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Abstract: Home equity is the single largest component of household wealth for the majority of American households. Yet, there is virtually no way for the average family to insure itself against drops in home value and the ensuing destructive financial loss. Much of U.S. housing policy has focused on helping Americans own their own home, but relatively little has focused on helping protect them against the risk that home ownership entails.

In this paper, we document the development and implementation of a home equity insurance program launched in 2002 in Syracuse, New York. The range of issues arising from the practical implementation of a home equity insurance program, as well as the institutional challenges offer useful data for further extensions of the program.

Highlights of the outcome, to date, of the pilot program include the finding that implementation of the program was feasible on the local level, that customers understand and wanted to take part, and that clean data on housing transactions is a vital component of the future success and expansion of the project.

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1. Introduction

There are by now a large number of theoretical schemes that promise both to improve the operation of housing finance markets and to increase the general welfare. Yet cases in which these ideas have borne practical fruit are few and far between. This paper describes just such a case. It outlines the process by which the broad idea of house price insurance, an idea with deep historical roots, has evolved into a product that is currently available for purchase in the city of Syracuse, New York. This study shows just how intricate is the process of reform, and suggests that a profound convergence of interest is needed to make even the most theoretically attractive products feasible.

As detailed in section 2, the initial impetus for our project was the poor performance of the economy of Syracuse in the 1990's. The local political and business communities were willing to consider innovative proposals to halt the pattern of urban decline, and our home insurance project is the result. This project required a rich collaboration among not only the co-authors of this paper, but many others beside.

Ours is not the first home price insurance scheme. An important precursor was offered by the City of Oak Park in Illinois in the early 1970's. Yet for reasons outlined in section 3, this scheme and its more recent variants could not be used as a template for our project. One major drawback of these schemes is that they severely restrict the right of sale in order to ensure that adequate effort is put into the sale of the home and that the home is adequately maintained. To avoid these restrictions, we early on embraced a suggestion due to Shiller and Weiss [1993]: that product payouts should be based on changes in a house price index, rather than changes in the price of individual homes.

The key question of how we chose among available indices is outlined in sections 4 and 5 below. Section 4 outlines the simple criteria that we used in assessing index performance, while section 5 explains how an analysis of these criteria led us to select a ZIP-code repeat sales index for the project in Syracuse. As discussed therein, the key limitation in the pilot project is the need to use an "off-the-shelf" product, rather than to design our own index from scratch. In the long run, market expansion hinges on improving the design of these indices.

In section 6 we simulate payouts on our proposed insurance product. In the course of these simulations, we present additional elements of product design, specifying in particular the precise contingencies in which payments will be made, and any restrictions on the use of the product such as a minimal period of occupancy. With these details understood, we discuss in section 7 additional considerations impacting the setting of price, and ensuring the capital adequacy of the program.

The process of product design is intricately interwoven with the need to fit with the various rules and regulations governing financial transactions in general, and housing finance and insurance in particular. The nature of these regulatory constraints on product design is detailed in section 8.

Section 9 addresses the more general importance of our pilot project. If the program in Syracuse succeeds, it will bring financial and economic stability to city residents, and to the broader community. It may also spur increased interest in the city among financial institutions that may otherwise have been reluctant to participate in neighborhood revitalization. Such a success might inspire replication in other declining cities, and might also have a profound impact on public policy. All of those who believe

that home ownership is a valid route to wealth accumulation will be better able to make this argument if the extreme risks on the downside can be mitigated.

In the end, we believe that our research may have significance that extends beyond the particulars of home price insurance. There are many reform proposals in the housing finance arena, and yet few of them get translated into practice. Maybe what is needed to produce further reforms is a dramatic example of an idea being taken all the way from the drawing board to the market place. If so, ours may not be the last story of success in translating theoretical ideas for housing finance reform into practice. According to the most optimistic vision, we may be standing on the threshold of a revolution in the U.S. system of housing finance.

2. Background to the Project

Once a thriving industrial city that peaked at 250,000 inhabitants in 1950, Syracuse suffered significant population losses starting in the 1950's with the decline in its manufacturing base. The economy of Syracuse and other cities in the upstate New York region continued to decline during the 1990's, while the rest of the country was on the upswing. According to Census figures, the city of Syracuse lost 10 percent of its population from 1990 to 2000, declining from 164,000 to 147,000 residents.

Concomitant to the loss in population and in manufacturing activity, the Syracuse housing market declined precipitously. Home prices in Onondaga County (the city of Syracuse and several of its suburbs) dropped by 16.5 percent in nominal terms from the fourth quarter of 1988 to the fourth quarter of 1997. Half of all homeowners in the county who sold their homes in 1997 did so at a loss. As homeowners left the city, many city neighborhoods were left with an overwhelming preponderance of investor-owned properties – the homeownership rate in Syracuse stood at just 40 percent by 2000, while the number of vacant properties had risen to more than 1,000.

Given the long history of decline and even greater fears for the future, Congressman James Walsh issued an urgent challenge to revitalize the distressed neighborhoods in Syracuse. One outcome of this was that the Syracuse Neighborhood Initiative (SNI) was set up in 1999. SNI is a collaborative effort between the City of Syracuse, local and national non-profit community development organizations, and private sector leaders to revitalize neighborhoods in Syracuse and reclaim and reduce the city's substantial stock of vacant buildings.

At the behest of Congressman Walsh, Neighborhood Reinvestment Corporation (NR) was called in to provide assistance to SNI. NR is a public, nonprofit organization that was chartered by Congress to help revitalize the nation's distressed, older communities. For nearly 25 years, the corporation has provided funding, training, technical assistance and program monitoring to a network of over 225 local nonprofits working in over 2,000 communities across the country. The nonprofits engage in a variety of activities including home ownership education and lending, affordable housing development and management, economic development, neighborhood revitalization and community building.

In November 1998, NR conducted a symposium in Syracuse called "What Works" to provide examples to Syracuse stakeholders of programmatic strategies and best practices for addressing such a soft market and to foster dialogue. This symposium

introduced the community to the Initiative and began to lay the groundwork for solutions. One key question asked was why there was not more interest among renters in buying their homes, given that houses were so affordable (in 2001 the median sale price for a home in Syracuse was only $60,000). One of the sessions in the symposium focused on the home equity insurance programs that had started in Oak Park, and had been replicated in several Chicago neighborhoods, and a number of other areas in addition (see section 3 for a complete discussion of these cases). The programs in Illinois were seen as providing particularly instructive examples, because the neighborhoods in which the product has been offered have generally enjoyed strong housing markets, and have stabilized as racially diverse, mixed-income areas.

After the symposium, the City of Syracuse and SNI asked NR to do a follow-up study to explore the potential of an equity insurance program in Syracuse. Their report further buttressed the case for such a program. The authors of the report found that a major factor in the decline of Syracuse was population loss to the surrounding suburban areas. Moreover, evidence was gathered through interviews and surveys that fear of continuing price declines in city neighborhoods was contributing to disinvestment in and of itself.

In most markets, a fall in price leads to an increase in demand. But in the real estate market, a decline in price may further depress demand as homebuyers become concerned that homeownership will prove to be a bad investment. Real estate agents reported that homebuyers were shying away from city neighborhoods because they perceived it as a bad investment, while existing owners in the city were looking for a chance to get out before they lost everything. Even today, feedback from focus groups suggests that many potential homebuyers consider it a near certainty that prices in Syracuse will continue to decline.

Given the high level of fear in the atmosphere, NR believed not only that an equity protection program might encourage new investment in Syracuse neighborhoods, but also that it would help to protect the many families who were already homeowners in Syracuse. These owners included many low- and moderate-income households who had purchased homes through government subsidized programs, only to see their equity put at serious risk. Overall, NR concluded that by making it safe for potential and current homeowners to invest in a home, an equity assurance program would directly address one of the main barriers --- risk to the homebuyer's equity --- to reinvesting in older urban neighborhoods like those in Syracuse.

With the conceptual case clear, SNI asked NR to take the lead in developing an insurance product for use in Syracuse. Following up on this, the two NR staff members who are co-authors of this report – Beth Prentice, the director of the corporation's New York & Puerto Rico district office, and Eric Hangen, a member of the district staff – took on the task of designing a program appropriate for Syracuse. Beth and Eric contacted researchers at Yale School of Management and met with an interdisciplinary team from Yale and NYU interested quite broadly in housing, finance and urban issues. Ultimately, the project was structured as a joint venture between the Yale School of Management and Neighborhood Re-Investment Corporation. It involved the active efforts of researchers from Yale, New York University and Real Liquidity, Inc.

In addition to those listed as authors of the paper, the research team at various times included Professors Douglas Rae of the Yale School of Management, and Professor

Barry Adler of New York University. HUD provided home mortgage data and Freddie Mac provided additional data, along with other research, legal, and marketing assistance.

The academics in the team were largely motivated by a desire to participate in the development of an innovative product to mitigate a problem of great theoretical and practical importance: real estate risk. Theoretically, the benefits to risk sharing in the residential real estate market appear overwhelming. Empirically, Goetzmann (1993), Flavin and Yamashita (1998), and Englund, Hwang, and Quigley (2000), have confirmed the magnitude of these benefits, not only in the U.S. but also overseas. In addition, the notion that such products might encourage ownership is supported by results of Rosen et al. (1984) concerning the impact of house price risk in reducing the incentive to own. Moreover academics have proposed several different market structures in addition to simple insurance to enable this risk sharing to take place. In addition to proposing the broad development of insurance markets, Case, Shiller, and Weiss (1993) analyzed the potential value of a market in futures contracts tied to regional house price indices, allowing households and institutions to hedge by taking short positions in these derivatives contracts. Caplin, Chan, Freeman, and Tracy (1997) suggested setting up "Housing Partnerships" allowing far broader ownership and risk sharing in the housing sector. The project therefore held a natural fascination for those of us interested in how to translate these theoretical ideas into practice.

3.Home Equity Insurance: A Historical Perspective

The roots of home equity insurance go back to at least 1925 when Civil Code § 453hh was added in California. This code regulated land value insurance. After minor amendments in 1933, land value insurance was codified into the California Insurance code in 1935. Four years later, it reached a sudden, and apparently ignominious, end. All sections of the land value insurance code were repealed, and transacting in land value insurance was made a felony. In a unanimous vote on June 20, 1939, land value insurers changed from regulated industry to criminal enterprises. The records do not explain this radical change of status.

The first actual home equity insurance program in the U.S. was started the Department of Defense in 1966, in the "Demonstration Cities and Metropolitan Development Act Of 1966"[2]. This ongoing program protects military personnel and civilian contractors from loss in home value caused by the closing of a nearby military installation.

Marcus and Taussig [1970] and Yarmolinsky [1971] were the first to propose general home equity insurance programs. In both proposals, the payout to the purchaser was based on the difference between the insured value and the actual sale price of the home. Marcus and Taussig envisioned financing this insurance from the public purse, while Yarmolinsky suggested policies should be written by the commercial insurance industry and then reinsured by the federal, state, or local government. Professor Yarmolinsky suggested a pilot program, with administrative costs covered by a local government or foundation that would also guarantee the policy risk, if the insurer fails. Oak Park, Illinois launched just such a program in 1978.

[2] Public Law 89-754, Section 1013 (80 Stat. 1255,1290)

In 1973, a women's group named "First Tuesday" in Oak Park, Illinois, an incorporated village on Chicago's northwest edge, formed to discuss efforts to racially integrate. They realized that the panic of declining home value that led to "white flight" was a major hurdle to orderly racial integration of Oak Park. To defuse the panic, "First Tuesday" had, by 1977, convinced the Village to implement a home equity assurance program, conceptually nearly identical to the program described by Professor Yarmolinsky in 1971. Oak Park launched the program backed by a property tax in 1978, with 99 households enrolling in the first four months. The Oak Park experiment with home equity insurance became the model on which other home equity insurance programs were based for the next 20 years.

After much ethnically charged debate, in 1988 the state legislature passed the Illinois Home Equity Assurance Act, which allowed local precincts in Chicago[3] to pass binding referenda creating local tax districts to support home equity insurance programs. Following this, schemes have been offered in various other districts of the city.

The first question for the team was whether or not we could adapt existing these programs to the Syracuse context. Superficially this seemed to be a promising possibility. However, the more we explored the details of these schemes, the more obvious it became that the answer was no. Hersh [2001] provides the most up-to-date description of these programs, although there remains no comprehensive presentation anywhere in the literature.

The apparent attractiveness of these schemes is easy to understand. In the original Oak Park scheme, for a one-time fee of $175, the participants were offered the opportunity of claiming back 80% of any losses after they had owned their homes for a minimum of 5 years. This price to the individual participant was set well below estimates of program cost, so that these costs had to be raised through a general tax levied on all homeowners in neighborhood.

In many respects, the Oak Park program appears to have been a great success. Prices in the neighborhood have generally risen, and there has apparently never been a single insurance claim against the program. In fact, the program appears to have been a victim of its own success. The neighborhood is now so successful that the program is no longer offered, in part with the rationale that the mere presence of the scheme may suggest a fear that is no longer relevant. According to Mahue [1991],

> "The Oak Park program's … participants now have dwindled to 99, most of whom are original members….. Furthermore, administrators no longer promote the program, citing that the speculation and uncertainty caused by such promotions could trigger a, "where there's smoke, there's fire" response among home owners."

The other schemes set up under the broader Illinois law offer even more coverage than did the original scheme. For a one-time fee of no more than $200, the programs cover 100% of the losses on sale of one's residence after the five-year waiting period.

[3] The Illinois Home Equity Assurance Act limits its purview to cities of 1 million or more people, § 65 ILCS 95/2 (2003), so Chicago is the only city in Illinois to which it applies. Smaller cities in Illinois can, like Oak Park, charter home equity insurance programs on their own, but the state statute enabled neighborhoods within Chicago to charter programs under the state code and bypass Chicago politics.

Following the lead of Illinois, there are other programs current or pending in Baltimore, Pittsburgh, and in two communities in Missouri: Ferguson and Florissant. All of these schemes offer participants coverage of their entire loss after a five-year holding period. However, the programs outside Illinois remain very small: there is little supporting legislation, and in some cases the funding base remains unclear. In essence, the only case that is well developed enough to offer design lessons is the Illinois case, and it is this case that we investigated in more detail.

One of the most remarkable features of the Illinois programs is the limited number of households who purchase the insurance, despite the fact that the price involves a heavy component of subsidization. Hersh reports that there were 1500 households who initially used equity assurance in Oak Park, a number that had fallen by a factor of 10 by the year 2000. Even according to these numbers, which may in fact be overstated, only 15% of owner-occupiers chose to avail themselves of this subsidized insurance. [4] In the other municipalities in which it has been offered, the take-up rates have generally been below 10%.

Why would there be such limited demand for such an apparently important and attractive product? The reason is obvious as soon as one looks at just two of many product "details".

Limited Coverage

The first product feature that might restrict homeowner interest is that the insurance applies only to strictly local fluctuations. According to the Illinois Home Equity Assurance Act 65 ILCS 95, the insurance is:

> "Intended to provide relief only from specifically local adverse housing market conditions within the territory of the program as they may differ from municipal-wide, regional, or national housing conditions" (65 ILCS 95/3)

Given the intent to cover only local fluctuations, the program can be temporarily suspended if there is a:

> "5% annual decline in the median value of existing houses in any 12 month period for the nation, Midwest region, State of Illinois, or municipality in which the program is located according to statistics published by NAR" (65 ILCS 95/13)

Thus the program specifically excludes the type of wholesale price fall that occurred in the city of Syracuse.

Restrictions on Sale

A second major problem with these schemes is that they impose onerous payout conditions. Insurance is based on the *actual* transactions price. This means that a whole section of the Illinois law (section 8) has been written to prevent excessive or fraudulent claims. Each individual program has nine commissioners appointed by the Mayor of the

[4] Unfortunately there is no definitive report on these programs, so that even the number of enrollees is a subject of dispute. According to Mahue [1991], there were never more than 150 members of the Oak Park program.

municipality in question. Home sales that trigger a claim need to be vetted by this committee. The first step in this process is for the homeowner to submit a "notice of intent to sell", which may then trigger an appraisal for a possible write down of the guaranteed value (if the property is deemed to have deteriorated since purchase). After filing this notice, the owner must list the house for sale according to program guidelines "at a price that can be reasonably expected to attract buyers."

If the property is not sold at guaranteed value in ninety days, the homeowner must then file a "notice of intent to claim." The commission then requires the owner to submit to a new 60 day listing with municipality-wide advertising at price *they* set. If there is an offer during this 60 days which is below the guarantee, the commissioners have three working days to approve or reject the offer. If they fail to act, this is tantamount to rejection. In cases of disagreement, the result is arbitration as set out in section 10 of the Law.

Given the limitations on use and the restrictions in the right of sale, it is no wonder that take up rates have remained small. In fact the complexity of the claims process may in part explain the apparent success of the program, at least as measured by the miniscule claims against the insurance funds.

Even though the Illinois programs may be of doubtful value to individual homeowners, this does not mean that they are of no value to the community. Indeed, it can be argued that the chief value of the Oak Park scheme was precisely that its mere existence added to confidence. The initial introduction of equity assurance was in large part designed to reassure existing homeowners that the Oak Park neighborhood would not be allowed to decline.[5] The theory is that preventing neighborhood decline is much like preventing a bank run. Without this type of protection in place, people might sell in advance of any reality, and their fear of decline may become a self-fulfilling prophecy.

If the program works as a confidence-building device, then one might expect it to be very popular at the community level, even if there is limited demand from individual homeowners. Unfortunately, this does not seem to be the case for the programs in Illinois. Any municipality may vote to institute just such a program, yet very few have in fact done so.

One possible reason for communities to be skeptical of the value of these programs is an entirely rational fear of high administrative and insurance costs. As stressed by Mahue, the programs are expensive to administer, and there is no capital stock to support any policy payouts. Thus if values in the neighborhood were in fact to decline significantly and trigger a significant volume of claims, the money would have to come from a special tax assessment levied on all property owners, regardless of whether or not they had chosen to participate in the program. This would be particularly inappropriate in Syracuse, where property tax rates are already high relative to much of the U.S.

Contemplating the fallout from a serious decline in real estate prices raises one potentially alarming possibility concerning these programs. It seems possible that a severe downturn would make the programs insolvent. In turn, fear of insolvency might trigger a rush to sell at the early stage of the downturn, in order to make a claim prior to

[5] Along with providing protection against a sudden decline in neighborhood property values, the program restricted the public display of for-sale signs, with the goal of calming existing homeowners.

insolvency. The neighborhood would decline in part because of a "run" on the insurance fund, with the initial claims stoking fear of further decline and therefore triggering new claims in a self-fulfilling downward spiral.

The problems alluded to above made clear to the research team that we would have to start our task of product design without relying excessively on the example of Illinois. The transactional complexity of the scheme also suggested to us that it would be better to use a scheme based on a house price index rather than one based on individual house prices. Shiller and Weiss (1998) provide additional quantitative arguments in favor of index-based techniques on the grounds of moral hazard in maintenance.

4. Evaluating Index Performance: A Simple Approach

In this section we set out the main criteria we use to assess the performance of any given index in terms of its ability to provide homeowners with protection declines in the value of their homes. Before outlining these criteria, we introduce one key feature of product design that plays a crucial role in these evaluations.

As discussed by Case and Shiller, there are a great many different ways in which one can offer insurance against home price declines. The key issue that distinguishes these various different forms of insurance is the condition under which the funds are actually paid out. In principle, one could offer a fully-flexible product that allowed the insurance to be claimed at any point, treating it as a pure financial option. On the other end, one might offer a policy allowing claims only in very few contingencies. One specific product variant discussed by Case and Shiller requires that in order to claim, the household in question not only has to sell their current home, but also has to purchase a new house at least 50 miles away from the home being sold.

After much internal discussion, the team decided that the best option would be to mimic one aspect of the Oak Park program, and allow exercise at point of sale, without reference to future purchase behavior. Simulations suggested that by allowing exercise at will, the price that would have to be charged for the insurance would become prohibitive. For this same reason, we also rejected such intermediate options as allowing exercise upon termination of a specific mortgage. Fortunately, evidence from focus groups suggests that most people believe that the most important point at which to receive an insurance payment is the point of sale, so that this restriction apparently would do little to lower consumer interest. With respect to restrictions on movement, we felt that such restrictions would not sufficiently lower program costs to justify its somewhat onerous terms.

Another option discussed by Case and Shiller is a product in which the index-based insurance is paid out only to those who lost money at point of sale. We worried that this would set up bad incentives with respect to maintenance and improvements. We wanted to provide positive incentives for homeowners to maintain and improve their homes. In addition, we thought that potential customers would find the product particularly attractive if they could make a profit on the sale of the home should they have taken particularly good care of it, even if their neighborhood declined.

Given the assumption of exercise at point of sale, the fundamental input to any measure of index performance is actual or simulated data on repeat sales data for the houses in a given area over some fixed time period indexed by t, with $0 \le t \le T$. The

universe of repeat sales in the given area for the given period is indexed by $i \in I$. The precise source of this data varies from case to case, depending on whether we are looking at a particular historical event, or simulating future events.

Repeat sale transactions can be partitioned into those involving sale at a (strict) loss and those involving sale at the purchase price or above, I_L and I_G respectively. The date of purchase in repeat sale *i* is $t_0(i)$ and the date of sale is $t_1(i)$, with corresponding prices $p_0(i)$ and $p_1(i)$. The level of the particular price index under study throughout the period is *P(t)*. Note that while the universe under study comprises repeat sales, the underlying index may be constructed based on any amount of additional information, including hedonic measures of housing characteristics, transactions prices in surrounding areas, and broader economic indicators.

The question of interest is how well insurance based on the value of the index covers individual losses given all of the above fundamental data. Here we make one key simplifying assumption. We assume that index insurance is purchased by all homeowners in the area in an amount that precisely corresponds to the initial value of their home. If their house value was to be perfectly aligned with the index, this would imply that they were 100% insured.

In practice, we allow households to buy index insurance different in value than the value of the home itself. A household that is particularly concerned with not suffering losses may decide to purchase insurance corresponding to an amount in excess of the face value of their home. The additional insurance increases the proportion of losses that are going to be covered. This implies that associated with any given insurance product is a whole set of different performance criteria, based on the extent of coverage chosen. We believe that our calculations based on universal purchase of insurance of equal face value to the house captures the essence of what is available with a given index, but it must be borne in mind that there may in fact be richer options available.

Given these assumptions, we can compute the actual insurance payout for each repeat sale in the sample. Specifically, the *index-based insurance payout* on transaction *i* is,

$$\pi(i) = \max\{[\frac{P(t_0(i)) - P(t_1(i))}{P(t_0(i))}]p_0(i), 0\}.$$

Having computed these payouts for each transaction *i*, the first question concerns how well actual losses are covered (*coverage).*

- Definition 1: The (*average loss) coverage* of the index is defined as,

$$C = \frac{\sum_{i \in I_L} \pi(i)}{\sum_{i \in I_L} [p_0(i) - p_1(i)]}.$$

This definition involves averaging up individual loss coverage according to the dollar amounts of the loss. This measures what fraction of a loss is covered on average. Note that in calculating this measure, we do *not* average a payment of 200% to one homeowner and 0% to another and call this 100% coverage Instead, we take the more conservative approach and only count payments that cover the actual loss.

A second important determinant of index performance concerns whether or not the index inadvertently pays out significant funds to those who have in fact not suffered losses (*efficiency*).

- Definition 2: The *efficiency* of the index is defined as, $E = \frac{\sum_{i \in I_L} \pi(i)}{\sum_{i \in I} \pi(i)}$.

Efficiency measures the fraction of total payouts that went to people who lost money on their sales. The efficiency number may understate "true" efficiency if there are homeowners who only profit on their sale because of specific investments that they made in improvements.[6]

Our measures of coverage and efficiency are computed on a per dollar basis. They measure respectively how much of each dollar of losses is covered, and how much of each dollar of payouts goes to those who incurred losses. In addition to these per dollar measures, we need measures of total program costs, both actual and ideal. To measure the actual payout costs of a given index, we compute the *payout ratio* as the ratio of non-discounted payouts to the initially insured value of housing. This is the cost of paying claims, without taking account of administrative costs and capital requirements.

- Definition 3: The *payout ratio* is defined as, $P = \frac{\sum_{i \in I} \pi(i)}{\sum_{i \in I} p_0(i)}$.

This measure of actual program costs needs to be contrasted with the costs of a program that perfectly targets actual losses. We label this the *loss ratio*.

- Definition 4: The *loss ratio* is defined as, $L = \frac{\sum_{i \in I_L} [p_0(i) - p_1(i)]}{\sum_{i \in I} p_0(i)}$.

The coverage, efficiency, loss ratio, and payout ratio are related by the identity,

$$P = \frac{L.C}{E}.$$

In the next section, we will explore the manner in which various different indices perform according to the above criteria using both actual and simulated data, in Syracuse and in other parts of the country. Of course, the indices that we get using fixed geographic categories, such as the ZIP code, will never be quite as precise as one might get by using an expert system in which true neighborhood boundaries are tracked over time. It will therefore always be of interest to consider also how any given index does against such an expert system.

Neighborhood-Level Heterogeneity

The starting point for the analysis of neighborhood-level heterogeneity is some ex ante division of the geographic area in question into smaller neighborhoods. In many

[6] We are only measuring nominal losses. Thus many of the people who made money in nominal terms will have lost money in real terms. We do not include these individuals in our calculation, further lowering reported efficiency.

cases, neighborhood boundaries may be well known to all who inhabit a given area, and yet be entirely different from the basis on which the indices are constructed. For example, in the city of Syracuse, city records show a division into 20 distinct residential neighborhoods with significant levels of owner-occupation. The boundaries between neighborhoods bear no relation to standard ZIP-codes. One should expect to find similar subdivisions in any reasonably large geographic area. This raises the obvious question of whether a given index performs well or badly in terms of its treatment of the various different underlying neighborhoods.

What are the appropriate measures of how well a given index is performing at the neighborhood level? Clearly, one wants to achieve similar levels of coverage in all neighborhoods. An index that has 80% coverage in one sub-market and 20% in a second of equal size is clearly inadequate in the second sub-market even if the average coverage of 50% is deemed acceptable. One also wishes to achieve similar levels of efficiency in all neighborhoods. An index that covers 50% of losses in two different regions may nevertheless systematically misdirect far more funds in one of the neighborhoods than in the other. Hence one technique for gauging neighborhood level heterogeneity is to recalculate our measures of coverage, efficiency, and payout ratios at this level.

Important as it is to repeat these measures at possibly ever more refined levels, we believe that it may also be important to measure heterogeneity of index performance separate from the notion of how well and efficiently losses are covered. In conceptual terms, an index has heterogeneous performance at the neighborhood level if and only if it contains within its borders two or more geographically and demographically distinct sub-regions, identifiable ex ante, that have experienced fundamentally divergent price dynamics. In the next section we present a preliminary analysis of neighborhood heterogeneity in the Syracuse context.

Refining the Criteria

It is clear that the simple criteria outlined above are far from the last word on how to measure index performance. For example, our effectiveness measure is weighted by the size of the loss. There are other useful definitions available in which the losses are measured in real terms, averaged across transactions rather than on a dollar for dollar basis, or measured in some other more utility-relevant fashion. Such alternatives are in mind for long-term research.

Even as we refine our theoretical criteria for ideal index performance, we must bear in mind that actual transactions histories contain a great deal of noise. Some sales are not truly at arm's length, so that the corresponding transactions prices are essentially meaningless. In other cases, houses are left to deteriorate and it is this that accounts for declines in price. In yet others, there are radical improvements that account for price increases. Hence we would neither expect nor desire to achieve 100% effectiveness in practice. In particular, we have no desire to protect individuals from their own failure either to maintain their home, or to put in the effort required sell it at a fair market price. We want to protect people from market conditions, not from moral hazard.

5. Index Performance in Three Historical Episodes

In this section we address the fundamental question of index choice for our Syracuse equity insurance program. Time and resources constraints and the need for a consistent available data source imposed one profound limitation on our adoption of an index for the project. All of these computations are carried out using various geographically defined repeat-sales indices that are not of our construction. The broadest is OFHEO's MSA-level index. Somewhat narrower is the Mortgage Risk Assessment Corporation's (MRAC) index at the county level. The narrowest involves the use of MRAC ZIP code level indices.

There are many reasons why we will ultimately have to take a more hands-on role in generating the methods used to construct the indices. One crucial issue is that all available indices use the *repeat-sales* methodology. With this methodology, indices have significant measurement error in the short-run. In fact, the level of the index for a particular month is revised over time as new trades are realized. In the computations below, we use throughout the value of the index as computed at the end of the sample period, which may differ significantly from its value as computed on a real-time basis.

Measurement error is of great importance to those who are offering index-based insurance, since it adds extra volatility into an index. Since protection essentially is a put option, it becomes more expensive where there is more noise. Our geographically specific repeat sales indices are particularly good candidates for this form of error, since they may be based on a small number of highly idiosyncratic transactions, and they ignore vast amounts of available information. Information relevant to the value of the index in a specific time and place can be found in transactions that occur in surrounding geographic areas, in ensuing time periods, and in entirely different markets. There may be additional information contained in the volume of transactions. How best to construct an index for insurance purposes is an issue that is in need of greatly increased analysis.

With respect to the specific indices that are being compared, one would expect the use of finer geographic resolution to improve index performance, at least until the point where the improved specificity is swamped by measurement error given the small number of trades that actually take place. Note that the presence of significant measurement error at the ZIP code level is suggested by the facts presented in table 1. It is well known that there is positive serial correlation in real estate returns. This is reflected in the increase in annualized volatility at longer horizons in an index of US real estate values. This same increasing pattern of volatility is present at the MSA level. However it is reversed at the ZIP code level, suggesting that mean-reversion in rates of return implied by measurement error at this level is overwhelming the serial correlation. Table 1 shows that this effect is no longer so significant when we look at the largest ZIP codes by population.

TABLE 1: STANDARD DEVIATION OF RETURNS AT DIFFERENT TIME HORIZONS

Annualized standard deviation				
	1 qtr	1 year	2 years	5 years
Stocks	14.6%	14.7%	13.4%	14.4%
US real estate	2.2%	3.0%	3.8%	3.8%
MSA real estate	3.4%	5.0%	6.4%	6.7%
ZIP code	10.2%	8.7%	8.5%	8.4%

ZIP code large MSAs	10.8%	10.0%	10.4%	10.9%

There is one last choice to be made. There were practical limits to our ability to get hold of data on repeat sales. Hence we had to be selective concerning the historical episodes of particular importance to the evaluation of index performance. Clearly, Syracuse in the 1990's is the central case to be understood. Beyond that, our selection process was strongly influenced by our view that the fundamental goal is to provide protection to and build confidence in those in markets that may in future decline. We would like them to be confident that their investment will remain more or less intact in the face of such a decline. Hence our primary empirical concern is with the coverage of losses in the face of a systematic regional downturn. Syracuse in the 1990's is not the only case of such a downturn, so it is of interest to perform calculations of coverage, efficiency, and payout ratios for other areas that have had similar patterns of decline. To this end, we use data from MRAC on repeat sales in two other geographic locations that experienced sizable house price declines, namely New Haven County since the mid-1980's and Los Angeles County in the early 1990's.

Syracuse

Table 2 illustrates the coverage, efficiency, and the payout ratio for actual repeat sales in Onondaga County during the time period 1991- 2001. We have data on 3,323 repeat sales transactions. This represents all recorded transactions in the county, excluding those that have the very highest and lowest 3% of returns on an annualized basis, which we treat as outliers.[7] On average, the homes in the sample were purchased for an initial price of $83,902. When we compute the total of all losses on houses that fell in price, it averages to some $6,288 per transaction (including those in which there were gains). It is the ratio of these losses to the initial price of the houses that accounts for the recorded loss ratio of 7.49% in table 2.

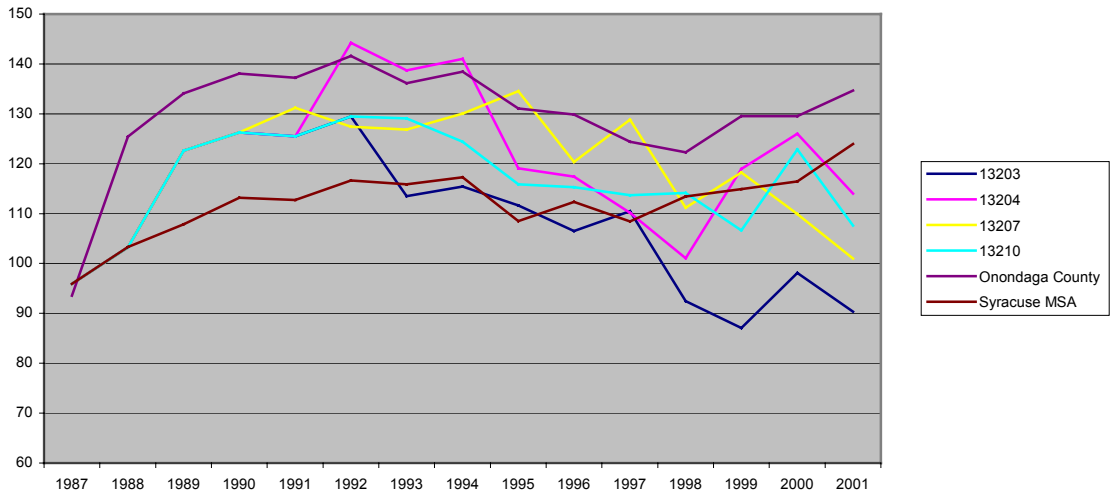
The results in table 2 present our three different underlying indices: OFHEO's MSA-level index, the MRAC index for Onondaga County , and the MRAC ZIP code indices. There are 15 different Zip codes in Onondaga County, of which 8 are entirely contained in the city of Syracuse itself, and 2 more overlap the city. Figure 1 shows the different patterns that these various indices have taken during the 1990's.

TABLE 2: Index Performance in Syracuse

Syracuse N=3253	Coverage	Efficiency	Payout Ratio	Loss Ratio
	C	E	P	L
OFHEO	12.1%	55.0%	1.64%	7.49%
MRAC county	31.3%	53.6%	4.38%	7.49%
MRAC ZIP	42.3%	50.1%	6.33%	7.49%

[7] Our general findings are robust to various different rules for defining outliers.

FIGURE 1: Index Plot for Selected ZIP Codes, Onondaga County and the Syracuse MSA



As one might hope, the coverage level of the indices increases significantly as the geographic definition of the index area is narrowed. The MSA index covers only 12% of losses, while the county level index covers more than 30%, and the ZIP index more than 40% of all losses. In terms of efficiency, there turns out to be relatively little difference among the indices. In all cases, roughly 50% of the money paid out appears in fact to compensate sellers for actual losses. Given that efficiency remains similar regardless of the index used, there is a close link between coverage and payouts. The low coverage of the MSA index is reflected in a low payout ratio of well under 2%, while the high coverage of the ZIP index is reflected in a payout ratio in excess of 6%.

Given that the ZIP indices provide so much better coverage than the broader indices, it is natural to wonder whether even further refinements should be considered. What happens when we look at the neighborhood-level heterogeneity of our ZIP indices? Are there ex ante identifiable geographic and demographic divisions within Syracuse in which the index performs particularly poorly or particularly well? To assess this, we use the division of Syracuse into 20 residential neighborhoods as used by the city planning office. The neighborhoods are delineated as areas set off with strong boundaries, and are recognized by residents as well as the planning office.

In looking for neighborhood-level heterogeneity, we use data on all 3,323 transactions. For each such transaction, we compute the "drift": the difference between the realized return on the repeat sale and the return on the index over the same period. We then sort repeat sales by neighborhood, giving us a complete empirical distribution of our measure of drift for each of the 20 neighborhoods in Syracuse. We then look for patterns in the drift within a given neighborhood. A preliminary examination of this data produced no evidence that this drift had any systematic relationship to the underlying neighborhood structure. In almost all of the neighborhoods, the median level of drift is very close to zero. In the case of Syracuse at least, drift from the ZIP-code index appears

to be related only to what happened at an extremely local level, below even the neighborhood level.

New Haven and Los Angeles

Our data for New Haven covers the New Haven MSA, comprising New Haven and Middlesex counties. The data contains all repeat sales in the period 1985 to 2001. Again the 3% highest and lowest returns are excluded. This leaves us with more than 30,000 repeat sales with an average purchase price of close to $150,000. As indicated in Table 3 the average loss experienced in this sample amounted to almost 10% of the purchase price.

TABLE 3: Index Performance in New Haven

New Haven	Coverage	Efficiency	Cost	All losses (%)
OFHEO	31.7%	72.4%	4.19%	9.58%
MRAC county	55.9%	61.0%	8.77%	9.58%
MRAC ZIP	58.7%	66.1%	8.50%	9.58%

Table 3 shows that both the effectiveness of coverage and the efficiency at all three geographic index levels is substantially higher than for Syracuse. In New Haven, the OFHEO index provides coverage of more than 30%, while achieving more than 70% efficiency. Both the MRAC county and ZIP code level indices achieve more than 55% coverage levels and efficiency levels higher than 60%. In contrast to Syracuse, the New Haven ZIP code levels only achieve a modest increase in effectiveness of coverage over the county indices, suggesting that fluctuations in house prices during this time took place more at a county-wide level rather than at a ZIP code level.

While there is far less improvement in coverage at the ZIP level in New Haven than in Syracuse, the ZIP indices still appear to have had a somewhat better performance history than the county indices. They achieve a modest increase in coverage with a 10% higher level of efficiency. Combining the small increase in coverage with the increase in efficiency, the ZIP code indices result in greater loss coverage at lower cost than the county index.

TABLE 4: Index Performance in Los Angeles

Los Angeles	Coverage	Efficiency	Cost	All losses (%)
OFHEO	32.8%	69.5%	4.52%	9.56%
MRAC county	47.0%	63.6%	7.06%	9.56%
MRAC ZIP	49.8%	67.8%	7.03%	9.56%

Our data for Los Angeles in table 4 covers all repeat sales for the years 1988-2001 excluding the usual “outliers”. The sample includes more than 300,000 repeat sales with an average purchase price of over $210,000. The average loss in this sample was a little

over $20,000 or 9.5% of the average purchase price. The effectiveness of coverage and the efficiency at all three geographic index levels is again higher than for Syracuse. At both the county and the ZIP code level coverage levels are close to 50% with efficiency of almost 68% at the ZIP code level. As with New Haven, the ZIP index achieves slightly higher efficiency than the county index, and at slightly lower cost.

6. Estimating Insurance Payouts

Given the above results, it was natural for us to propose that the ZIP-code index be used in developing the insurance product in Syracuse. In the next two sections we provide various methods of understanding the past and possible future costs of providing this form of insurance. In this section we focus in particular on the payouts that are likely to be involved when insurance is offered using this index.

Our concern with payouts requires us to substantially broaden our analysis beyond the cases of Syracuse, New Haven, and Los Angeles. It becomes important to consider a larger universe of geographic areas, not merely to focus on those that ex post turned out to have a slump. From MRAC, we have data on actual ZIP code price indices from more than 9,000 ZIP codes in the country. These ZIP codes represent 69% of the population of the US and 83% of the value of the nation's housing stock based on 1990 census data. All of these ZIP codes are used in the analysis that follows.

In addition to broadening our geographic coverage, we must move away from data on actual repeat sales by neighborhood, and come up with a broader and more general characterization of homeowner mobility, since it is this that determines the volume of claims against the program. In all of the simulations that follow, we estimate mobility in the simplest possible fashion, using a constant moving rate of some 10% per annum. Clearly, refinements to this procedure can be considered in future research, as can the question of how the availability of the insurance product itself might impact mobility.

With this mobility assumption in place, it quickly became apparent that a high proportion of losses are incurred in the very earliest years of operation of the program, since these are the years in which the probability of a decline in the index is the highest. The combination of the cost implications and the policy goal of ensuring neighborhood stability led us to follow the lead of the existing programs and to impose a minimum period of occupancy. We imposed a minimum occupancy period of three years, while also allowing for health-based exceptions to this minimum occupancy period. In all of the simulations that follow, we estimate the costs of insurance that is available upon sale of the house after this minimum occupancy period expires.[8]

While mobility has important impacts on the costs of insurance, the dominant determinant of payouts is the dynamic pattern of ZIP-code indices. As outlined below, we use two very different approaches to assessing house price dynamics.

- **Historical:** Our first procedure uses historical price indices for all of our ZIP codes together with the assumed mobility rates to estimate the claims that would have arisen to an insurer writing business in any given year since 1980.

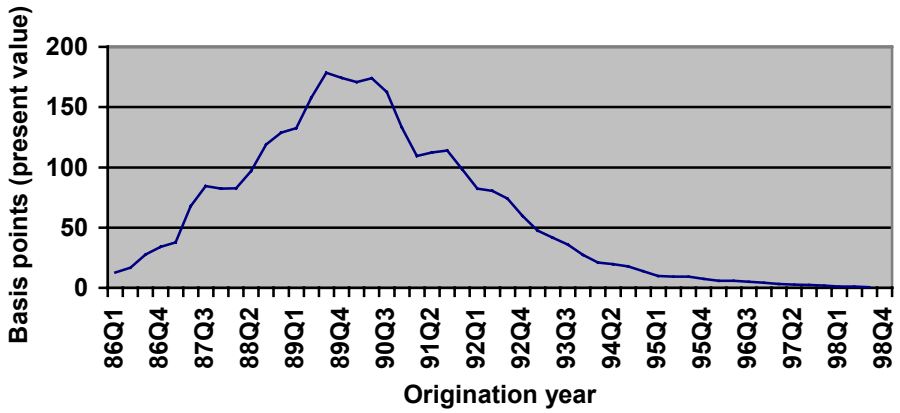
[8] In addition to the minimum period, our insurance product expires 30 years after its issuance. This has minimal impact on payouts, since the numbers remaining at this late date are so low, as is the probability of prices remaining below their initial value at this late date.

- **Simulation Based:** Our second procedure involves estimating simple models of the dynamics of house prices at the ZIP code level. We then run Monte Carlo simulations to generate time paths for the evolution of the house price index.

Historical Indices

We consider insurance written in each year 1986-1997 in each ZIP-code for which data is available.[9] Given the constant hazard rate (moving rate) of 10% per year after the end of the three-year occupancy period, we can then compute losses by year in any given year in any given ZIP-code. We can then aggregate these to get an estimate of the present value of losses to date on each such insurance contract. In doing this, we use a nominal interest rate of 6% per annum. Figure 2 shows the average of these present value computations across all ZIP codes for each book year.

FIGURE 2: Insurance Claims to Date by Year of Issuance



There is clearly substantial fluctuation in the present value of payouts depending on the year in which the insurance is issued. Insurance from the mid-1980's has experienced very low payouts, with little or no more to come in future. Yet insurance issued in the late 1980's and early 1990's has experienced claims approaching 200 bps. Because of the overall healthy economy in 1990's and the concomitant rise in home prices, minimal loss experience is recorded for recent book years. When we average across all markets and all years of issuance since the beginning of 1986, the present value of insurance payouts to date is a mere 60 bps. Note that this average reflects the imputed claims to date, and is therefore likely to significantly underestimate ultimate payoffs for insurance issued in recent years. One simple method to correct for this issue is to use the average claim by time period since origination of the policy and then sum these to generate the average historical loss. After making this adjustment the average imputed national historical loss is 79 basis points in present value terms**.**

[9] The MRAC data begins in the early 1980s. However, we use 1986 as our starting point because the early years suffer from relatively sparse coverage and more volatile index estimates. In addition, estimates from a period of higher inflation such as the early 1980s are not a useful a guide to the future costs of such insurance.

Simulating Future Movements in the Syracuse Index

Valuable as are the above findings, the period 1986-2000 under study may not be ideal as a guide to future expectations. The recent decline in inflation is one specific factor that might drive up losses in the future compared to the historical imputed loss experience, since our product provides nominal price protection for homeowners. Another unique feature of the survey period is that it covers the entire boom period of the 1990's. Hence pricing design must consider systematic changes in loss performance in the future.

Our initial expectation was that we could directly estimate a time series model of monthly real returns at the ZIP-code level. Measurement error rendered the results unsatisfactory (the mean reversion induced by measurement error obscured the well-known positive serial correlation in returns). Given this, we used two different approaches to estimate the dynamics of house prices.

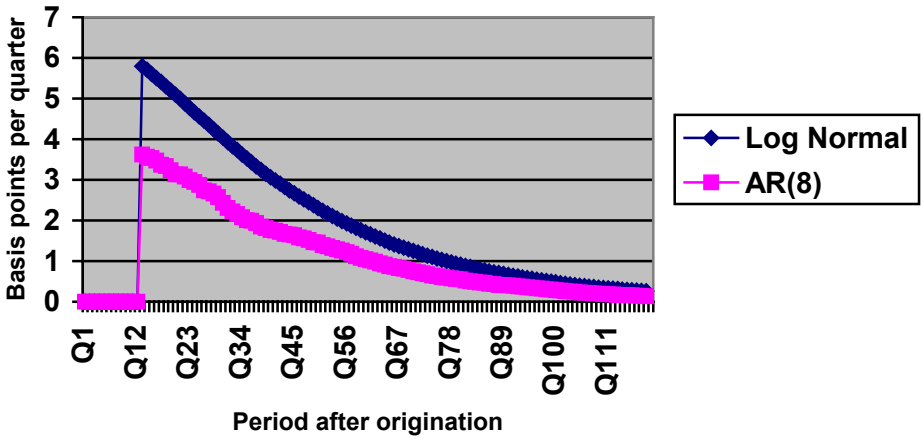
Our first approach was to assume that annual real returns on housing at the ZIP code level are described by a simple log normal distribution with increments that are serially uncorrelated. For the Syracuse market we make the assumption that there is no expected appreciation of real house prices. This means that we estimate the average rate of nominal house price appreciation at 2% per year going forward, in line with consensus expectations of inflation. With respect to the standard deviation, we estimate this over a long horizon for all ZIP codes in the sample. We find a quarterly standard deviation of 4.2% (comprising 3.0% at the MSA level and a further 3.0% deviation of the index at the ZIP code level from the MSA index). [10]

There is an obvious limitation of the "log normal" approach described above. There is a great deal of evidence of positive momentum in housing returns. To allow for this, our second approach involves estimating an AR(8) model of the dynamics of prices at the MSA level. We then layer on top of this an additional ZIP code level risk (itself assumed to be serially uncorrelated) over and above the MSA price index.

Having estimated by both techniques the price dynamics at the ZIP code level, we generated 1,000 future price paths for each of the eight ZIP codes contained entirely within the city of Syracuse, and the associated losses for each ZIP code on each time path. Figure 3 illustrates the evolution of losses averaged across ZIP codes for each of the two approaches.

FIGURE 3: Projected Claims Following Origination Using Two Different Indices

[10] While we are aware that there is considerable evidence for momentum in the evolution of house prices, we believe that the presence of the three year lockout period for claims makes the assumption of an efficient housing market without correlated returns a reasonable simplifying assumption.. While we neglect the presence of momentum to determine near term price movements, we do include the impact that momentum has on our volatility estimates. Thus, the estimated ZIP code volatility is based on volatility at a two-year horizon translated back to a quarterly measure.



Using the 6% annual rate of interest, we estimate that the present value of losses is 121 basis points when we use the log-normal approach, and 74 bps using the more intricate AR(8) approach. The reason that the AR(8) approach provides a lower estimate of the cost of insurance written today is that the recent increase in Syracuse home prices provides a positive momentum to the estimated price series. In our pricing and program design approach we adopted the more conservative of these two approaches. We believe this is appropriate because there are a number of offsetting costs that we have not explicitly modeled.[11]

Conceptual Limitations of the Analysis

There are of course any number of technical alternatives to be considered that may change the above conclusions concerning insurance payouts. Yet provided we base our analysis on historical data, it is unlikely that the above conclusions concerning future program costs will be radically altered. The deeper issue is that the insurance that we are offering has properties that cannot be entirely predicted in advance. We simply do not know enough about the underlying determinants of house prices to obtain a reliable description of future dynamics. This becomes especially important given that the availability of insurance may itself have profound effects on the pattern of returns on real estate. Given the current limitations in our ability to accurately model these feedback effects, we are left with little alternative but to rely on simulations based on the historical pattern of returns.

One of the key issues that we leave out of the formal analysis is the possibility alluded to in our discussion of existing insurance schemes in section 2. We there outlined a case in which pessimistic beliefs about the future solvency of the insurance fund might lead to a wave of selling, which would validate the initial fears and set up a self-perpetuating cycle of decline. Unfortunately, history does not provide any reliable way for us to assess the likelihood of such an outcome.

[11] For instance, we assume no change in homeowner moving behavior beyond the assumed hazard rate of 10% in response to the presence of equity assurance. In addition, we assume that the deviations from the MSA index of the ZIP code indices within the city where the product is offered are independently distributed.

Even contemplating the possibility of a run of some kind suggests a number of points of caution. First, we need to limit the amount of protection that is offered for a given level of initial capital in order to reduce the rational basis for the initial fears. One method for setting this limit is analyzed in the next section. Second, we need to consider whether in an expanded program, the insurance contract and the capital needs should be designed explicitly to lessen the chances of a run. The chance of a local run causing a significant loss of capital would become insignificant in a truly national program. However, that still leaves open the possibility of a statewide or even nationwide collapse of confidence leading to a self-fulfilling fear of an impending collapse of the underlying insurance program. We return to the implications that this may have for the long-run expansion of the insurance market in section 10.

7. More on Costs and Prices

There is more to setting the price of insurance than determining the average cost of payouts. One important design issue with Home Equity Protection was the choice of how the product would be purchased. Shiller and Weiss focused attention on insurance products in which the protection is purchased on a short-term basis, similar to fire or theft insurance. Instead, our implementation has a one-time fee covering the full thirty-year life of the insurance product. We felt that using an annual fee would risk destroying the fundamental pooling required for insurance to be efficient. Those who lived in markets that were increasing in value would swiftly cancel their insurance, leaving in the pool only those with high risk. Hence in order for the insurance to remain viable, fees for those who selected to stay in the program would have to be commensurately higher. Of course, there are more intricate dynamic paths of prices that may be worth considering in the future. In addition, there is clearly room for the product to sell at different prices in different markets, depending on future market prospects. However, in the present program these considerations would merely add additional confusion to a product that is already somewhat more novel than is comfortable for many consumers.[12]

Given that we had decided to charge for the product on a once-off basis (albeit with financing available), the next question is "how much"? In determining how this price was set, it is important to bear in mind one source of funding entirely specific to this project, as well as a constraint defined by the social goal of providing insurance at a relatively low cost to a not especially affluent target group. Of course, in the long run we would like to calculate the appropriate price to charge in a purely privately funded program. The computations below tell an important part of that story, but many new questions would need to be addressed before such a launch could be successfully carried out.

The specific funding to launch this program comprises a $5 million HUD grant to the Syracuse Neighborhood initiative obtained by Congressman. Walsh The intent is that

[12] The same remark applies to the idea of index insurance payouts to the rate of price appreciation. Case and Shiller proposed that any insurance program should include such indexing right from the outset. Hard as it is for consumers to understand insurance based on one index, we felt that it would be exponentially more difficult for them to understand if there were two different indices involved. Not only would the product be more complex if it compensated for real losses, but it would also be far more expensive to supply.

this entire block of funds be used as capital for the program. Together with opportunity comes responsibility. The role of the program is to make the insurance available on a relatively low cost basis to all current and potential homebuyers in the Syracuse area, regardless of income. Hence the price is constrained to not exceed a level that might cause demand in the low and moderate income families within the target group to be unacceptably low. Using evidence from local focus groups, it became clear that interest among our target group might drop off considerably if the price exceeded 2% of the initial value of the house. In fact, a price of 1.5% of the face value of insurance purchased was thought by most respondents to provide decent value for money. Hence this is the price that we work with in the remainder of the calculations described below.

The key question that we had to address once the size of the initial capital for the program was set at $5 million and the price of the insurance was set at 1.5% of the protected value was precisely how much insurance we could afford to write without excessive risk to the capital adequacy of the program. This depends critically on the volatility of payouts, and on the analysis of unfortunate tail events. We now describe our methodology for analyzing these tail events, and the implications for the amount of insurance that can be written with the given level of capital.

Certain data are fixed at the outset. We fix the initial $5 million in capital, and also fix the price of insurance as 1.5% of the face value of the insurance purchased. In addition we assume a 6% return on invested assets. We also take account of direct program expenses, estimated at 30 bps per annum.

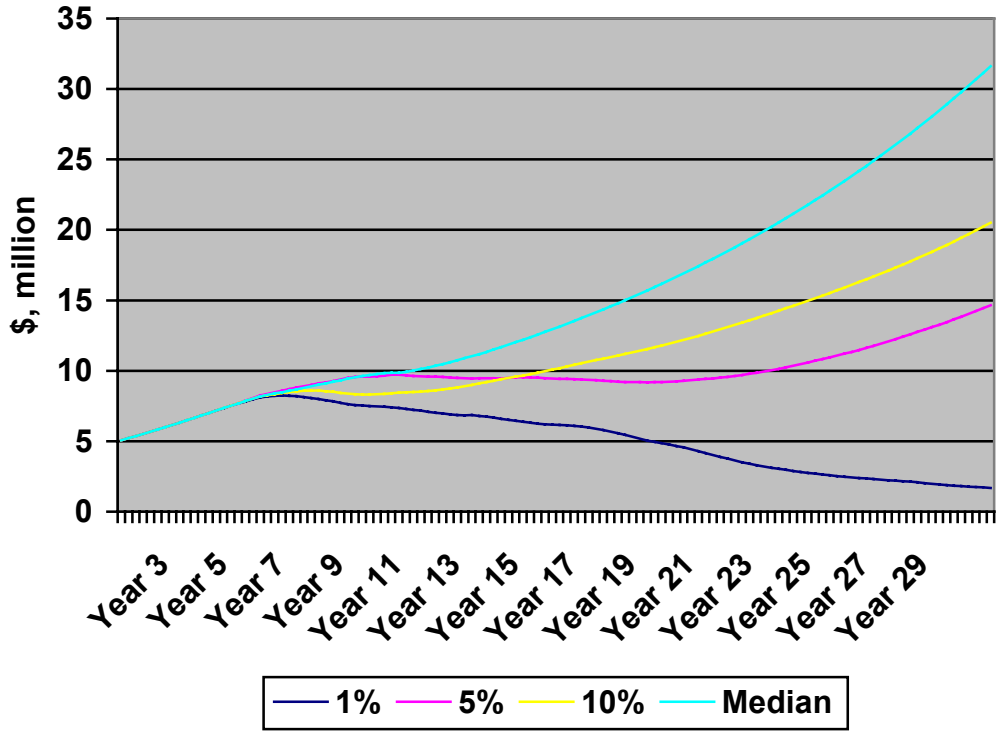
With these data fixed, we then simulate a wide variety of different possible paths for the future evolution of returns on the ZIP code index. For each such path, we calculate payoffs in each year assuming that a certain fixed amount of insurance is issued at a constant annual rate for the first five years, with no additional insurance being written thereafter. Subtracting these payoffs and program costs from the initial capital, up-front premiums, and accrued investment returns, gives us a dynamic path for the evolution of the total funds that remain for meeting future insurance obligations.

As the amount of annual insurance issued increases, so the path of remaining funds shifts, due both to increased costs and revenues, and an increase in potential future payouts. In the typical case, there will be some finite maximum to the amount of insurance that can be offered in each of the five years before the fund itself ends up running out of money at some point in the future. Paths are indexed by $p \in P$, and we let $M(p)$ denote the corresponding maximum amount of annual insurance contracts that can be issued. By definition, provided no more than $M(p)$ of insurance is issued in the first five years, the program will never run out of capital on path *p*.

With price paths ordered in this manner, we select the paths that are in the most demanding 1% in terms of how little insurance they allow to be offered in order to ensure that the program remains solvent throughout the period: we look at the first percentile of the distribution of $M(p)$. Provided the amount of insurance issued is no higher than this value, our simulations indicate that the program will remain solvent for the entire thirty period covered by the insurance in 99% of cases. Following this method, we determined that we are able to write $24 million per year of insurance for five years, or a total of $120 million in insurance with the $5 million of initial capital, while still maintaining a 99% probability of remaining solvent over the subsequent 25 years.

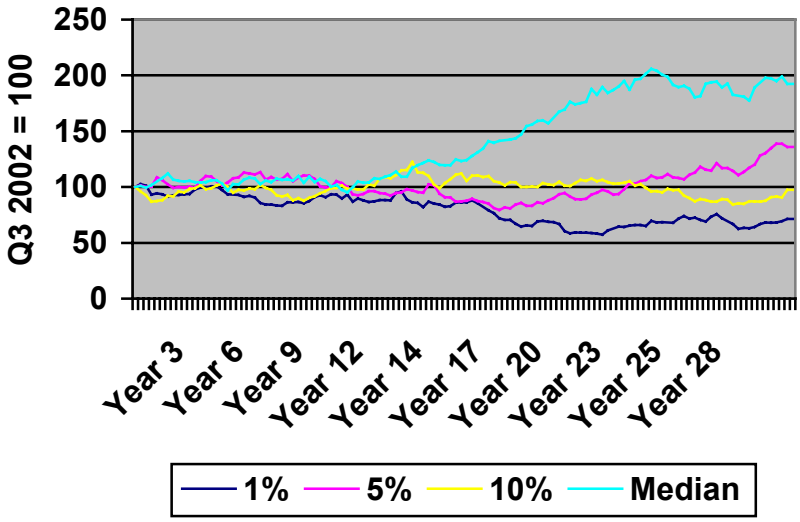
Figure 4 illustrates the evolution of capital over time for the median case and for specific1%, 5% and 10% worst-case loss scenarios. By design, the 1% worst-case scenario exhausts the program's capital down to zero at the end of thirty years. However, in the 5% and 10% worst-case scenarios not only does the program not run out of capital, but capital is substantially in excess of the initial $5 million at the end of thirty years. Capital does decline in both the 5% and 10% cases during the peak loss periods, as losses and expenses exceed new premiums plus the program's investment income. However capital bottoms out before the end of the year 15 even without any new business written. In addition, note that in these two cases capital is never below the initial level of $5 million.

Figure 4: Capital in Various Different Scenarios



To put these loss scenarios in perspective Figure 5 shows the evolution of average prices in each of the 1%, 5%, 10% and median loss scenarios. As can be seen from the figure, the 1% loss scenario represents a pretty dire housing market, much worse than Syracuse has experienced in the past ten years. In the 1% worst-case scenario, prices decline by close to 40% in the first 20 years. Even at the end of the thirty-year period prices are 30% below their initial starting point. The 5% and 10% worst-case scenarios also show prolonged periods of significant price weakness, with peak to trough declines of 30%. Of note is that in this example the 5% loss scenario shows a stronger long term housing market than the 10% loss scenario, with prices in the former ending 35% above their starting level compared to 2% below their starting level in the latter case. This illustrates the importance of the pattern of house price movements in determining the projected losses from the program.

FIGURE 5: Price Paths Associated with Different Paths of Capital



8. Product Design and the Regulatory Environment

At the same time as we were developing the product and pricing parameters described above, we were also exploring the regulatory challenges that would be involved in any product offering. Of course, offering a new financial product is not easy, since there are many regulatory requirements that must be met before a new product of this nature can be launched. These requirements are particularly stringent in New York State. While those who set up these regulatory requirements were doubtless well-intentioned, the resulting rules often miss their intended mark, and end up instead causing confusion and delay. We hope that a successful launch of this equity protection product may provide some guidance to the regulators in New York State in their ongoing efforts to modernize and update the regulatory environment. In the present environment, it appears that these regulations may be inadvertently preventing the development of financial products that could be of tremendous social value if properly regulated.

Is it Insurance?

Our first conjecture was that the financial regulations to which we would be subjected would be the insurance regulations. Yet as we met with the regulators, who were very helpful, we found that the matter was more intricate than it appeared. Initial discussions with the regulators concerning the insurance status of our product were inconclusive. While there were legal authorities who felt that the product was not insurance, there were others who felt that the rules were not so clear-cut.

Given the confusing nature of the underlying laws, the worst of all worlds would have been to be left in a gray area, uncertain as to the ultimate classification of equity insurance. Because the New York State Insurance Commissioner, Greg Serio, and his

senior staff could see the social value of the product that was being proposed, they removed us from this gray area. They kindly took the time to review the case very carefully and provided a specific letter of opinion. This letter stated that the product that we ultimately designed does not fall under the realm of insurance regulatory law, at least in the State of New York.

What prevents our product from being classified as insurance? According to the State of New York, under the definition of an insurance contract (Art. 11, Sect. 1101), the insurer is obliged to pay money on the:

> "happening of a fortuitous event in which the insured has… a material interest which will be adversely affected by happening of such event".

The key words in the definition are "fortuitous event" and "material interest". Insurance regulators worry about the moral hazard potential of insurance contracts. Thus, it is essential that the insured not have any ability to influence the outcome of what is being insured. A fire or a theft may be regarded as a fortuitous event, but sale of a home at a loss is not deemed fortuitous. After all, the sale of the home and therefore the exercise of this equity protection policy is under the direct control of the homeowner. The fact that the homeowner can decide *when* to collect, even if he or she is required to take some costly action such as sell the home, means that the event is not fortuitous.

The second reason why the offered protection is not insurance is that the homeowner does not have any material interest in the local real estate index. While the value of the index may be highly correlated with the value of a person's home, it is entirely possible for one's home to go up in value while the index falls. The lack of a 1-1 material interest means that home equity protection functions essentially as a derivative or a hedge, and, hence, is not insurance.[13]

It appears that the intent of the regulations is to distinguish between insurance (good) and gambling (bad). To avoid any possibility that the insurance laws could be interpreted as legitimizing private lotteries, the law prohibits insurance products that provide derivative-like protection on financial products. Unfortunately, this applies equally to such desirable insurance products as weather insurance and home price insurance as it does to gambling.

The letter of opinion stating that our product was not insurance gave us the green light to move forward and explore entirely different channels for delivering our product. However it has some unfortunate implications. It denies consumers the additional sense of safety they might derive from knowing that there was an agency involved in guaranteeing the capital adequacy of providers. Some such agency, private or public, will be necessary if the market is to expand beyond the trial stage. The lack of certification of this type is reflected in the naming of the product. Rather than being called insurance or assurance, our product is called "Home Equity Protection". This provides consumers

[13] From an economist's perspective, this definition is not easy to justify. The local index is used rather than the individual house precisely to *avoid* the moral hazard problems that so worry regulators. The current regulation would almost be like saying that bidders on eBay do not have a material interest in their bids as they will pay the second-highest bid and not their own! One of the great lessons of modern economics is to find ways to preserve incentives while offering protection. We would encourage insurance laws to embrace this approach rather than to reject it.

with a good description of the product without misleading them into thinking they are purchasing a regulated insurance product.

Is it a Mortgage?

Having discovered relatively early on that our product was not likely to be deemed an insurance product, we were somewhat concerned that we might find ourselves subject to even more stringent regulation, or even deemed to be offering an altogether inadmissible product. To avoid such a status, we explored the idea of writing the equity protection directly into a mortgage. To this end, we designed an equity protection mortgage that operates just like a Price-Level Adjusted Mortgage (PLAM), but with adjustments to the outstanding mortgage balance based on the level of the local house price index rather than the general price level.[14]

As we designed it, adjustment in the mortgage balance would only be one way; that is, down. The outstanding balance would fall in line with a change in the real estate index. The mortgage note itself would detail the calculation of the precise change in the balance when this index fell between the initial date that the mortgage was initiated and the trigger date, as determined by the house itself being sold. On the supply side, we envisaged these mortgages as being packaged into pools that would be very attractive on the secondary market. The ultimate supplier of the underlying equity protection would make payments first to the mortgage holder. The individual selling the home would receive only payments over and above those required to pay off the underlying mortgage. The equity protection would therefore offer additional security to the underlying holders of the mortgage-backed securities, with the premium possibly being passed back to borrowers in the form of a reduced rate of interest.

A second attractive feature of our home equity protection mortgage proposal is that it makes clear a connection between equity assurance, private mortgage insurance (PMI), and FHA insurance (FHA). FHA and PMI make payments to lenders in case the homeowner defaults. Frequently, this default is accompanied by, or triggered by, a reduction in the value of the house. By helping to protect the net equity in the property, an equity protection mortgage would in certain circumstances substitute a small cost of prevention (equity protection) for the large cost of the cure (PMI or FHA insurance).

While the equity protection mortgage or a HEP product and FHA/ PMI insurance are similar in that they offer protection to lenders, an important distinction is that FHA/PMI programs insure *only* the lender in cases of default, not the borrower. With PMI and FHA insurance, the benefit to the borrower is indirect. The value of the FHA and PMI products to the borrower is that it enables them to gain access to well-priced home mortgage loans with less than 20% down payment. Demand for these products is driven entirely by the mandates of the lenders. In contrast to these FHA and PMI programs, a home equity protection mortgage would directly protect homeowners from

[14] A Price-Level Adjustable Mortgage is a mortgage in which the principal adjusts in relation to some index, such as inflation. In certain high-inflation countries, mortgages are written in real terms and so the payments due and outstanding balance both adjust with inflation. This allows the borrower to pay the real rate of interest rather than the nominal rate. Mortgages become less onerous as less of the payments are front-loaded. The regulatory concern appears to have arisen because these mortgages may have negative amortization in the early years. While this is surely important for borrowers to be aware that this might occur, it is economically absurd to pass an outright ban on negative amortization. By construction PLAMs have positive amortization in real terms, even if they do not in nominal terms.

loss. Since our product is designed so that the equity protection payouts go first to any lender, rather than directly to the homeowner, these mortgages would offer lenders an equity protection benefit that might reduce the need for and/or cost of FHA and PMI. Of course, such a change would have to survive scrutiny by HUD, Fannie Mae and Freddie Mac and their Congressional overseers. This was an angle that we were keen to pursue.

Unfortunately, our investigation of this issue was stopped in its tracks. Attractive as this mortgage might be, it ran afoul of New York State banking regulations. New York State makes all forms of Price-Level Adjusted Mortgage illegal.[15] Since our Home Equity Protection Mortgage would have been ruled to be a variant of the PLAM, it was deemed illegal by extension. This seems to be a prime example of regulation having just the opposite of its intended effect.

Fortunately, the Banking Superintendent, Elizabeth McCaul and her senior staff understood the value of the equity protection idea and were extremely helpful to us in reviewing the regulations and making a quick determination on how to proceed with our equity protection ideas in a manner that would survive regulatory scrutiny.

No, It is Something Else!

In the end, our Home Equity Protection (HEP) product is written as a stand-alone product, that is neither insurance, nor a mortgage. Legal analysis has also concluded that HEP is not a security for securities regulation purposes, since it is not intended or marketed to consumers as a way of generating a gain or profit but rather as a way of protecting against a loss.

Our stand-alone product retains one design feature that was initially proposed in the days in which we believed that we would be offering the protection in combination with a mortgage. The product is structured so that a mortgage lender, if one exists, will have priority in getting the protection payment. This is similar to the case of fire insurance on the home where the mortgage lender is the first payee. The homeowner gets the full value of the payment in the form of a reduced mortgage obligation and may get even further benefit in reduced interest rates that reflect the enhanced quality of credit (or reduced risk) extended to these households.

By putting the lender first in line, we intend to make clear to suppliers of capital the benefits of lending to homeowners who have purchased equity protection. In fact, we believe that it will be important to research the overlapping risk between HEP and FHA/PMI. Of course, both FHA and PMI protect against some risks that HEP does not. In particular, thsy protect lenders from the expense involved with removing the owner from the home, the missed interest payments, and possible distressed re-sale prices, given the likely lack of homeowner maintenance during the default and foreclosure period. Ultimately it may be of value to price equity protection and FHA/PMI insurance products together, to protect both borrowers and lenders against idiosyncratic events such as job loss and divorce that lead to default as well as market forces that lead to falling house

[15] The case against our "PLAM" in the context of home equity insurance is even weaker than the general case against a PLAM indexed to the rate of inflation. Our proposed product could reduce the outstanding balance due to a decline in property values. While an adjustment to the principal is possible, the adjustment would only be *favorable* to the homeowner. It is hard to see how banning such a product protects homeowners.

prices. We would expect cost savings to result for the purchaser of any such pooled product.

With the details of product definition pinned down, there remained a number of vital steps that had to be taken before the product could in fact be launched. One important issue was to identify an institutional home for the project. In this regards, NR was able identify an ideal candidate. Home Headquarters Inc. (HHQ), a local NeighborWorks affiliate of NR in Syracuse, offered a ready vehicle to deliver the product. Their Website www.equityhq.org, provides a good description of the product offering and a set of frequently asked questions.

On July 30, 2002, a press event to launch the program was held by Congressman Walsh and Mayor Driscoll. On this date, Deborah Woods, a dental hygienist, became the first person to purchase protection against a general market loss in her home equity. The press event was held at her home to dramatize the fact that the product was immediately available.

9. Looking Forward

A major priority in future research is to assess the success or failure of the project. Precisely how best to measure these aspects of the program is a great challenge in and of itself. Some of the benefits go to individual purchasers, and to this extent success may be reflected in the level of private demand for the product, and satisfaction with its performance ex post. Yet there are also community-wide benefits, and these may be somewhat more difficult to assess. In fact, there are those who believe that the program can succeed even if very few households choose to buy the equity protection. The case of Oak Park suggests that, by building confidence, home equity protection may produce profound social benefits even if there is little private demand. Understanding the potential confidence-building effects of equity protection is an important question left for future research.

As highlighted in section 5 above, a key limitation of the current product is the reliance on an index that may not be optimal on a real-time basis. There is a profound need for additional research on index design, and several of the authors of this paper intend to contribute to this design effort. In fact, the pressure to improve index design may be crucial to expansion of richer markets in real estate related assets.

While recognizing that success itself may be difficult to measure, it is nevertheless of interest to speculate on the future ramifications of the project, should it be judged to succeed. We believe that the potential benefits to those in the city of Syracuse are self-evident. The fact that ownership in the city of Syracuse has been correctly perceived as a poor investment in recent years has surely held back the rate of homeownership. To the extent that the availability of equity protection reduces the attendant risk and thereby boosts ownership rates, the benefits would extend to the larger community. If the product is able to make home ownership more attractive in Syracuse, it should be expected to bring the broader benefits of community involvement that are so strongly associated with ownership. At the same time, the combination of the increase in ownership rates and the decrease in default rates due to the presence of the protection may stabilize the financial community's investment in the area, and thereby increase the

extent of this community's involvement with the central city area. Of course, a reduction in defaults is itself important in preventing buildings from becoming abandoned and being blight upon the rest of the community. Finally, the increase in stability in central city Syracuse would be very good news for the broader metropolitan area, both by increasing the long-term viability of the entire area, and by preventing further erosion in the tax base, and potentially stabilizing the flow of tax revenues.

Any success in Syracuse would surely provoke interest in other communities in need of similar help. Identifying these communities is a high priority in any future efforts aimed at project expansion. There are several key issues involved in this identification effort. In the first place, one needs to look at various different cities in the country to look for a combination of declining property values, abandonment, low homeownership rates in distressed neighborhoods, high default/foreclosure rates, and the potential homeowners' reluctance to move into these neighborhoods. In the second place, it is important to find other parts of the country that would provide diversification benefits for financial participants interested in supplying the product. A third requirement is institutional infrastructure. There must be a set of local and national organizations that are willing to promote and develop the product as needed for the particular community. Finally, one needs to investigate the legal and regulatory barriers that may operate in states other than New York, to ensure that the appropriate products are developed.

While the introduction of home equity protection was targeted to the moderate-priced houses in Syracuse, we expect there will be similar demand across the price spectrum. One of the team members, Barry Nalebuff, has written up the product in a column in Forbes Magazine written jointly with Ian Ayres (Ayres and Nalebuff 2002). The electronic version of this article is available at the website, http://www.forbes.com/2002/08/28/0829whynot.html. In addition to describing the basic product and its price, this article concludes by asking readers to indicate their level of interest in the product. The results to date suggest that there may be great interest among more affluent households in the type of home price protection of the type that we have introduced in Syracuse. This interest appears to be particularly pronounced among those who do not as yet own homes. Indeed we have emails suggesting that there are some households for whom the lack of availability of any form of protection represents the major barrier standing in the way of homeownership. If the responses to the poll are in any way indicative of attitudes in the broader population, there may well be room for a national market in home equity protection that operates on a for-profit basis. Of course, many new issues will arise in assessing the potential operation of such a market, and we hope that these also may be addressed in the near future.

As further evidence for the potential level of interest in equity protection at a national level, we conducted a non-representative national Internet survey of recent homebuyers concerning their general concerns when buying their home. Over 70 percent of respondents reported that whether homes in the neighborhood hold their value is very important to their decision on where to buy a home. There was no other single factor that was deemed this important by such a large proportion of buyers. In addition to this general statement of priorities, a significant minority of 13 percent of respondents indicated that HEP would encourage them to purchase in a neighborhood they liked, but where property values were seen as "shaky."

The advent of home price protection would have profound ramifications for other parts of the housing finance system. As detailed in section 9, in the current market those who do not have sufficient cash to place a large down payment on their homes must purchase PMI. PMI is clearly of great benefit in terms of stabilizing the financial system, and yet does little to help the borrower who ends up in default, and with tremendously compromised credit. An important subject of research as the home equity protection market develops is the extent to which the product lowers default rates, and thereby reduces the need for PMI. Prevention in this case is surely better than cure, and if protection is able to prevent homeowners from going into such deep negative equity positions, it may enable lenders to reduce their purchases of PMI without in any way compromising the safety of the financial system.

Success of the scheme may have a broader impact on public policy. For some time now, there has been a consensus that promoting home ownership provides one of the most important vehicles for encouraging wealth building among less well-off households. Yet with ownership come profound financial risks. It can be argued that no one benefits if a household is provided with a subsidy for purchasing a home, but then finds that their house has fallen in value because of declines in the local or national economy.

While the above paints a rosy picture of the ramifications of success, it would be remiss to ignore negative possibilities. Some may be uneasy at the market impact of home equity protection in the case even of a relatively mild fall in prices. The likelihood in such a case would be that there would be more households selling their homes than in the existing market. Historically, in the midst of a downturn people have been trapped in their homes due to negative equity. With equity protection in place, they would no longer be trapped, and thus the local housing market may experience a bout of sales in the midst of a downturn. On balance we view this as an improvement over the status quo: allowing mobility is good public policy, especially in the event of job losses. However, those who remain in the neighborhood may not agree with our positive assessment.

Altogether more serious than the orderly run-down alluded to above is the possibility of a panic, referred to already in section 3. In this scenario, fear of a future suspension of the program triggers a run, leading ultimately to the collapse of the program. It would be absolutely tragic if the future of home equity protection products foundered due to under-capitalization of the initial program. It is for this reason that we will remain very conservative in setting limits on product availability until there is a longer historical record with which to work, and until we have deepened our understanding of possible feedback effects.

Fear of a run is a major consideration motivating program expansion beyond the Syracuse area. Such an expansion will allow for better pooling of risks. With superior pooling, there would be no reason for a decline in one small geographic area to threaten the capitalization of the protection, since such declines would be of negligible significance in a national context.

While geographic diversification can remove the fear of a local price decline causing a run, there remains that question of what would happen in face of a major decline in the value of housing either at the national level, or in a large state such as California? There is simply no way for an insurance product to provide protection against such a large-scale event, since it is essentially a non-diversifiable risk. In such situations, funds to pay the insurance cannot be made available, except by governmental bailout.

The situation here is no different than for insurance against other major events, such as earthquakes, or acts of terrorism. Whether explicit or implicit, any offer of insurance against such contingencies can be made void by an event of unprecedented magnitude.

One possible way to address the problems that would arise with a large-scale market meltdown is to consider radical changes in product design. The goal of these changes would be to maintain the essential risk-sharing benefits of equity protection, without requiring any party to make a promise to deliver payments that they may in fact be unable to keep. Our home equity protection mortgage is one simple product that has this feature. With this form of mortgage, the losses in house value result in lower payments to those holding the mortgages. In principle, these mortgages could be priced up front to include a discount for possibly catastrophic later falls in the value of the housing at the national level. These mortgages should be bundled into securities, sold onto the secondary market. In this manner, the ultimate holders of the mortgage backed securities would wind up providing insurance to homeowners, but there would at no stage would anyone be providing a second party with a promise that could not be kept.

With suitable imagination, it may be possible to construct far richer state contingent housing finance products that would serve all of the functions of home price insurance, without some of the drawbacks, such as the need for high reserves, and the possibility of runs. As we consider the possibility of yet more ambitious efforts at market reform, so we are drawn back to the question of whether or not the U.S. housing finance market is ready for more profound innovations. For such innovations to occur, changes need to be made in the underlying changes in the rules of the innovation game. In particular, the regulatory environment is in need of an overhaul. While the New York State regulators provided us with great assistance in threading the regulatory needle, the rules that they are enforcing appear somewhat dated. We hope that our project spurs a revision of the regulations with a view to encouraging innovation, while nevertheless maintaining necessary oversight. Provided all parties are willing to learn the hard lessons that our experience provides, there may well be room for major innovations in housing finance in the U.S.

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