times; however, participation has declined.

GAO's analysis of the effect of the rate increases on participation indicates that while the rate increases have influenced the decline in program participation, other factors, such as a decline in flooding in the last few years and the general economic recession, also contributed to the decline. GAO's analysis could not determine which of the factors had the most influence.

GAO/RCED-83-107

FEBRUARY 28, 1983

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UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

RESOURCES, COMMUNITY,
AND ECONOMIC DEVELOPMENT
DIVISION

B-207018

The Honorable Edward P. Boland
Chairman, Subcommittee on
Department of Housing and
Urban Development-Independent
Agencies
Committee on Appropriations
House of Representatives

Dear Mr. Chairman:

This report studies the impact recent rate increases have had on individual and community participation in the National Flood Insurance Program. It also discusses why high participation is an important factor in achieving the program's objective of reducing Federal expenditures for disaster relief. You requested this study in your report on fiscal year 1983 appropriations for the Federal Emergency Management Agency. We did not obtain official agency comments; however, we did discuss the matters covered in the report with program officials, and their views are included in the report where appropriate.

As arranged with your office, unless you publicly announce the contents of this report earlier, no further distribution will be made until March 17, 1983. At that time we will send copies of this report to the Director, Office of Management and Budget; the Director, Federal Emergency Management Agency; interested congressional committees, subcommittees, and individual Members of Congress; and other interested parties. Copies will be available to others on request.

Sincerely yours,

J. Dexter Peach
Director

GENERAL ACCOUNTING OFFICE
REPORT

THE EFFECT OF PREMIUM INCREASES ON ACHIEVING THE NATIONAL FLOOD INSURANCE PROGRAM'S OBJECTIVES

D I G E S T

From its inception in 1969 until fiscal year 1982 when it generated a small surplus, the National Flood Insurance Program has operated at a deficit. In 1981, the Federal Emergency Management Agency established a goal of making the National Flood Insurance Program self-sustaining and through a series of increases raised the average premium from about $79 in 1980 to about $167 in 1982. Prior to 1981, there had never been a rate increase.

The Chairman, Subcommittee on Department of Housing and Urban Development-Independent Agencies, House Committee on Appropriations, in approving the Agency's fiscal year 1983 budget expressed concern that the recent rate increases might make the program too expensive for a large portion of people living in flood-prone areas. As a result, GAO was asked to study the effect of the premium increases on program participation.

PROGRAM OBJECTIVE

The Congress established the National Flood Insurance Program to reduce mounting Federal expenditures for disaster relief. To help accomplish this objective, flood insurance was to be offered only in those flood-prone communities which adopted and enforced adequate flood plain management regulations.

Having as many individuals and communities as possible in the National Flood Insurance Program is a critical factor in achieving the program's objective. If large numbers of individuals purchase flood insurance, the demand for other forms of post-disaster assistance, such as Small Business Administration disaster loans, can be reduced. In addition, wide individual participation can make the insurance more affordable by allowing the risk of flooding and the fixed costs of the program to be spread over a broader base.

Maximum community participation is also important because it ensures that flood plain management regulations, designed to reduce future losses, will be in effect in as many flood-prone areas as possible. (See p. 10.)

PROGRAM PARTICIPATION HAS DECLINED

The same month the Agency first raised rates--January 1981--individual participation in the program as measured by the number of policies in force began to decline. Participation fell from a peak of about 2,014,500 policies in December 1980 to about 1,860,400 in November 1982. During this same time period, six small communities left the program.

GAO identified several factors in addition to the rate increases which could have contributed to the decline in individual participation. These factors include

--the decline in the housing market during the last few years,

--the smaller number of floods and flood losses experienced in the last few years, and

--the general economic recession which began in July 1981.

GAO tested, in a limited way, the effect of the rate increases and the other factors on the number of flood insurance policies using the statistical technique known as regression analysis. This technique allowed GAO to attempt to explain changes in the number of flood insurance policies being caused by the rate increases and the other factors. The results of GAO's analysis indicate that while the rate increases did have some influence on the decline in program participation, other factors, in particular the smaller number of floods in recent years and the general recession, also negatively affected program participation. The statistical techniques used by GAO cannot determine with any degree of precision the relative effect on program participation of the rate increases as opposed to the other factors. (See p. 21.)

GAO also contacted the cognizant local official in each of the six communities which the Agency identified as having voluntarily withdrawn from the program since January 1981. None of the communities left the program because of the rate increases. In any event, the communities were very small, with the total number of policies in the six communities accounting for only 0.01 percent of the total number of policies in the program.

The Administrator, Federal Insurance Administration, has been concerned about the possible adverse impact of rate increases on program participation and the program's objectives. He has stated that if the Agency determines that rate increases are hurting program participation, the Agency will re-examine and revise its goal of achieving a self-sustaining program by fiscal year 1988.

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GAO did not obtain official Agency comments on this report. However, GAO did discuss the matters covered in this report with program officials and their views are included in the report where appropriate.

Contents

ABBREVIATIONS

FEMA	Federal Emergency Management Agency
FIA	Federal Insurance Administration
GAO	General Accounting Office

CHAPTER 1

INTRODUCTION

In his report on the Federal Emergency Management Agency's (FEMA's) fiscal year 1983 appropriations, 1/ the Chairman, Subcommittee on Department of Housing and Urban Development-Independent Agencies, House Committee on Appropriations, expressed concern about the possible adverse impact major increases in flood insurance premiums could have on the National Flood Insurance Program. The report noted that recent increases, designed to make the program actuarially sound within a short period of time, could drive the cost of the program beyond the ability to pay of a large portion of the homeowning public living in flood-prone areas. 2/ As a result, the chairman requested that we study the effect of the premium increases on the congressionally intended purposes of the program.

HISTORY AND OBJECTIVES OF THE NATIONAL FLOOD INSURANCE PROGRAM

Prior to the National Flood Insurance Act of 1968 (Public Law 90-448), flood insurance generally did not exist. Private insurers were unwilling to provide flood insurance because (1) the frequency and magnitude of floods are unpredictable, making the estimate of potential losses very difficult, (2) a major flood could bankrupt an insurance company before sufficient reserves had been accumulated to cover major losses, and (3) as a result, it was difficult to offer affordable rates.

In the absence of insurance coverage flood victims turned to Federal and State governments for the major portion of their relief and rehabilitation needs. After flood disasters in 1962 and 1965, the Congress, in the Southeast Hurricane Disaster Relief Act of 1965, requested a study on the feasibility of offering flood insurance as an alternative to ever-increasing disaster relief outlays. A report from the Secretary of Housing and Urban Development entitled "Insurance and Other Programs for Financial Assistance to Flood Victims" recommended a national program of flood insurance as a viable method of shifting some of the costs of living in flood-prone areas from the general taxpayer to the areas' occupants. The report also recommended that the Federal Government work with States and local agencies to develop land-use standards designed to mitigate future flood losses.

1/House Report No. 97-720 dated August 10, 1982, on the Department of Housing and Urban Development-Independent Agencies Appropriations Bill, 1983.

2/The estimated average premium for flood insurance increased from about $79 in 1980 to about $167 in 1982. Chapter 2 contains a detailed discussion of the program's recent premium increases.

The National Flood Insurance Act of 1968 established the National Flood Insurance Program. In the act's legislative history, the Congress noted that the significant damage floods cause underlined the need for a program that would provide flood insurance, encourage persons to become aware of the risk of occupying flood-prone areas, and reduce the mounting Federal expenditures for disaster relief assistance. To implement the broad objective of reducing Federal disaster assistance, the Congress gave the program two major purposes. The first was to provide flood insurance on a nationwide basis using methods that would pool risks, minimize costs, and distribute the burden of providing flood insurance equitably among those protected by the insurance and the general public. The second purpose was to encourage State and local governments to make appropriate land-use adjustments to (1) constrict development of land exposed to flood damage, (2) minimize damage caused by flood losses, and (3) guide development of proposed future construction, where practicable, away from locations threatened by flood hazards.

To link these two purposes, the program was implemented using a unique "quid pro quo." Property owners are eligible to purchase Federal flood insurance only if their flood-prone community joins the program and adopts and enforces adequate flood plain management regulations, such as elevating new structures, designed to protect lives and property from future floods. To encourage broad individual participation, FEMA was allowed to charge owners of existing structures, for whom commercial flood insurance had been prohibitively expensive, subsidized insurance rates. Owners of new structures, however, were expected to pay rates which reflected the risk of building in flood-prone areas. These rates could be kept to a reasonable level if a property owner conformed to the flood plain management regulations and, for example, elevated his structure.

During the program's first year of operation, only four communities out of about 20,000 with flood hazard areas joined the program, and in these four communities only a few policies were sold. This occurred because the act's ratesetting approach required preparation of a detailed map showing the various areas of flood risk before insurance rates could be determined. Preparing these maps proved to be time consuming and inhibited communities' ability to join the program. Consequently, the Congress, in December 1969, amended the 1968 act to create an "emergency" program that allowed eligible communities to enter the program before a detailed map was prepared.

The emergency program increased participation, and by 1973 over 272,000 policies were in force. However, participation was still below the program's projected goal. The Congress, recognizing the need for a more comprehensive flood insurance program, passed the Flood Disaster Protection Act of 1973 (Public Law 93-234) which amended the 1968 act.

To increase participation, the 1973 act required that flood insurance coverage be purchased and adequate safeguards and land-use restrictions be enacted in order for individuals and communities to receive Federal financial assistance for purchase or construction purposes. Specifically, the 1973 act required (1) designated communities to participate in the flood insurance program or face restrictions on Federal financial assistance and (2) property owners to purchase flood insurance to receive new or additional Federal financial assistance for acquisition or construction purposes in identified special flood hazard areas. Federal financial assistance included not only loans, grants, or mortgage insurance provided by Federal agencies, but also mortgages made by private institutions regulated in some way by the Federal Government. To obtain Federal disaster assistance for construction or reconstruction purposes, the 1973 act also required property owners in participating communities to first purchase flood insurance.

The Housing and Community Development Act of 1977 (Public Law 95-128) removed the prohibition against conventional mortgage loans from federally regulated lenders in flood-prone communities not participating in the program but added a notification procedure to alert prospective mortgagors that flood disaster relief would not be available for properties in those communities.

HOW THE PROGRAM OPERATES

The National Flood Insurance Program is administered by FEMA. The insurance aspects are managed by FEMA's Federal Insurance Administration (FIA). FIA sets insurance rates, develops an insurance manual for agents' use, underwrites policies, and maintains liaison with the insurance industry, trade associations, and mortgage lenders. The day-to-day insurance operations of the program are performed by a private contractor, Electronic Data Systems Federal Corporation, and are monitored by FIA staff. The private contractor is responsible for recordkeeping on policyholders, accepting premiums, settling claims, and providing FIA with statistical and financial data on the insurance operations.

With regard to the noninsurance aspects of the program, FEMA's State and Local Programs and Support Directorate (1) identifies flood-prone areas, (2) provides communities with flood maps so that they can enter the program, (3) establishes flood plain management criteria, (4) oversees participating communities' adoption of necessary ordinances and enforcement of required flood plain management regulations, and (5) oversees continued community eligibility for flood insurance resulting from the communities' compliance with FEMA's criteria.

FEMA provides flood insurance through an emergency program and a regular program. The rates charged and the insurance coverage available depend on which program a community is in.

Under the emergency program FEMA provides limited amounts of insurance at federally subsidized, or "chargeable," 1/ rates on all structures, pending completion of a flood insurance rate map. To be eligible a community is required to (1) apply officially to participate in the program and (2) adopt minimum flood plain management regulations to guide new construction in the flood-prone areas.

A community enters the regular program after two principal conditions are fulfilled. First, local officials enact regulations that require all new or substantially improved structures to be built according to Federal flood plain management criteria. Second, to identify flood-prone areas and to assist in setting insurance rates, FEMA prepares a flood insurance rate map which identifies the rate zones in the community. As noted previously, in order to receive Federal financial assistance for acquisition or construction purposes, insurance is required in the special flood hazard areas. These areas are typically comprised of zones along rivers or in coastal areas. Insurance is optional in other, less hazardous zones.

There are two classes of rates in the regular program. Existing structures built before December 31, 1974, or the effective date of the flood insurance rate map, whichever is later, may continue to pay the chargeable rate for a basic amount of insurance coverage. New structures built after the rate map is completed must pay a "risk premium" rate for basic coverage. Risk premium rates are also called actuarial rates and are intended to cover the costs associated with providing this category of flood insurance. The 1968 act also requires that risk premium rates be charged for any additional coverage for both existing and new structures. Available coverage is shown in table 1.

1/FEMA uses the term "chargeable" to identify subsidized rates. The term is derived from section 1308 of the 1968 act.

Table 1

Maximum Insurance Coverage Available

Program and building type	Building		Contents	
	Basic	Additional	Basic	Additional
Emergency program:				
Single-family residence (note a)	$ 35,000	-	$ 10,000	-
Other residential (note a)	100,000	-	10,000	-
Nonresidential	100,000	-	100,000	-
Regular program:				
Single-family residence	35,000	$150,000	10,000	$ 50,000
Other residential	100,000	150,000	10,000	50,000
Small business	100,000	150,000	100,000	200,000
Other nonresidential	100,000	100,000	100,000	100,000

a/Higher maximum amounts are available in Hawaii, Alaska, Guam, and the Virgin Islands.

Source: Federal Insurance Administration, Federal Emergency Management Agency

OUR RECENT REPORT ON FLOOD INSURANCE

Our January 3, 1983, report entitled "National Flood Insurance Program: Major Changes Needed If It Is to Operate Without a Federal Subsidy" (GAO/RCED-83-53) addressed FEMA's process for setting risk premium and chargeable rates. We found that because of data and methodological weaknesses, the program's risk premium rates had not generated sufficient premium income to cover associated claims and operating costs. We also found that despite three rate increases since January 1981, the current risk premium rates were still inadequate. We noted that FEMA was aware of the weaknesses in the ratesetting process and had taken action in some areas. Nevertheless, we made a series of recommendations to the Director, FEMA, to improve the ratesetting process so that the risk premium rates would produce adequate premium income as required by the 1968 act.

With regard to the chargeable rates, we reviewed alternatives for eliminating the Federal subsidy these rates contain. Alternatives included increasing the subsidized rates, reducing the amount of coverage, cross-subsidizing with a surcharge on nonsubsidized ratepayers, or a combination of these options. We noted that such actions could cause policyholders to drop their flood insurance policies and increase their reliance on Federal disaster relief in the event of a flood, contrary to the program's objectives. We recommended that FEMA establish a monitoring program to detect any adverse impacts which increases in chargeable

rates or decreases in coverage provided at chargeable rates could have on the flood insurance program's objectives.

While FEMA has not formally replied to our recommendations, FIA's Deputy Administrator has discussed with us actions FEMA is taking to improve the ratesetting process. Further, FIA's Assistant Administrator told us that FIA is using a monthly report it receives from Electronic Data Systems Federal Corporation to monitor possible adverse impacts due to rate changes.

PROGRAM STATISTICS

As of November 1982, according to unaudited FEMA data, slightly over 17,300 communities were participating in the program. Of these communities, about 8,800 were in the emergency program and over 8,500 were in the regular program. An additional 3,100 communities have had special flood hazard areas identified but have decided not to participate in the program.

As of November 1982, the program had about 1,860,400 policies with a Federal liability, as measured by insurance in force, of almost $105 billion. The current number of policies represents a decline from the program's peak of about 2,014,500 policies, which occurred in December 1980.

In fiscal year 1982, the flood insurance program received about $234 million in earned premium income and about $328 million in appropriations earmarked to repay funds borrowed in previous years from the Treasury to finance program losses. The program's expenses included over $36 million for insurance agent commissions, almost $34 million in operating expenses for FEMA's contractor, and over $163 million for claims and loss-adjustment expenses. This left the insurance program with a small surplus of about $663,000--the first since the program's inception in 1969. FIA officials attributed this to (1) higher premium income generated by the recent rate increases and (2) the relatively low level of flood losses the program experienced in fiscal year 1982.

OBJECTIVES, SCOPE, AND METHODOLOGY

The objective of this review was to study the effect of the recent increases in flood insurance premiums on the program's objectives. In consultation with the office of the Subcommittee on Department of Housing and Urban Development-Independent Agencies, House Committee on Appropriations, we agreed to focus our review on determining whether recent premium increases had caused individuals to buy less flood insurance and/or communities to leave the program. We did not attempt to determine if the amount actually expended on flood-related disaster assistance had increased since FEMA began raising the flood insurance premiums. It was our judgment that given the relatively small number of flood-related disasters which have occurred since 1981 and the large number of factors which can influence the amount of disaster assistance, there was a low probability

of successfully determining the effect of the rate increases with any acceptable level of precision.

Our review was performed in accordance with generally accepted government audit standards. Work was conducted from December 1982 through February 1983 at FEMA headquarters in Washington, D.C.

We reviewed the National Flood Insurance Act of 1968, as amended, its legislative history, and other pertinent legislative information. We reviewed FEMA regulations, policies, procedures, records, and data applicable to the program.

To identify how rate increases could affect the program's objectives, and what factors besides premium increases might influence community and individual participation in the program, we interviewed (1) the FIA Administrator and other FIA officials, (2) property and casualty actuaries, (3) academic and consulting economists familiar with property and casualty insurance, and (4) representatives of property and casualty and insurance agent trade associations. Appendix I is a list of the organizations and people we interviewed. We also searched economic literature to find out what factors influence the demand for property and casualty insurance. Appendix II is a bibliography of the research studies we reviewed.

To test for the influence of the premium increases and the other factors we identified on individual participation in the program, we used a statistical technique known as regression analysis. This statistical technique allowed us to attempt to explain the observed changes in the number of flood insurance policies being caused by increases in flood insurance premiums and other factors. An alternative approach would have been to interview a random sample of policyholders who left the program. It was our judgment that the quality of FEMA's policyholder records and the time permitted for this review would not have allowed us to successfully complete this approach.

To determine the impact of premium increases on community participation, we obtained a list from FEMA of communities which had left the program since January 1981 when the first rate increase took effect and interviewed the cognizant local official.

CHAPTER 2

VARIOUS FACTORS HAVE CONTRIBUTED TO THE DECLINE IN PROGRAM PARTICIPATION

Having as many individuals and communities as possible in the National Flood Insurance Program is an important factor in achieving the program's objectives. If large numbers of individuals purchase flood insurance, the demand for other forms of post-disaster assistance can be reduced. In addition, wide participation can make flood insurance more affordable by allowing the costs and risks to be spread over a broader base. Maximum community participation contributes to the program's objectives because it ensures that flood plain management regulations, designed to reduce future losses, will be in effect in as many flood-prone areas as possible.

The flood insurance program has historically operated at a deficit. To address this situation FIA's Administrator set a goal of making the program self-sustaining, and in January 1981 began raising insurance rates--the first time this had been done since the program's inception in 1969. At the same time that rates began to increase, the number of policies began to decline with the program losing about 154,100 policies during the last 2 years. A regression analysis we performed indicates that while the price increases partly explain the decline in program participation, other factors, such as the decline in flooding during the past several years and the general recession also have negatively affected program participation.

FEMA HAS RECENTLY BEGUN INCREASING FLOOD INSURANCE RATES

From its inception in 1969 until fiscal year 1982 when it generated a small surplus, the National Flood Insurance Program has operated at a deficit. In 1981, FIA's Administrator established a goal of making the flood insurance program self-sustaining and actuarially sound by fiscal year 1988. With regard to the goal of a self-sustaining program, the Administrator intends to have the program operating without a Federal subsidy by 1988. To achieve the goal of actuarial soundness, the Administrator wants to improve the program's ratesetting approach so that the program will meet accepted actuarial principles. 1/

1/In general, accepted actuarial principles stipulate that a sound rate structure is one which ensures the financial integrity of the insurance system by collecting adequate premium income while at the same time charging policyholders rates which equitably reflect the risk they face. For a more detailed discussion, see our previous report (GAO/RCED-83-53).

As part of its effort to achieve this goal, FIA has established a semiannual rate review to examine the adequacy of its rates and to implement annual rate revisions. Since January 1, 1981, rates have been revised three times, the most recent revision occurring in June 1982. These revisions, which all involved increases, represented the first rate changes since 1974. Between 1969 and 1981, the only action FIA took with regard to the program's rates was to decrease the intentionally subsidized chargeable rates in July 1972 and again in January 1974. Both of these decreases were implemented to make flood insurance more affordable and thus encourage broader participation. The impact of the recent rate increases is shown in table 2.

Table 2

National Flood Insurance Program Rate Revisions
January 1, 1981, to Present

	1980 average premium	January 1, 1981, revision: Percent increase	January 1, 1981, revision: Estimated average premium after revision a/	October 1, 1981, revision: Percent increase	October 1, 1981, revision: Estimated average premium after revision a/	June 1, 1982, revision: Percent increase	June 1, 1982, revision: Estimated average premium after revision a/
Chargeable rates	$95	b/ 22	$116	47	$170	0	$170
Risk premium rates	64	61	103	6	109	50	164
Programwide	79	38	109	28	139	20	167

a/Estimate reflects average amount of insurance purchased in 1980. Actual average premiums since 1980 will differ because policyholders are purchasing higher amounts of insurance.

b/Chargeable rates not increased; however, a $20 expense constant previously charged only to risk premium ratepayers was assessed chargeable ratepayers along with a new minimum premium of $50.

Source: Federal Insurance Administration, Federal Emergency Management Agency.

INDIVIDUAL AND COMMUNITY PARTICIPATION HAS DECLINED

Since FEMA began increasing the rates for flood insurance, individual participation, as measured by the number of policies, has declined. In addition, six small communities have left the program since the rate increases began.

As seen in figure 1 the flood insurance program experienced uninterrupted growth from its creation in 1969 until 1980, when the number of policies reached an average annual total of 1,897,000. During the last 2 years the number of policies has declined to an estimated average annual total for fiscal year 1982 of 1,875,100 policies. As figure 2 containing monthly data illustrates, this decline began in January 1981, the same month the first rate increase took effect, and has continued since then. The number of policies has declined by about 154,100 policies from a peak of 2,014,500 in December 1980 to about 1,860,400 policies in November 1982.

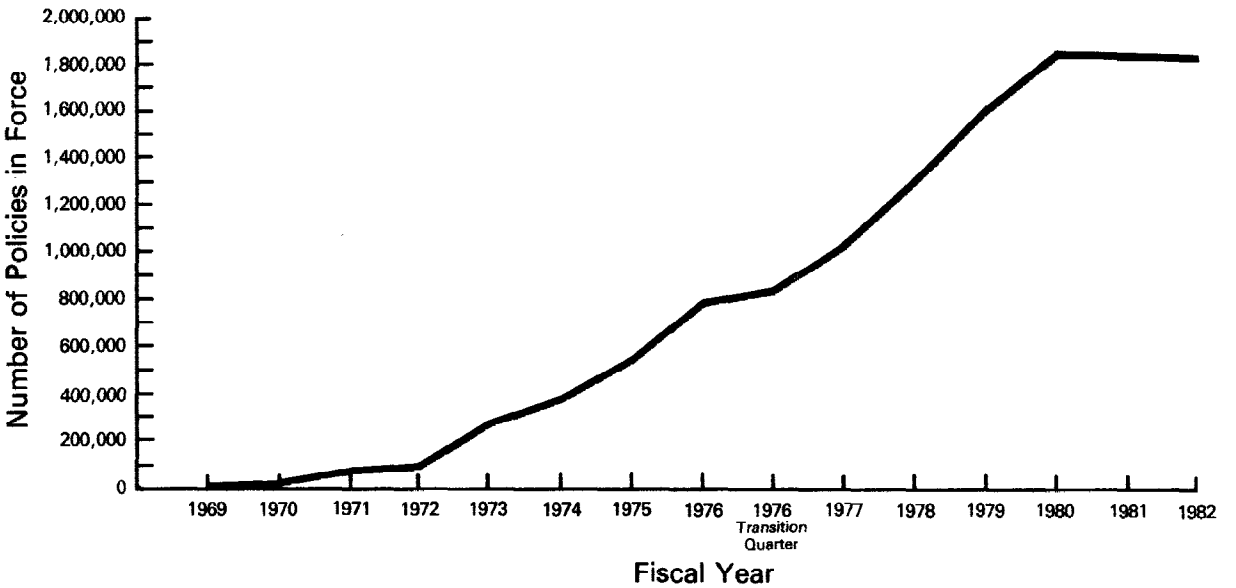
During this overall decline the rate of policy renewals has remained relatively steady--at about 80 percent of the total number of policies. Consequently, the decline in the total number of policies has been primarily the result of not enough new policies being sold to offset the policies which were either canceled or not renewed.

WHY WIDE PARTICIPATION IS IMPORTANT TO THE PROGRAM'S OBJECTIVE

Having as many individuals and communities as possible in the National Flood Insurance Program is a key factor in achieving the program's broad objective of reducing Federal expenditures for disaster assistance. As noted by FIA and insurance industry officials we spoke with, without high individual participation the demand for disaster assistance, such as a Small Business Administration disaster loan, as well as the amount of casualty loss tax writeoffs, could increase. Consequently, the total cost to the Federal Government could increase, contrary to the program's broad objective. High individual participation also helps (1) maximize the benefits of risk pooling and (2) spread the fixed costs of the program over a broader base, thus helping to lower rates. Lower rates, in turn, make the program more attractive to persons living in flood-prone areas and therefore can encourage even broader participation. Maximum community participation is important because it ensures that flood plain management regulations, designed to reduce future losses, will be in effect in as many flood-prone areas as possible.

FIGURE 1

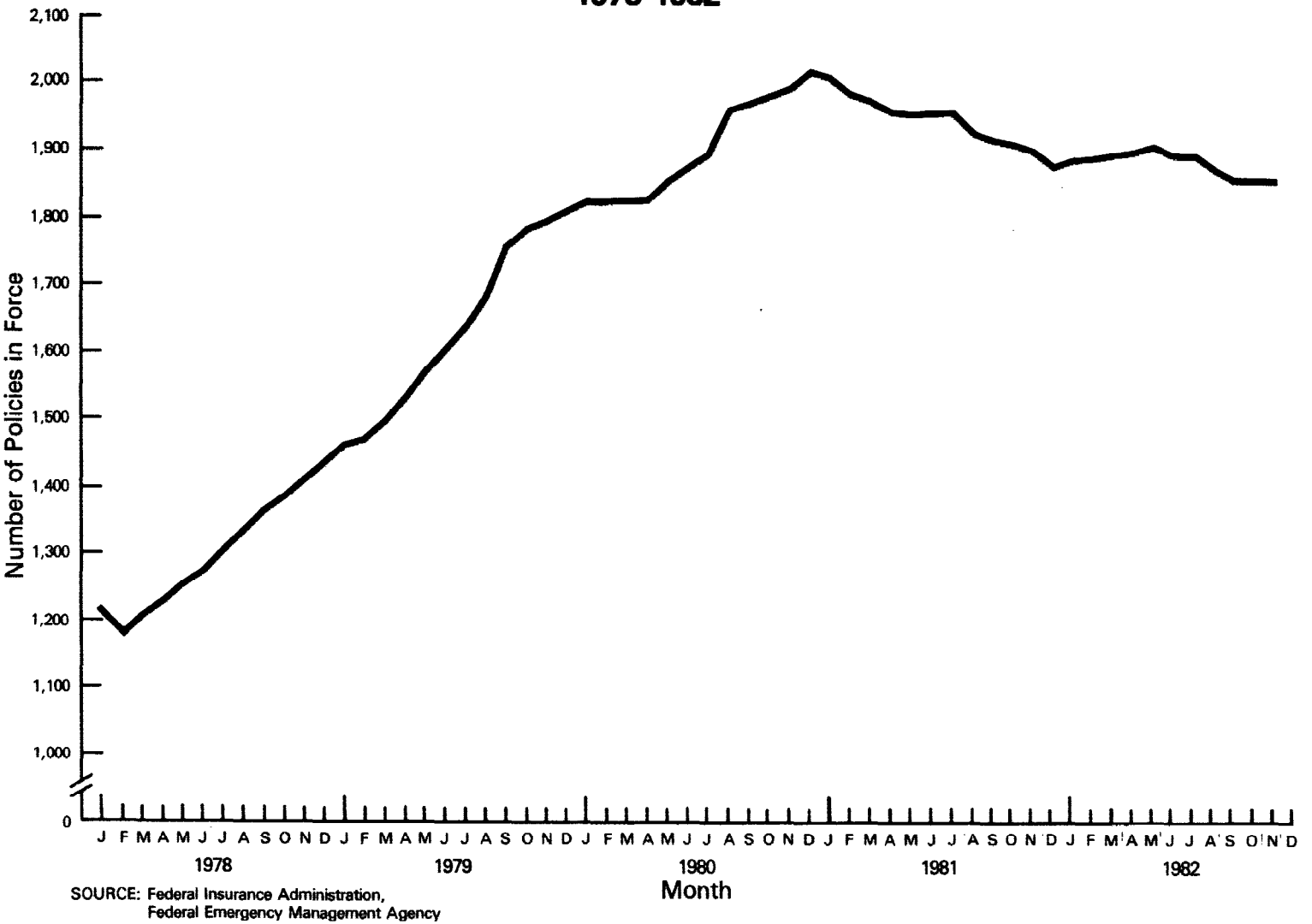
Number of Policies in Force by Fiscal Year
National Flood Insurance Program
1969-1982



SOURCE: Federal Insurance Administration,
Federal Emergency Management Agency

FIGURE 2

Number of Policies in Force by Month
National Flood Insurance Program
1978-1982



SOURCE: Federal Insurance Administration,
Federal Emergency Management Agency

HOW RATE INCREASES CAN CAUSE PARTICIPATION TO DECLINE

When the price of a good or service increases, consumers almost invariably reduce their demand for that good or service. In the case of flood insurance reduced demand could be manifested in two ways: (1) individuals who currently have flood insurance could cancel or not renew their policies or (2) individuals who were considering buying flood insurance could change their minds.

Participation declines generated by rate increases can be exacerbated by the phenomenon of adverse selection. As noted in our previous report (GAO/RCED-83-53), adverse selection occurs when insurance premiums are based on average rates set to cover a fairly broad spectrum of risk. Some individuals correctly perceive that their risk is smaller than that implied by the premium. If, in the face of higher premiums, these individuals choose not to insure, participation declines, property that is more flood-prone remains in the program, and a self-reinforcing cycle of higher rates occurs because average risk increases. In theory, participation could eventually drop to zero.

As we noted, however, in our report entitled "Federal Disaster Assistance: What Should the Policy Be?" (PAD-80-39, June 16, 1980), the only solutions to this problem are subsidized rates and/or compulsory participation. Currently, the act allows FEMA to charge subsidized rates in order to encourage the purchase of flood insurance. Communities are not required to participate in the program. Within participating communities insurance is required only for persons in special flood hazard areas receiving Federal financial assistance for construction or acquisition purposes.

If enough policyholders in a community elected to leave the program, the community might find that the benefits of having flood insurance available to its citizens no longer outweighed the costs imposed by adopting and enforcing the required flood plain management regulations. Given such a determination, a community might withdraw from the program. In this event flood insurance would no longer be available in the community.

Rate increases can affect the program in other ways

The program could also be negatively affected if in response to price increases, persons who keep their policies in force reduce the amount of insurance coverage they purchase. As noted in our prior report on the program's ratesetting process (GAO/RCED-83-53), the flood insurance program has experienced a problem with policyholders not insuring to value, i.e. underinsurance. Reductions in the amount of insurance purchased in response to rate increases could exacerbate this problem, to the program's detriment.

The problem of underinsurance arises because, on average, the probability of a total loss of property value is very small. In

general, most losses experienced by policyholders are partial losses. This creates an incentive for policyholders to underinsure their property since by underinsuring they can significantly decrease their premium payments and not incur a great risk of a loss exceeding the policy's face value.

According to the Deputy Administrator, underinsurance has a direct negative impact on the program's financial health. When people do not insure to value, the program is denied the extra premium income it would have received if the policyholder had insured to full value. This "extra" premium income is important since the program is less likely to have to pay out this income on a total loss. Conversely, even though it is receiving premium income on the lower amounts of coverage, it is more likely to have to pay out this income in partial losses. FEMA has compensated for this problem by using an underinsurance factor in its ratesetting process. Rates are raised above the amount needed to cover loss claims by factors ranging from 1.25 to 3.

If policyholders respond to rate increases by underinsuring, overall program deficits could increase with a resulting shift of the program burden from policyholders to general taxpayers. As the FIA Administrator noted, it would be difficult for FEMA to deal with additional underinsurance by raising the underinsurance factor, since the resulting higher rates could exacerbate the problem of adverse selection. Finally, the purchase of less insurance could, like a reduction in participation, increase the demand for other forms of post-disaster assistance.

Factors which could dampen these responses to rate increases

Several factors could prevent or at least dampen individual or community responses to rate increases. At the individual level, if an individual is receiving Federal financial assistance for acquisition or construction purposes and his or her property is in a special flood hazard area, section 102 of the 1973 act requires that flood insurance be purchased. Federal financial assistance can take several forms, including a loan from the Federal Housing Administration, from a bank regulated by the Federal Deposit Insurance Corporation, or from the Small Business Administration. This requirement would make it difficult for policyholders to withdraw from the program in the face of rate increases. Lenders may also require flood insurance on properties which they know are prone to frequent flooding but which are not subject to section 102 of the 1973 act. Again, in these circumstances it would be difficult for policyholders to withdraw from the program. Finally, an individual's ability to reduce the amount of insurance purchased is limited by the requirement in section 102 of the 1973 act that when Federal financial assistance is obtained, flood insurance must be purchased to cover at least the value of the mortgage or loan.

At the community level, if a community does not participate in the program, it cannot receive Federal financial assistance

for construction or acquisition purposes in its special flood hazard areas. Further, if a flood-related disaster occurs, persons living in the special flood hazard area will not be eligible for disaster relief to repair their property. In such a case, however, FEMA will allow a community to rejoin the program so that individuals can purchase flood insurance and subsequently receive disaster relief.

FACTORS OTHER THAN RATE INCREASES MAY HAVE CONTRIBUTED TO THE DECLINE IN THE NUMBER OF POLICIES

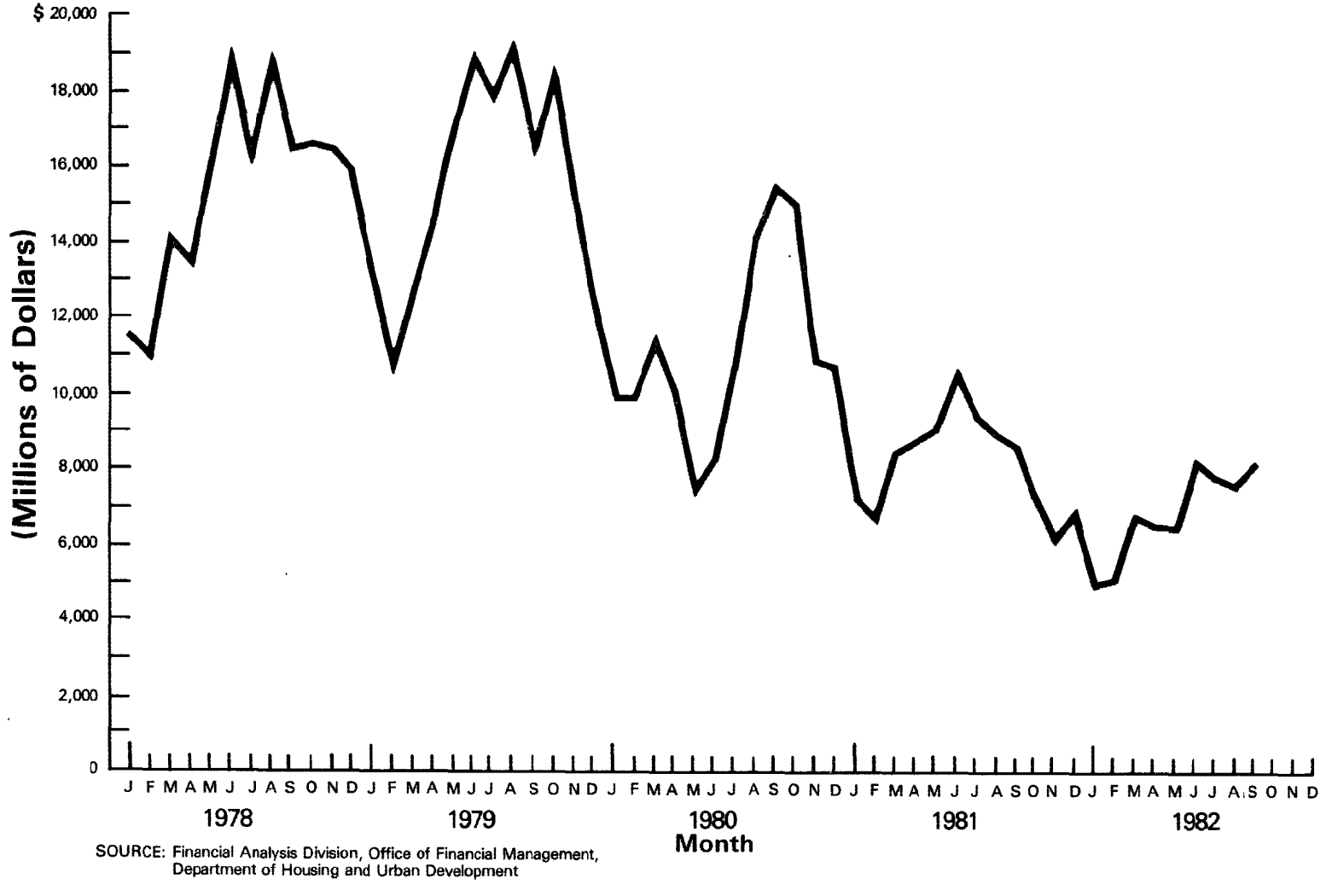
Other factors may also be at work which could adversely affect participation in the flood insurance program. Aside from rate increases, FEMA officials, industry representatives, and economic consultants told us that in order to study what impact rate increases have had on program participation, other factors, such as (1) the decline in the housing market, (2) the decline in flooding in recent years, and (3) the current economic recession, also need to be considered. These factors have the potential to affect the number of new policies sold and existing policies renewed.

Reduced real estate activity

The depressed state of the housing market in the last several years may have contributed to a decline in the number of new policies sold. As noted previously, under section 102 of the 1973 act, in order to receive Federal financial assistance to purchase, construct, or substantially improve a building located in a special flood hazard area, an individual must purchase flood insurance. This requirement extends only to communities with identified special flood hazard areas participating in the program, and only to loans made after July 1, 1975. FIA's Administrator, Deputy Administrator, Assistant Administrator, and a number of insurance industry officials believed that the relatively low level of mortgage activity, which would trigger the requirements of section 102, has been a major factor in the lack of growth in new policies and thus the decline in the total number of policies.

Lending institutions primarily affected by section 102 include the Veterans Administration, the Federal Housing Administration, and federally regulated financial institutions. These include banks and savings and loans insured or regulated principally by the Federal Deposit Insurance Corporation, the Federal Savings and Loan Insurance Corporation, the Federal Reserve, and the National Credit Union Administration. As shown in figure 3, overall monthly mortgage activity, as measured by the dollar amount of new long-term mortgages originated for one- to four-family nonfarm homes, has fluctuated downward since 1979. In 1979, a total of $185 billion in loans was extended, of which 80 percent was extended by Federal or federally regulated institutions. The annual total dropped in 1980 to $134 billion, of which 75 percent, or $99.7 billion, was lent by these institutions. In 1981, the total declined further to $98 billion, of which 73 percent ($72

FIGURE 3
Originations of Mortgage Loans for 1-4 Family NonFarm Homes 1978-1982



SOURCE: Financial Analysis Division, Office of Financial Management, Department of Housing and Urban Development

billion) was lent by such institutions. During the first 9 months of 1982, a total of only $62 billion had been lent (69 percent by Federal or federally regulated institutions). By way of contrast, for the first 9 months of 1979, the total was $140 billion. This declining mortgage activity for one- to four-family homes has occurred at roughly the same time as the program's decline in the number of policies. One- to four-family homes account for about 87 percent of the program's total number of policies.

The potential effect of the decline in mortgage activity on the number of flood insurance policies is lent further credence by the fact that about 65 percent of the current policies are financed with a mortgage. Data is not available on what proportion of the flood insurance policyholders are required by their mortgagees to purchase flood insurance under the terms of section 102 of the 1973 act.

We informally discussed the impact of this provision with members of the three major property-casualty insurance agent groups in the country--the Independent Insurance Agents of America, the National Association of Casualty Insurance Agents, and the Professional Insurance Agents. 1/ One member of the National Association of Casualty Insurance Agents indicated that most individuals to whom he sold flood insurance were required by their mortgagees to purchase the insurance. As a result, his insurance agency has not experienced a decline in the number of policies it services. However, his agency has written few new policies. Similarly, an official with the Independent Insurance Agents of America indicated that most of the people purchasing flood insurance through his agency who were not required to purchase flood insurance had dropped their policies. He attributed this to the recent rate increases. He also told us that some people who were required to purchase flood insurance had gone to their mortgagees and tried to be excused from the requirement. In some cases, he said, these individuals were able to reduce their policy coverage so that only the amount outstanding on their loans was covered--not necessarily the full value of their structures.

The recent decline in flooding

The extent of flooding within the United States decreased during 1980 through 1982. FIA officials and insurance industry representatives told us that this decrease may account for a part of the overall decline in program participation. The limited

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1/These individuals, who sell flood insurance in Florida, Louisiana, New Jersey, North Carolina, and Texas--States which include a large number of flood-prone areas and flood policies--are also participating in discussions the FIA Administrator is holding with the insurance industry on improving the program.

amount of empirical work done in the area of natural disasters and insurance also suggests that individual reaction to recent flooding could affect the number of flood insurance policies sold and renewed.

Economists and researchers in the field of decisionmaking theory and insurance have studied the effect of natural disasters on individual decisions regarding the purchase of insurance. Their work supports the contention of insurance industry officials that people are reluctant to buy property-casualty insurance for low frequency/high severity types of hazards like floods. Work conducted by Slovic et al 1/ on the effect of the probability of a loss on decisions to insure against the loss suggested that individuals are naturally predisposed to protect against high probability hazards and to ignore rare threats, such as a major flood which might occur only once every 100 years. A March 1977 study prepared for the National Science Foundation 2/ drew similar conclusions. Field survey data indicated that most people refused to worry about future losses from disasters which they perceived as having a small chance of occurring. This denial of a potential major disaster was the principal reason why insurance was not used as a means of self-protection. The most important variable which distinguished insured from uninsured was whether the hazard was considered serious and whether the insured knew someone who had already purchased coverage. Past experience was the most important factor which alerted homeowners to the severity of the hazard, particularly in flood-prone areas where many residents had suffered large losses.

As table 3 shows, the frequency and severity of nationally declared flood-related disasters and emergencies declined from 1980 through 1982 in comparison to the preceeding 2 years. According to a management analyst in FEMA's disaster assistance program, about 80 percent of all declared disasters are flood related. He believed that the number of floods and the amount of flood losses have dropped precipitously over the past few years. FIA claims data for fiscal years covering the same time period also indicates a similar trend of somewhat lower than normal flood losses in recent years.

1/Slovic, P. et al. "Preference for Insuring Against Probable Small Losses: Insurance Implications." Journal of Risk and Insurance, June 1977, Vol. XLIV, No. 2.

2/Kunreuther, H. et al. Limited Knowledge and Insurance Protection: Implications for Natural Hazard Policy. March 1977 (PB 270524).

Table 3

Incidence of Flood-Related Natural Disasters Which Warranted Presidential Declaration and Assistance (note a)

	1978	1979	1980	1981	1982
Major flood-related disaters	22	35	16	12	19
Flood-related emergencies	0	7	0	0	1
Estimated FEMA-provided disaster funds (millions)	$253.8	$520.9	$217.0	$28.9	$132.1

a/Pursuant to Public Law 93-288.

National Flood Insurance Program Claims Paid Fiscal Years 1978 to 1982

	FY 1978	FY 1979	FY 1980	FY 1981	FY 1982
Claims (millions)	$138.3	$380.5	$274.1	$110.0	$155.3

Source: Federal Emergency Management Agency.

If the incidence of flooding influences whether or not individuals perceive flooding as hazardous and thus purchase flood insurance, the reduced occurrence in recent years could contribute to some reduction in policies. Discussions with industry representatives tend to support this view. A member of Professional Insurance Agents stated that because the area he sells insurance in has been fortunate and not had a major flood recently, people are not buying flood insurance. His experience has indicated that people generally go out and buy insurance after a flood. Another member of Professional Insurance Agents told us that individuals he sells policies to are aware that a major flood could affect them at any time. This perception is based on the fact that they have experienced two such floods within this century. However, people buy policies only when the river rises two-thirds of the way up the town's levee. When the water recedes, he said, policies are allowed to expire.

Reduced flooding in recent years may have reduced program participation through the impact of the requirements imposed by section 102 of the 1973 act. To receive disaster assistance for

flood damage to buildings in special flood hazard areas, owners must obtain flood insurance. This assistance includes individual and public assistance provided by FEMA, as well as disaster loans provided by the Small Business Administration and the Farmers Home Administration. Insurance must adequately cover the size of the loan or grant and is required to be maintained by the recipient of the loan or grant. Because damages from flood-caused national disasters have dropped in recent years, it is possible that fewer individuals are being required to purchase insurance as a condition of receiving assistance.

The general recession

The state of the economy was a third factor mentioned by FIA and industry officials which could explain, in part, the decline in the number of policies. The recession may cause some individuals who might have purchased flood insurance to purchase other products more directly related to their well-being or which give a potentially greater return on their investment.

The U.S. economy is in its third recession within the past 10 years. As discussed in our August 31, 1982, report entitled "An Analysis of Fiscal and Monetary Policies" (GAO/PAD-82-45), the current recession began in July 1981--barely a year after the end of the 1980 recession, from which the economy had only just regained lost ground from the previous recession of 1974-75. While the current recession has not been, by itself, very severe, in combination with the 1980 recession it has weakened many sectors of the economy, in particular housing, mortgage finance, and the automobile industry.

Representatives from all three of the national agent groups held the view that the economy has influenced the decline in flood insurance policies. A member of the Professional Insurance Agents told us that if the water was not rising and it was not raining, people would not renew their policies--it was a choice between groceries and insurance. A member of Independent Insurance Agents of America said that some of the policies he has lost were not renewed because the policyholders were unemployed.

Individuals may also perceive that with the income they do have, flood insurance may not be a good investment. The authors of the March 1977 National Science Foundation study cited earlier postulated this view. Because people, in general, deny the potential for a major disaster, if insurance is brought to their attention they may view it as a poor investment--one not likely to return anything on their cash outlay. 1/

1/Kunreuther et al, p. 10.

THE RECENT PRICE INCREASES APPEAR TO HAVE CONTRIBUTED TO THE DECLINE IN INDIVIDUAL PARTICIPATION

Because the price increases and other factors discussed previously can simultaneously influence the number of policies in force, we used a regression analysis to determine if the price increases, as well as the other factors, have had any effect on program participation. A regression analysis attempts to explain the observed changes in a dependent variable, in this case the number of flood insurance policies, being caused by changes in any number of independent variables. Appendix III discusses in technical detail the data we used and our estimating procedure.

The results of our estimating procedure indicate that the three rate increases have had a negative effect on the number of policies in force. Because numerous factors determine the rate charged policyholders, we were not able to develop a single representative price for a unit of flood insurance. These factors include, for example, how a building is constructed, how close it is to a flood source, and how many families occupy it. Data was available, however, on the average premium paid by policyholders. The average premium paid is influenced not only by rate increases but also by the amount of insurance purchased; that is, the purchase of larger amounts of insurance will increase the premium paid. Consequently, we compensated for this by adjusting the average premium data to reflect the higher amounts of insurance purchased and used this adjusted value, which reflects the effect of the rate increases, in our regression analysis.

We also estimated to what degree the number of flood insurance policies responds to changes in the adjusted average premium paid--in economic terms, the price elasticity of demand. Our elasticity estimates indicate that the demand for flood insurance policies is relatively insensitive to changes in the adjusted average premium. In other words, all other things being equal, it appears that relatively large changes in the adjusted average premium are needed to produce relatively small changes in the number of flood insurance policies. Our analysis did not allow us to determine, however, the relative effect on program participation of the price increases as opposed to the other factors.

Our results also indicate that other factors have affected program participation. Disposable personal income and personal savings both appear to have had a significant influence. Thus, the slower growth rate in disposable personal income and the increase in personal savings experienced during the current recession may have contributed to the decline in the number of policies. The number of policies also appears to be sensitive to the price of a key substitute for flood insurance--the interest rate on Small Business Administration disaster assistance loans.

We found that the number of flood-related disasters occurring over a 3-month time span was positively related to the

number of policies. This would suggest that when fewer flood-related disasters occur, as has happened in the last 3 years, fewer flood insurance policies will be sold. This result tends to support the view that past experience can influence the decision to purchase flood insurance. It also tends to support the view that the requirements of section 102 of the 1973 act can increase the number of policies in effect after a flood-related disaster.

Our regression results did not support the view, discussed earlier, that the decline in the housing market has contributed to a decline in the number of policies. We used four variables to measure this phenomenon: (1) the dollar amount of mortgage loans originated on one- to four-family nonfarm homes, (2) the sales of new and existing single-family homes, (3) the estimated total number of conventional, Federal Housing Administration, and Veterans Administration mortgage loans, and (4) the total number of Federal Housing Administration and Veterans Administration mortgage loans. None of these variables showed the expected relationship--as housing activity declines the number of flood insurance policies should also decline. The disappointing results for this set of variables are difficult to explain. It is possible that if we had had time to develop a better set of data, including a reliable estimate of all lenders who might require flood insurance under section 102 of the 1973 act, our results might have improved.

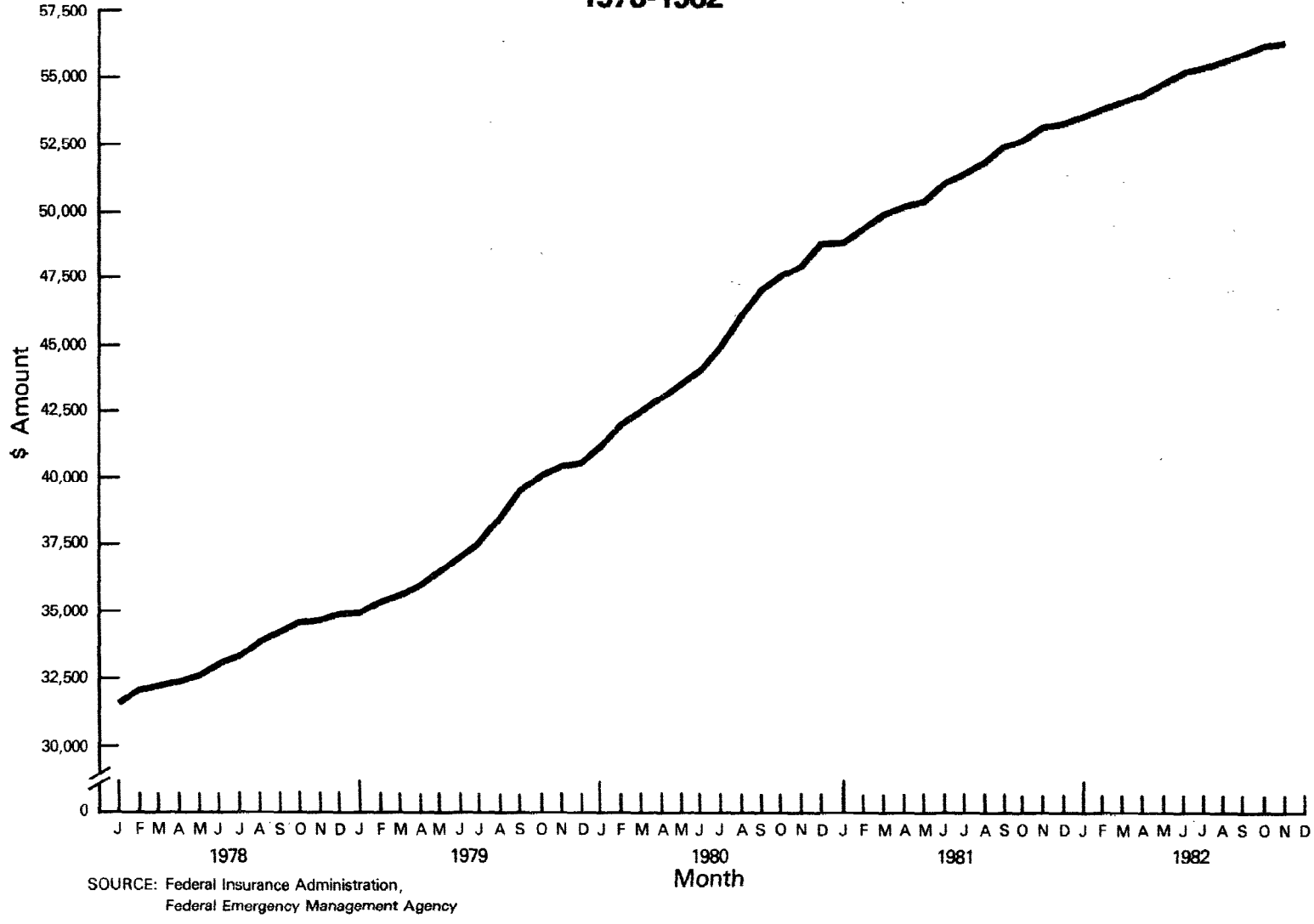
While the rate increases appear to have affected the number of policies in force, they appear to have had little effect on the amount of insurance purchased by policyholders remaining in the program. As shown in figure 4, the average amount of insurance purchased has continued to increase, rising from about $48,900 in January 1981 to about $56,400 in November 1982. FIA's Deputy Administrator attributed this to various actions FIA has taken to encourage the purchase of adequate amounts of insurance. These actions include

--offering lower rates for higher amounts of coverage purchased,

--automatically increasing the amount of coverage on renewal bills by 10 percent (policyholders may refuse this escalation), and

--providing replacement cost coverage if the owner of a single-family residence maintains insurance equal to at least 80 percent of value.

FIGURE 4
Average Total Coverage (Building and Contents) Per Policy 1978-1982



SOURCE: Federal Insurance Administration, Federal Emergency Management Agency

COMMUNITIES DID NOT LEAVE THE PROGRAM DUE TO RATE INCREASES

As noted earlier, since January 1981, only six communities have voluntarily left the National Flood Insurance Program. To determine if the rate increases had any impact on the communities' decision to leave the program, we asked FEMA to supply us with a list of the communities which left the program between January 1981 and December 1982. Using this list we contacted a cognizant official in each community and asked (1) why the community left the program, (2) if the rate increases had any impact on the community's decision to leave the program, and (3) if the community was concerned about losing Federal benefits after it left the program.

None of the officials in the six communities believed the community left the program because of rate increases. In fact, community officials told us that the rate increases had very little impact on their communities' participation. Rather, their reasons for leaving the program included the building restrictions imposed by the flood plain management criteria, a belief that there was not a need for flood insurance, and the communities' dislike of having the Federal Government tell them what they could and could not do in their flood-prone areas. Most community officials we spoke with were not concerned with the loss of Federal benefits.

The six communities did not have a large population or policyholder base. As can be seen in table 4, population ranged from about 600 persons in one community to slightly over 17,000 in the largest area. Before the six communities left the program, their total participation amounted to only 208 policies, or about 0.01 percent of the current total number of policies. In addition, only 33 claims were paid during the communities' participation.

Table 4

Statistics on Communities Which Have Left the National Flood Insurance Program Since January 1, 1981

Communities	Population	Population in special flood hazard area	Total number of policies	Total number of claims a/	Date of withdrawal
Rochelle, Illinois	8,594	200	8	1	10/81
Stewartstown, N. H.	1,008	39	0	1	3/81
Graford, Texas	613	66	0	0	9/82
Parker County, Texas	17,318	920	160	25	5/82
Richmond, Texas	5,777	0	24	3	9/81
Galax, Virginia	6,278	377	16	3	6/82

a/Claims made during the last 3 years of communities' participation.

Source: Information Resources Management Office, Federal Emergency Management Agency.

FEMA HAS RECOGNIZED THE POTENTIAL NEGATIVE IMPACT OF RATE INCREASES

FIA's Administrator is concerned about the potentially negative impact that rate increases could have on program participation and ultimately on the program's overall objective. He has stated that if FIA determines that the rate increases are having an adverse impact on the program, in terms of eroding the policyholder base, FIA will re-examine and revise its goal of achieving a self-sustaining program by fiscal year 1988. Concurrent with this study, FIA has been conducting its own study on the effects the rate increases have had on the policyholder base. An FIA program analyst told us he will try to establish the relationship between the decline in the number of policies and the decline in the housing market that we could not establish by focusing his analysis on the effect of the decline in the housing market on the number of new flood insurance policy applications. FIA officials expect their study to be completed before FEMA's fiscal year 1984 appropriations hearings.

ORGANIZATIONS AND INDIVIDUALS INTERVIEWED

We obtained information from the following individuals and organizations.

Insurance organizations

American Risk and Insurance Association

Independent Insurance Agents of America

Insurance Information Institute

Insurance Services Office

National Association of Casualty Insurance Agents

National Association of Independent Insurers

National Insurance Consumer Organization

Professional Insurance Agents

Reinsurance Association of America

Other

A. M. Best Company (an insurance industry statistical organization)

Chairman, Risk and Insurance Department, Graduate School of Business, University of Wisconsin, Madison

John Wilson and Associates (consulting economists)

Venezian Associates (consulting economists)

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TECHNICAL ANALYSIS

This appendix provides details for the technical reader on the regression analysis and results highlighted in chapter 2.

The equation we used was developed based on the demand function used in economics. In such a function, the demand for a particular good or service, such as a flood insurance policy, depends on (1) the price of the good or service, (2) the income of consumers, (3) the price of substitutes for the good or service, and (4) other factors which might influence consumers' tastes or preferences for the good or service in question.

We made our analysis using monthly data covering the period from 1978 through August 1982, the latest date for which all of the data was available. We did not attempt to use data prior to 1978 because reliable data for the flood insurance program did not exist at that time. We used the ordinary least squares method of estimation.

THE PRICE VARIABLE

The price a consumer is charged for a unit of flood insurance depends on a large number of factors including (1) whether he is in the emergency or regular program, (2) how close he is to a source of flooding, and (3) how his house is constructed. Ideally, we would have constructed a variable that adequately measured the price of a unit of flood insurance. However, the large number of factors which can determine the price prevented us from constructing such a variable.

Instead we used data on the average premium paid. The average premium, however, can be influenced not only by rate increases but also by the amount of insurance coverage purchased. As noted in chapter 2, the average amount of insurance coverage increased steadily between 1978 and 1982. To adjust for this we deflated the average premium data using an index we developed from the average coverage data. This has the practical effect of removing the influence of policyholders increasing their coverage from the average premium data, and results in adjusted average premium data which reflects the effect of the rate increases. 1/

As can be seen in table 5, the coefficient of the adjusted average premium variable had the expected negative sign--that is, when rates were increased the number of flood insurance

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1/A policyholder's average premium could also increase if he or she made a major alteration to a structure, for example, adding a second floor. Data was not available to determine to what extent this has occurred; therefore, we did not attempt any adjustment.

policies declined after accounting for the influence of other factors. The significance of the coefficient is indicated by the "t" statistic shown in parentheses. This variable was significant at the 95 percent level. 1/

We also computed the elasticity of demand using two methods. First, we estimated the equation in logarithmic form. This produced an elasticity estimate of 0.39. Second, we estimated the elasticity using the means for the adjusted average premium, and the number of flood insurance policies. This produced an elasticity estimate of 0.38. These relatively inelastic 2/ values indicate that, all other things being equal, the demand for flood insurance policies is relatively insensitive to changes in the adjusted average premium. Our analysis did not allow us to determine the relative effect on program participation of the price increases as opposed to the other factors.

OTHER VARIABLES

Our regression results indicate that other factors can influence the number of flood insurance policies. Income, as measured by disposable personal income, had a coefficient with the expected positive sign; in other words, as income increases, the number of flood insurance policies will increase. The income coefficient was also significant at the 95 percent level.

We included two variables to capture the price of substitutes. The first was the subsidized rate charged to homeowners on Small Business Administration disaster loans. We expected that as the rate went up, signifying an increase in the price for a disaster loan, consumers would be more inclined to purchase flood insurance. The result of our regression was that this variable had the expected positive sign but was significant only at the 80 percent level. We also included a variable for wealth, specifically total personal savings, on the grounds that as consumers' wealth increased they might be inclined to purchase less flood insurance, preferring instead to self-insure. This concept has

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1/In any estimate there is a range of error. A "t" statistic is computed to allow a researcher to determine within what range of probability the estimated value is significantly different from zero. The larger the absolute number for the "t" the more confident we are that the result is not just a chance occurrence.

2/Values of less than 1.0 are considered to be indicative of relatively inelastic demand.

been advanced by Kunreuther. 1/ Our result revealed the expected negative sign and was significant at the 95 percent level.

To account for factors which might influence consumers' tastes or preferences for flood insurance, we used two different variables. To capture the influence of recent flooding we used the number of flood-related disasters declared during the current month and the 2 previous months. We included the 2 previous months to account for any lag which might be experienced due to people not immediately buying flood insurance after a major flood and the fact that it may take a couple of months after a disaster before flood victims obtain Federal assistance, which requires the purchase of flood insurance. The coefficient associated with this variable had the expected positive sign and was significant at the 95 percent level.

To account for the influence of the decline in the housing market, we used several different variables. None of the results were what was expected. The first variable we used was the dollar amount of mortgage loans originated for one- to four-family nonfarm homes. We used this data because about 87 percent of the program's policies are on one- to four-family homes. The result was a coefficient with an unexpected negative sign; in other words, based on the results, as the amount of mortgage loans increased, the number of flood policies would decrease. This result was contrary to our expectations.

Because the number of policies more correctly depends on the number of loans originated and not on their value, we attempted to identify a data series to represent the number of loans made. We decided not to use data on the number of housing starts because this data includes only new homes and because even though a unit is started it does not necessarily follow that it has been sold. Instead we estimated the equation using data on the annual rate of new and existing single-family home sales. The result was again an unexpected negative sign. This could be explained by the increased use of owner financing, where the requirements of section 102 of the 1973 act are not applicable. As an alternative, we obtained data on the number of mortgage loans issued by the Federal Housing Administration and the Veterans Administration. We combined the total of this data with an estimate of the number of conventional mortgage loans processed which we obtained from a monthly survey done by the Federal Home Loan Bank Board. This total also resulted in a coefficient with a negative sign--contrary to the expected result.

1/See Kunreuther, H. "Economic Analysis of Natural Hazards: An Ordered Choice Approach." Natural Hazards--Local, National and Global, ed. G. F. White. Oxford University Press, 1974.

In a final attempt, we used a combination of the number of Federal Housing Administration and Veterans Administration mortgage loans. We did this because we knew the Federal Home Loan Bank Board data was only an estimate, and included lenders not subject to section 102 of the 1973 act. By using the combination of the two Federal programs we would have reliable data which included only loans where flood insurance could be required. The regression equation using this variable again produced a coefficient with a negative sign; however, it is included in table 5.

The disappointing results for this set of variables are difficult to explain. It is possible that if we had had time to develop a better set of data, including a reliable estimate of all the lenders who might require flood insurance under section 102 of the 1973 act, our regression might have produced improved results.

SUMMARY STATISTICS

Our R-bar squared indicates that the independent variables are explaining most of the variation in the dependent variable. The closer this statistic is to 1.0, the better the equation fits the data. The Durbin-Watson statistic for our original equation indicated that there was some correlation among the equation's error terms. We adjusted for this using a standard procedure.

Table 5

Regression Equation Results

Independent variables	Coefficient ("t" value)
Constant	571168 (4.419)*
Average premium adjusted for increased coverage purchased	-10145.5 (-9.160)*
Disposable personal income, in billions of dollars	1046.20 (15.35)*
Personal savings, in billions of dollars	-686.679 (-3.248)*
Interest rate on Small Business Administration disaster loans	3124.46 (1.211)**
Number of flood-related disasters declared during current month and the 2 preceeding months	2184.71 (3.143)*
Total number of Federal Housing Administration and Veterans Adminisration mortgage loans	-0.0147263 (-0.1021)
Summary statistics	
R-bar squared	0.9974
Durbin-Watson statistic	1.7991

*Significant at least at the 95 percent confidence level.
**Significant at least at the 80 percent confidence level.

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