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# Pricing Flood Insurance

*How and Why the NFIP Differs from a  
Private Insurance Company*

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# **Pricing Flood Insurance: How and Why the NFIP Differs from a Private Insurance Company**

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## **Abstract**

Flood insurance in the United States is offered through the federal National Flood Insurance Program (NFIP). After going deeply into debt following the 2005 hurricane season, pricing in the program has been the subject of debate and two reform bills. Private sector insurance pricing has often been used as a benchmark in these discussions. In this paper, we explain NFIP pricing in the context of actuarial pricing principles, clarify why some policies are priced below what is considered to be the full risk rate, and explain how and, more importantly, why NFIP pricing practices differ from the private sector. NFIP pricing has incorporated other program goals that are at times at odds with the ability to cover all payouts for insured losses without taxpayer support. These multiple programmatic goals make the private sector a questionable analog for the NFIP.

**Key Words:** flood insurance, rate-setting, NFIP, premiums

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# Pricing Flood Insurance: How and Why the NFIP Differs from a Private Insurance Company

Carolyn Kousky and Leonard Shabman\*

## 1. Introduction

Much of the debate surrounding the National Flood Insurance Program (NFIP) over the past several years has centered on the price of policies.<sup>1</sup> Following Hurricane Katrina in 2005, the NFIP went massively into debt to the US Treasury. One result was increased attention to the fact that many policyholders—roughly 20 percent—had historically been paying rates below what the NFIP would define as a full risk premium. In the summer of 2012, Congress passed NFIP reform legislation, which among other provisions required the NFIP to begin phasing out these lower rates. Almost immediately, NFIP policyholders and local communities complained to their congressional representatives that the higher rates made the insurance unaffordable for many floodplain residents. In response, Congress passed legislation in early 2014 that reinstated lower-rate classes for some policyholders and slowed the increase for others. It also, however, established a surcharge on all policyholders.

Private sector pricing, often referred to as actuarial, has been suggested as a benchmark for NFIP rates, with the argument being that the private sector would not artificially suppress rates below what was needed to fully cover the risk. Some of that public debate confuses the objective of actuarial soundness in pricing practices with the fiscal condition of the NFIP. Within constraints set by law, the NFIP may employ actuarially sound pricing principles. At the same time, because of restrictions on its pricing and operations, the NFIP may not collect enough premium revenue to cover payouts over the long run, which is a requirement for a fiscally sound program. As we discuss in this paper, NFIP pricing has incorporated other program goals that are at times at odds with the ability to cover payouts for insured losses without taxpayer support.

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<sup>1</sup> The terms price, premium, and rate are used interchangeably.

These other goals make the NFIP fundamentally distinct from a private insurance company and may make the analogy to the private sector a poor one. The NFIP aims to encourage communities to implement regulations governing floodplain development, seeks to have widespread participation in the program, and has the underlying objective that insurance should be “the preferred mechanism for disaster assistance” (Hays and Neal 2011, p.2). It may be more appropriate to consider the NFIP as a means to have floodplain occupants partially pre-pay the costs of their disaster aid. Indeed, FEMA has noted that some lower rate classes, discussed below, were adopted to encourage insurance purchase so that property owners “would still be funding at least part of their recovery... This was considered preferable to... disaster relief that came solely from taxpayer funding,” (Hays and Neal 2011, p.4). This is quite a different policy objective than mimicking a private insurance market.

In this paper we explain NFIP pricing in the context of actuarial pricing principles, clarify why some policies are priced below the FEMA full risk rate, and explain how and, more importantly, why NFIP pricing practices differ from the private sector. In essence, NFIP rate setting does not mimic the rate-setting process that would be used by a private insurance company because the NFIP does not face the same costs, management requirements, or objectives as a private insurer. We discuss four major differences in rate-setting practices between the NFIP and the private sector: (1) NFIP premiums include discounts and subsidies for some policyholders put in place to achieve other program goals; (2) the NFIP has different cost loadings; (3) the NFIP is not managed to be able to cover catastrophic loss years; and (4) the NFIP has legislative restrictions on its ability to manage its overall portfolio. Future pricing reform for the NFIP must take note of these fundamental differences and make trade-offs among multiple program objectives.

The next section of the paper provides background on the NFIP and its pricing. Section 3 discusses what it means for rates to be actuarially sound and how this applies to the NFIP. Section 4 discusses each of the four differences noted in the preceding paragraph. Section 5 offers reflections and conclusions.

## **2. Background on the NFIP and Current Pricing**

The NFIP, currently administered by the Federal Emergency Management Agency (FEMA), was created in 1968, largely because flood coverage was not widely available in the private market. The intent in 1968 was to make insurance available. To be eligible for NFIP coverage, a property must be in a community that voluntarily opts-in to the program and adopts minimum regulations for areas mapped by FEMA as a “100-year floodplain.” These required

regulations point to the fact that the NFIP must support other goals beyond providing insurance. These include providing flood risk information to communities and reducing national exposure and vulnerability to flood hazards through floodplain management. Encouraging purchase of NFIP policies both within and beyond the 100-year floodplain has long been a program goal in order to reduce reliance by households on federal disaster aid; this has been advanced in part by making NFIP premiums more “affordable,” as we will discuss. Since 2005, particular attention has been paid to aligning premium income with insurance payouts—even in catastrophic loss years. This goal suggests that the NFIP should have process and payout rules that more closely mimic those of private sector insurance companies to keep it solvent even through catastrophic flood events.

The NFIP offers building coverage to residences up to a \$250,000 coverage cap and contents coverage up to \$100,000. Businesses can insure both contents and buildings up to \$500,000 each. Private insurance companies write the policies and process claims in exchange for a fee from the NFIP. This is referred to as the Write-Your-Own (WYO) program. Roughly 85 percent of policies are purchased through a WYO company, and the remainder are purchased through a FEMA contractor. As of June 2014, there were 5.38 million policies-in-force nationwide, representing \$1.28 trillion of coverage.

The NFIP sets flood premiums based on flood zones, which are depicted on Flood Insurance Rate Maps (FIRMs). The 100-year floodplain is referred to as the Special Flood Hazard Area (SFHA). In a SFHA, flood insurance is mandatory for homeowners who obtain mortgage loans from a federally backed or regulated lender. Congress adopted this mandatory purchase requirement in the 1970s after observing very low take-up rates for flood coverage. Within the SFHA are two zones, A and V; the V zones are subject to wave action, or storm surge. Prices vary by zone and, for SFHA policies, also by structural characteristics of the house—most notably, its first-floor height relative to the estimated height of waters in a 100-year flood, known as the base flood elevation. In essence, the NFIP groups similar risks according to flood zones and aspects of the structure, and assigns to each group the same rate, which can be read from a rating table. This is not unlike the practices of many private insurance companies.

The full risk rating method used by FEMA for SFHAs is based on a hydrologic model developed by the US Army Corps of Engineers and coupled to damage curves.<sup>2</sup> The probabilities of various-magnitude floods are modeled, and curves that relate these probabilities to damages based on the value of the property and characteristics of the structure (such as elevation) are used to develop an expected damage amount. The damage curves are checked against claim experience. The same rate is thus applied to properties that have similar characteristics, such as flood zone, building elevation, and type of basement. In 2008, the Government Accountability Office (GAO) raised concerns that some of the data used in this modeling were outdated or inaccurate. FEMA has been updating FIRMs and making other improvements, but certain items, such as probability estimates of floods, have not been updated in some time (GAO 2008).

Premiums are then adjusted by several factors. First is a loss adjustment factor, which covers the costs of loss adjusters and special claims investigations. Second is a deductible offset, and third is an underinsurance factor, which accounts for the fact that many policyholders do not insure to value (and rates are calculated based on full values), making lower claims more likely. Finally, an expected loss ratio adjustment loads rates for agents' commissions and other expenses, and a contingency loading of 10 percent of premiums is applied in A zones and 20 percent in V zones. Outside SFHAs, rates are based on actuarial and engineering judgments based on the results of the rate model and historical experience, since the cost of detailed frequency-magnitude relationships would be too high relative to the benefits (Garcia-Diaz 2014). The NFIP classifies the first \$60,000 of building coverage for single-family homes (\$175,000 for businesses) as the "basic limit" and charges higher rates for coverage under this amount, since losses are more likely to occur in this range; rates are lower for coverage beyond the basic limit (Garcia-Diaz 2014).

The NFIP is authorized to borrow from the Treasury in years when claims exceed revenues. For reasons discussed below, the program was never designed to cover catastrophic loss years, and the 2005 hurricane season sent the program into a debt from which it has yet to recover. Losses from Hurricane Ike in 2008 and Sandy in 2012 only exacerbated the debt. As of December 31, 2013, the debt stood at \$24 billion (Garcia-Diaz 2014). GAO has determined that the NFIP, as currently structured, is unlikely to collect enough revenue to cover future

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<sup>2</sup> Using modeling results, which are based on historical loss experience, and extrapolated to cover rare events, is consistent with private sector practice. Private firms often rely on more sophisticated catastrophe modeling; more information on these can be found in Grossi and Kunreuther (2005).

catastrophic loss years or repay its debt to the Treasury; it has thus been on GAO's High-Risk List since 2006 (Garcia-Diaz 2014).

### 3. NFIP Prices and "Actuarial" Principles

The Casualty Actuarial Society presents four principles for actuarial pricing practices. First, the rate should reflect the expected value of future costs. Second, it should provide for all the costs of risk transfer. Third, it should provide for all the costs associated with individual risk transfer (i.e., no cross-subsidization among policyholders). Finally, if the first three principles are met, then the price should not be excessive, inadequate, or unfairly discriminatory. Several states have adopted the language in this fourth principle: that an actuarially sound rate is one that is not excessive, inadequate, or unfairly discriminatory (American Academy of Actuaries 2012). Of course, such terms are open to interpretation. At a high level of abstraction, an actuarial rate would be the expected losses over the contract period, plus loading factors for expenses, profits, and uncertainty. One important caveat is that actuarial rates are subject to current laws and regulations.

The NFIP faces many constraints, but so do other lines of insurance. A National Research Council report draws a distinction between actuarial soundness and fiscal soundness in the NFIP (NRC 2013). The report concludes that the NFIP is fiscally unsound in the long run, but *within legislative constraints*, it may be actuarially sound. We discuss these constraints in Section 4 but here consider the NFIP objective of making rates affordable. The NFIP has established two types of rates in the program: full risk rates, to be set based on actuarial principles, and other than full risk rates, which were intentionally lowered for certain policyholders. If NFIP rates do not reflect actual expected damages or costs of risk transfer, but these liabilities are imposed on the program by statute, then the rates could still be considered as conforming to actuarial principles within the confines of the law, although they may be fiscally unsound.

Not surprisingly, then, prices for NFIP coverage could vary from those in the private sector, whether because of different costs, different regulations, or departure from actuarial principles. The Property Casualty Insurers Association of America concluded, using 2009 rates, that the NFIP is providing flood coverage on average at half the rate that would be offered by the private sector; for lower-risk properties, private sector rates would only be 23 percent more, but in higher-risk areas, true risk rates would be more than 200 percent higher (PCI 2011). Another study, examining two counties in Texas, found that the NFIP undercharges in many areas compared with a private company, but in some low-risk areas it appears to be overcharging relative to a private company (Czajkowski et al. 2012).



The next section explores in more detail four major differences between NFIP and private sector rates.

## 4. Four Pricing Differences

### 4.1. *Discounts and Subsidies*

The premium discounts and subsidies given to certain groups of policyholders are the best-known way in which NFIP pricing differs from what a private insurer would charge. Currently, two major groups of policies receive rates that are lower than FEMA full risk rates would indicate: pre-FIRM discounted policies<sup>3</sup> and grandfathered policies.

Pre-FIRM properties are those built before FEMA had mapped flood risk in a community. These discounts were adopted to encourage greater participation in the program by both communities and individuals and to not force the abandonment of otherwise viable capital stock (Hayes and Neal 2011). FEMA estimates that pre-FIRM properties are slightly less than 20 percent of policies-in-force (Hayes and Neal 2011). FEMA does not recoup this lost revenue from raising premiums on other policyholders nor does it receive taxpayer funds to offset these lower rates. As of 2010, pre-FIRM discounted policies experienced up to five times more flood damage than new properties built in compliance with maps and charged NFIP full risk rates (GAO 2010). When the program was created, it was thought these policies would be phased out over time as properties were lost to age or to flooding. However, while their proportion has greatly decreased, a large number remain in the program (Bingham et al. 2006). Under the 2014 legislation, pre-FIRM discounts are now being phased out for second homes, businesses, and properties that have seen repeated flooding.

Note that the goals leading to creation of the pre-FIRM discount—namely, encouraging participation and not unfairly penalizing homeowners with high rates who built before the program was established—are ones a private company would not share. To meet these other objectives, FEMA is unable to price policies based on risk for these older structures. There are private sector insurance analogues where pricing according to risk and expected payouts is not

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<sup>3</sup> FEMA refers to the pre-FIRM properties as subsidized. Since there is no explicit cash transfer from another source to cover the difference between the pre-FIRM rate and the full risk rate, we refer to them here as discounted. Note, however, that the pre-FIRM properties are receiving a set rate, not a percentage reduction off the full risk rate for the property.

possible. For example, some states and countries restrict the ability of insurance companies to price based on age, income, or gender when writing an automobile insurance policy, even if data show accident risk correlated with these factors.<sup>4</sup> As another example, it has been observed that state insurance commissioners may suppress rates (keeping them lower than the insurer would like to charge) and compress them (introducing cross-subsidization between low- and high-risk properties) (Klein and Wang 2007). So even in the private sector, rates may not strictly reflect the expected loss when insurers are constrained by regulators for other reasons, such as concerns over equity and discrimination.

There are three other classes of discounted rates in the program, but their overall numbers are small. The first is properties that will be protected from the 1 percent chance flood due to ongoing construction of a protective measure, such as a levee, that is at least 50 percent completed. The rates in these areas are set as if the protection were already in place. A second group is properties behind structural protection that no longer meets the 1 percent chance flood level but for which certain measures for restoration to that standard have been taken. The last group is V zone (coastal zone) properties that were built between 1975 and 1981, a time when the NFIP building regulations for coastal zones did not reflect storm surge risk because of the lack of models.

In the 1980s, the decision was made that the combined revenue from properties receiving discounts and those priced at full risk rates should be enough to cover losses from the “average historical loss year,” which was calculated as the mean annual loss over the life of the program. Of note, losses from 2005 were so extreme that they would have led to large rate increases, a step FEMA did not want to take without the explicit support of Congress. In subsequent years, 2005 was therefore given a weight of only 1 percent in calculating the average historical loss year (Hayes and Neal 2011). A private insurance company would not offer discounts akin to the NFIP discounts and would not be allowed by regulation to set revenue targets that were “backward looking” and excluded catastrophic years. This is discussed further in Section 4.3.

The second group of policies that are not paying full risk rates are so-called “grandfathered” properties. These are properties that were built in compliance with the hazard map in effect at the time of construction, and are given a lower rate if a new map moves them to a higher risk zone. The program tries to recoup these lower rates by charging higher rates across

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<sup>4</sup> Thank you to Patrick Brockett for supplying this example.

all other properties in the entire zone. This is an explicit cross-subsidization between grandfathered properties and all other properties in the SFHA; this cross-subsidization is not done with the other classes of discounted policies. It is not clear, however, whether the NFIP is increasing other SFHA policy premiums by an amount equal to the discount from the grandfathered properties since it does not keep data on grandfathered policies. Grandfathering is a policy that a private sector firm would not adopt as it was done with other public goals in mind, namely maintaining participation in the program and a perception of fairness on the part of homeowners in response to updated mapping.

#### ***4.2. Costs of Providing Insurance***

There are several costs that a private insurance company must pay, which must therefore be reflected in its rates. First, a private company must hold capital reserves, some of which come from investors and some from premium revenue. A higher capital base implies a stronger company that is more likely to be able to pay claims in severe loss years, such as those even less frequent than a 1-in-100 event. The amount of capital a company must hold is set internally and will vary by company, but is influenced by both regulation and rating agencies (lower ratings make it more expensive and difficult to raise capital), as well as firm-specific decisions. In the United States, state regulators and rating agencies set risk-based capital requirements (usually stricter for rating agencies than for regulators). Because they must access capital, private insurers include in their premiums a loading that reflects the cost of capital. This is the return demanded by investors and reflects the opportunity cost of those funds. It also reflects a risk premium: if investors view the investment as riskier, they will demand a higher rate of return. The NFIP, on the other hand, does not raise private capital or hold a reserve and thus does not need to load rates to reflect this. In addition to maintaining reserves, most private companies purchase reinsurance to manage some of their exposure; these costs are reflected in their rates. By design, however, the federal treasury has made credit available to the NFIP and private reinsurance is not purchased. However, the recent reform legislation requires that FEMA conduct a study on purchasing private reinsurance.

Second, private companies must pay federal taxes on investments but the NFIP does not. US insurers are not allowed to set aside tax-free accounts to pay future claims (Grace and Klein 2008), so they must pay taxes on premium revenue that comes in during low-loss years, even if saving it to pay future claims. This said, tax loss carryforward provisions may make this of minor importance. Both private companies and the NFIP pay state premium taxes.

Finally, administrative costs may vary across the NFIP and private companies. Private companies pay commissions to agents, licensing fees to states, payments into state guarantee funds (to protect policyholders in the event of bankruptcies), and other underwriting costs. Some of these costs, such as payments into state guarantee funds, the NFIP does not have to pay. As stated above, the NFIP pays WYO companies a fee to write policies and process claims (see Section 2.1). WYO companies also get a bonus for expanding the policy base of the NFIP. The GAO has found that the NFIP pays one-third to two-thirds of annual premium revenue to WYO companies but does not collect any data to compare these payments with actual expenses of the companies, making it impossible to know whether these payments are appropriate or excessive (GAO 2009). In 2008, FEMA did use actual expense data to modify the way it handles payments for claims processing because of very large payments to WYO companies in 2004 and 2005 (GAO 2009). In addition, the NFIP charges a \$20 policy fee to cover the costs of flood insurance studies, floodplain management activities, and some administrative costs of the program. We know of no good comparison between NFIP and private administrative fees.

#### ***4.3. Pricing for Catastrophes***

The NFIP does not price policies to be able to pay claims from a catastrophic loss year out of current revenue; claims are paid from Treasury borrowing. One aspect of this was discussed above—the NFIP provides discounts to certain policies and aims for total revenue to only equal the historical average loss (see Section 4.1). But even its “full risk” rates are not priced for a catastrophe. Many private insurance companies are managed to stay solvent with a certain probability. This might be set by regulation, such as in the European Union, or influenced by rating agencies. The requirement that a private company be able to cover claims for loss years that exceed the average prompts companies to include catastrophe loadings in rates. For portfolios of independent risks, this loading can be modest, since annual losses do not vary considerably from one year to the next. For catastrophic lines, such as floods, however, this loading can be quite large.

A catastrophe loading covers the costs of building a reserve, purchasing reinsurance, or any other activities undertaken to gain access to capital in high-loss years. For disasters like flooding, the high-loss years can be quite severe, requiring access to enormous amounts of capital in those years. The NFIP does not include a catastrophe loading, even in its actuarial rates. The Biggert-Waters reform act required the NFIP to begin building a reserve equal to 1 percent of total potential loss exposure, but as currently structured, the program will not be able to meet annual contribution targets. In fiscal year 2014, FEMA added a 5 percent assessment to

all policies to build this reserve fund. GAO estimated that a roughly 25 percent assessment was required, but the 2014 legislation capped rate increases at 15 percent (Garcia-Diaz 2014). It is thus impossible for the NFIP to achieve both legislated requirements simultaneously.

The NFIP was designed to borrow from the Treasury in bad years and return funds to the Treasury in good years, operating on a cash flow basis. As discussed, it never priced, and still does not, to cover extreme loss years, such as 2005. Congress is now trying to move the program a bit closer to being able to cover higher-loss years from premium revenue. Still, this will not be enough to cover the outstanding debt, let alone future high-loss years. The Biggert-Waters 2012 reform legislation required FEMA to produce a report on repaying its debt within 10 years. The report has not yet been released, but GAO reported that FEMA has determined that repayment is not possible within that time period, even if the price increases from Biggert-Waters had remained in effect (Garcia-Diaz 2014). Some argue that since the NFIP was never designed to be able to cover losses such as those incurred in 2005, Congress should forgive this debt, particularly since Congress has legislated requirements that prevent the program from pricing to cover such a year. To date, that has not been done.

#### **4.4. Overall Portfolio Management**

The addition of catastrophic risks to an insurance company's book of business requires more capital than for adding non-catastrophic insurance lines, and thus it is more expensive. Similarly, adding a risk to its portfolio that is correlated with its current holdings is more expensive than if the company were to add risks that are independent and increase diversification. For companies already writing wind coverage in hurricane-prone areas, for example, adding flood coverage could be expensive because it would be highly correlated with their current policies. That said, Lloyd's of London began writing coverage after Biggert-Waters, offering rates at times lower than the NFIP's (Harrington and Martin 2014).<sup>5</sup> Unlike a private company, the NFIP does not have the ability to add uncorrelated risks to its portfolio, nor does it price with consideration to its aggregate portfolio; it prices on a per property basis only. It thus does not adjust rates according to whether they concentrate exposure or increase diversification of the overall holdings of the program.

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<sup>5</sup> A very small number of carriers have long written flood coverage in certain areas, often in excess of the NFIP cap (Dixon et al. 2007).

Private companies would also manage their aggregate exposure by limiting underwriting in certain areas or for certain risks or by altering the terms of a policy. For example, some insurance companies have reduced their hurricane exposure along the Gulf Coast. In 2010, Farmer's announced it would drop more than 10,000 policyholders along the coast of Alabama, joining Allstate, Alfa Mutual, and State Farm in reducing exposure in that area (Amy 2010). As another example, after the 2011 tornadoes, some companies sought broader geographic diversification, reduced the amount of exposure in tornado-prone areas, increased deductibles, or changed pricing (Berkowitz 2012). The NFIP, however, is prohibited from denying coverage to anyone in a participating community and thus cannot manage its overall risk through selective underwriting. This has forced the program to continue to insure repetitive loss properties, for example, which are roughly 1 percent of policies but account for 35 to 30 percent of all claims payments (GAO 2010). Many of these properties are also receiving pre-FIRM discounts. A private insurer could choose not to insure such properties. The NFIP does add a contingency load to policies for A and V zone properties below the base flood elevation, ranging from 10 to 25 percent for the potential increase in risk, but it cannot exclude any properties.

## 5. Discussion and Conclusion

As discussed here, the NFIP differs in its pricing from a private company along multiple dimensions. Many of these are constraints imposed on the program. It thus must do its best to set rates within the confines of other requirements. This can make the program actuarially sound, within the given restrictions, but hurts its ability to pay claims out of its revenue. The best-known constraints are the discounted rates the NFIP must charge, but there are other pricing differences as well. One important conclusion of this paper is that eliminating the discounted and grandfathered rates may contribute to improving the fiscal soundness of the NFIP but would not be sufficient to repay its debt, nor would it insulate the NFIP from future deficits. To achieve those goals, other changes in pricing would be required. In addition, changes would need to be made to the operation of the program. For example, the NFIP is required to insure all eligible properties regardless of a single property's loss history. If properties have recurring losses, FEMA makes mitigation grants to minimize these future payouts, since their drain on the NFIP cannot be eliminated by a denial of coverage and sound rating for these properties would be politically untenable.

Our most general point is that fiscal soundness is not the NFIP's only goal and other program goals may conflict with risk-based pricing practices that might be required of a private insurer, making analogies to the private sector inappropriate. For example, encouraging take-up

of flood insurance is a program goal, and the NFIP makes the argument that higher take-up of flood insurance can reduce federal disaster aid payments (Hayes and Neal 2011). Households are more likely to insure, though, if the cost is lower. This partially motivated some of the pricing decisions that have been made over the life of the program; it was deemed preferable for households to pay at least part of the cost of an insurance policy than rely completely on federal disaster aid. At the core of the policy debate over NFIP pricing is the fundamental question of how future costs of flood losses should be shared by (1) the policy holder in the form of premiums, (2) the federal taxpayer through subsidies to the NFIP (for example, forgiving the debt, or other targeted payments), (3) the federal taxpayer through spending on post-flood disaster aid, and (4) by each property owner in the form of uninsured and otherwise uncompensated flood damages as a consequences of the floodplain location.

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