Shared-Equity Mortgages, Housing Affordability, and Homeownership

Andrew Caplin
James H. Carr
Frederick Pollock
Zhong Yi Tong
with
Kheng Mei Tan
Trivikraman Thampy

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About the Authors

Andrew Caplin is professor of economics and co-director of the Center for Experimental Social Science at New York University. James H. Carr is senior vice president for Innovation, Planning and Research at the Fannie Mae Foundation. Frederick Pollock is vice president in Private Equity at Morgan Stanley & Co. Zhong Yi Tong is director of Housing Affordability and chair of Research Review Committee at the Fannie Mae Foundation. Kheng Mei Tan was a research assistant at the Fannie Mae Foundation while working on this project. Trivikraman Thampy is a Ph.D. candidate in economics at New York University.

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Executive Summary

Overview

The recent increase in the rate of homeownership, from 65 percent in 1995 to 69 percent in 2005, appears difficult to sustain. The long real estate boom has created affordability problems for many renters; fiscal constraints severely limit funds available for housing affordability programs; and the burst of private sector innovation that introduced new affordability-enhancing mortgages has run its course

The authors of this report argue that the development of new shared-equity mortgages (SEMs) that blur the lines between debt and equity would propel further advances in homeownership. The rationale for these mortgages is that the broad financial markets value shares in individual housing returns more highly than do hard-pressed prospective homeowners. This report describes a new class of SEM and provides survey evidence that the majority of households would prefer these SEMs over currently popular affordability-oriented mortgages. Financial simulations confirm the value of securitized SEMs to investors. Simple computations suggest that introduction of SEMs would be likely to increase the U.S. homeownership rate between 1 percent and 1.5 percent. Their introduction would also reduce borrower vulnerability and add to the stability of the housing finance system. Yet given their novelty, realization of this potential would require sympathetic overhauls of the regulatory, legislative, and fiscal structures relating to U.S. mortgages.

Motivations and Background

Why Are Innovative New Mortgages Needed?

- There is little prospect of policy makers supporting costly new schemes aimed at expanding the rate of homeownership. The era of generous subsidies to influence housing market outcomes appears to have drawn to a close, at least for the foreseeable future.

- Given the continuing lack of major public sector initiatives, it has been left to private sector financial innovation to produce the new mortgages, such as interest-only and negatively amortizing mortgages, which have driven recent increases in the ownership rate. Unfortunately these mortgages leave borrowers, lenders, and the broader financial system exposed to significant risk. There is now regulatory pressure to mitigate these risks through tightened lending standards. At the same time, rising house prices have left many new entrants to the housing market with sharp, and steadily worsening, affordability problems. If house prices continue to rise even at a moderate rate, the affordability equation will work ever more powerfully against renters, who will be unable to participate in this appreciation.

- It is hard to see what will propel further increases in homeownership absent some thoroughgoing change in the structure of housing finance.

An Introduction to Shared-Equity Mortgages

- Corporations and financiers make use of a blend of debt and equity finance. It is therefore striking that individuals only have pure debt options available when financing a home. SEMs would offer consumers the option (long available to corporations) of providing some of the funding in exchange for sharing in the financial risks and rewards. Home buyers would gain access to a new source of mortgage funding with no concomitant increase in monthly mortgage payments, thereby enhancing housing affordability. Use of this new funding would also reduce borrowers' financial fragility by shifting risk to the financial sector, where it belongs.

- The earliest SEMs, known as "shared-appreciation mortgages," were developed in the 1970's. Shared-appreciation mortgages offer borrowers interest-free loans in exchange for a contractually specified share of appreciation on the home at point of termination. For

example, with an "appreciation-sharing ratio" of two to one, a borrower taking out a mortgage for 20 percent of the home value pays out 40 percent of appreciation as interest at loan termination. Consider a $100,000 loan on these terms for 20 percent of the value of a $500,000 house. To pay off this loan at the end of 10 years with a house price of $1 million would require a terminal payment of $300,000, comprising the initial $100,000 loan together with 40 percent of the $500,000 in appreciation.

■ While such mortgages may be potentially appealing to borrowers, a design problem prevents them from being similarly appealing to investors. The evidence suggests that the incentive to use these mortgages is highest among those expecting no price appreciation and those intent on holding the loans for as long as possible. To understand the attraction of long holding periods, note that when such a loan is first made, the borrower owes the lender exactly 20 percent of the value of the home. Hence the 40 percent sharing of appreciation represents double this share. However as the house appreciates over time, the share that is owed of the total house value rises toward 40 percent, and as it does so, the fixed 40-percent sharing of appreciation represents less and less of an incremental return for the investor.

■ Given these distortions in borrower incentives, creating investor interest in supplying funds requires charging borrowers an excessive price. In fact, the Bank of Scotland issued a shared-appreciation mortgage in the United Kingdom in the mid-1990s with a very long term and a very high appreciation sharing ratio of three to one (60 percent of appreciation on a 20 percent loan). While many borrowers were attracted to these expensive mortgages, investor interest in the corresponding securities was limited. The uncertain rates of return and low liquidity had little appeal for investors.

Key Research Findings

The New Shared-Equity Mortgage Design

■ The report outlines a new pricing mechanism for SEMs, the shared-equity rate pricing mechanism. This pricing mechanism provides stable investor returns while also providing borrowers with a predictable and transparent

cost of capital. As with shared-appreciation mortgages, no payment is required during the term of the loan. Yet the amount due at termination corresponds to a share in the value of the home that increases the longer the loan has been outstanding. The rate of growth in this share is called the shared-equity rate on the SEM in question: A typical annual rate is likely to be in the 3- to 4-percent range. The dollar amount due upon termination is determined by multiplying the share of the loan due by the value of the house.

■ This study illustrates that with a 4 percent shared-equity rate, a borrower who takes out 20 percent of the home value owes 20.8 percent at the end of one year, and 29.6 percent at the end of 10 years. Consider again the $100,000 loan on these terms for 20 percent of the value of a $500,000 house. To pay off this loan at the end of 10 years with a house price of $1,000,000 would require a terminal payment of $296,000, or 29.6% of $1,000,000. This is almost exactly the same as with the shared-appreciation mortgage described above. However, unlike the shared-appreciation mortgage, the shared-equity pricing mechanism makes the cost of capital to the borrower (and therefore the return to the investor) over and above the house price appreciation independent of the holding period. Hence there is reason neither for those with long holding periods to prefer a mortgage of this form, nor for distortion of holding periods by those who obtain such mortgages. It is for this reason that the pricing mechanism provides stable investor returns without distorting consumer behavior.

■ An important use of the new SEMs would be to speed up renters' transition to home ownership. Use of the SEM not only enables the household to move more rapidly into ownership; it also provides important bridging benefits for those with sharp current needs (e.g., an increase in family size) or rising income prospects. The SEM enables such households immediately to move to homes that align closely with their growing needs. This paper provides a series of comparisons contrasting three strategies: immediately buying the largest possible home with only regular mortgage finance; immediately buying the largest possible home with an SEM; and delaying the purchase for 10 years, saving and allowing assets to accumulate in the meantime, and

then buying the largest possible house in year 10 using regular mortgage finance. Even in bad cases, the use of the SEM proves superior to renting in terms of future housing affordability due to the immediate participation in housing appreciation. Moreover, even though affordability would be even higher if the household immediately bought into a far worse home with a regular mortgage, the gap in future housing affordability in year 10 is typically far smaller than the gap between the house initially purchased without the SEM and the house purchased with the SEM. In fact, if the household that buys the "too small" home with regular finance moves in the meantime, the extra buying and selling costs may leave it worse off in terms of housing affordability than a household that uses the SEM immediately to buy a more suitable home.

Interest in the New SEMs among Prospective Home Buyers

- Given the particular interest in affordability problems in areas that have recently appreciated, this report outlines results of a household survey conducted in 10 major metropolitan areas (Atlanta, Boston, Chicago, Los Angeles, Miami, New York, Philadelphia, San Diego, San Francisco, and Washington, D.C.). The survey targeted households who reported that they considered it at least "somewhat important" to buy their next home within the next five years. Fifteen hundred completed responses were received during February 2006. Care was taken to simplify the presentation of the pricing mechanism, tabulating the share that would be owed based on an initial loan for 20 percent of the house value and a shared-equity rate of 4 percent.

- The report highlights basic findings concerning interest among renters. First, the overall level of interest was high, with some one in six renters highly likely, and two in three at least somewhat likely, to consider use of the SEM in buying a home. Second, the level of interest varied across households in a highly reasonable fashion, suggesting that respondents had an intuitive grasp of the costs and benefits of the SEM. The new SEM was designed to be of most interest to renters facing either a pressing need to move (a new child, for example) or expecting improved circumstances in the near future. In

confirmation, more than *21 percent* of renting households with a child under age 10 (or likely to add a child within the next five years) were highly likely to consider the product, as opposed to less than *12.5 percent* of renters without young children. Similarly *22.5 percent* of renters anticipating high income growth (above 8 percent per year) over the next five years were highly likely to consider use of the SEM, as opposed to only 13 percent anticipating no rise whatever in household income.

- Survey results suggested also that most renters saw the SEM as a form of bridge finance that they would try hard to pay off in the relatively short term. Renters generally reported a direct preference for the new SEMs over the recent spate of affordability-oriented pure debt mortgages, such as interest-only and negatively amortizing mortgages.

Interest in the New SEMs Among Potential Investors

- For investors, the report presents simulations indicating that SEMs would provide a significant and stable incremental return over and above residential real estate returns. So attractive are such enhanced real estate returns that many individual investors own investment properties based on relatively low net rental yields and the anticipation of relatively significant capital growth. SEM securities are tools for making such investments available to the mass market, with low transactions costs and greater diversification across markets. Moreover, interest in these mortgages would be particularly high in areas of rapid housing appreciation, further enhancing investor returns.

- Many investors in asset-backed securities may be interested in assurances not only on the amount of money that their investment will ultimately produce, but also the timing of these monetary flows. The report constructs a model to simulate the pattern of payments over time to investors in SEM securities, incorporating evidence from the consumer survey concerning the likely pattern of borrowing and prepayment. Simulations based on this model show that the time path of payoffs on the new SEM securities would be both relatively easy to predict and tilted toward the short to medium term. The work also makes clear how easy it would be

for investors to smooth the flow of payments over time by investing in funds of different vintages.

The Broader Impact of SEMs

- Given the high level of interest in SEMs among renters, we estimate that their introduction would produce an increase of between 1 percent and 1.5 percent in the U.S. homeownership rate.

- SEMs pose less risk to the financial system than do interest-only and negatively amortizing mortgages. A borrower taking out a 90 percent loan with a combination of a SEM and a regular mortgage has lower default risk than one who uses only a regular mortgage. As a result, SEM finance would not only lower the risk of borrower default but also enhance the stability of the broader financial system.

Conclusions and Next Steps

The report shows that SEMs could contribute greatly to the solution of the nation's housing affordability crisis. This impact would be particularly dramatic in areas of rapid housing appreciation in which the forces of supply and demand are perfectly aligned.

Given their novelty, introduction of SEMs would require major overhauls of the regulatory, legislative, and fiscal structures relating to U.S. mortgages. Participation in the development of SEM markets would serve as a valuable reminder of the unique power that federal institutions possess in guiding financial innovation. After all, both the long-term mortgages that are taken for granted today and the widespread use of secondary mortgage markets were stimulated by enlightened federal policies.

Introduction

In the past decade the rate of homeownership has increased significantly. Having remained essentially flat at 65 percent from 1975 to 1995, the overall U.S. homeownership rate reached 69 percent in 2005. The increase in the homeownership rate among ethnic minorities has been even more marked. Yet there are increasing signs that these recent advances will prove difficult to sustain: The long real estate boom has created affordability problems for renters in high price appreciation areas; tightening fiscal constraints severely limit funds available for housing affordability programs; and the burst of private mortgage innovation that introduced interest-only and negatively amortizing mortgages appears to have run its course. Recent advances in the homeownership rate may reverse themselves should the market go through a downturn.

Introducing new mortgages that blur the lines between debt and equity, however, presents policy makers with the opportunity to propel further advances in homeownership. A simple trade-based argument provides the basic rationale for these markets. The broad financial markets would value shares in individual housing returns more highly than do prospective homeowners who are hard-pressed for cash. We describe a new class of shared-equity mortgage (SEM) engineered to allow trades in which financial investors would supply funds to hard-pressed home buyers in exchange for a contractually specified portion of the underlying housing returns. This report demonstrates the impact of these mortgages on housing affordability and presents "back of the envelope" computations suggesting that the advent of SEM markets would lead to an increase of between 1 percent and 1.5 percent in the U.S. homeownership rate.

The "Changing Priorities, Changing Policies" section provides a brief review of U.S. housing policy since the Great Depression of the early 1930s, leaving the interested reader to dig deeper in the more comprehensive treatments of Carliner (1998), Orlbeke (2000), and Quigley (2000). The clear bottom line is that the ability of the public sector to directly impact homeownership is tightly constrained, given the many other funding priorities and the high per capita cost of direct interventions. The "Private Innovation" section outlines the role that private innovation has played in expanding homeownership opportunities in recent years,

and the concern that these innovations have left borrowers dangerously exposed to adverse market conditions.

The "SEM Design and Gains from Trade" section introduces the new SEMs that are further detailed in Caplin, Pollock, Thampy (2006) and Caplin et al. (2006). This section also outlines the rationale underlying interest among households in using these mortgages to buy a first home, and the appeal of packaged shared-equity securities to investors. Even though the SEMs are obviously unfamiliar to borrowers, some survey evidence indicates that the majority of households would prefer them over such currently popular affordability-oriented instruments as interest-only and negatively amortizing mortgages. Use of the SEM results not only in an immediate improvement in living conditions but also permits immediate participation in housing appreciation.

The "SEMs and Homeownership" section presents computations concerning the possible impact of SEMs on the homeownership rate. We use a methodology based on a life cycle perspective rather than on the static perspective that currently dominates the literature in this area (e.g., Listokin et al. 2001). Our estimates remain highly preliminary; indeed, while our best estimates are in the 1 percent to 1.5 percent range, it is easy to construct scenarios producing increases anywhere in the 0.5 percent to 2.0 percent range.

Even if SEMs could significantly raise the homeownership rate, they are not a panacea for problems of housing affordability and the associated wealth-building constraints. By definition, sharing of equity limits the economic gains accruing to households as they become homeowners, at least in comparison to buying houses outright. Moreover, SEMs would do little to alleviate the problems faced by those who are far removed from the margins of homeownership. Yet development of SEM markets would powerfully complement other anti-poverty programs, offering a further helping hand once more basic needs had been addressed.

Changing Priorities, Changing Policies

At the time of the Great Depression, the U.S. housing finance system had critical vulnerabilities. On the positive side, in terms of financial stability, standard home loan contracts were tightly underwritten and permitted loan-to-value

ratios of only 50 to 60 percent (Vandell 1995). Unfortunately, they were also short term, carrying three- to 15-year term limits. Many borrowers also took out bullet second mortgages that were in need of refinancing within seven years (Carliner 1998; HUD 2003). This meant that the crash in house values that accompanied the Depression not only wiped out down-payment wealth, but also left many borrowers unable to refinance their bullet mortgages. The resulting wave of mortgage defaults produced such social problems as eviction and homelessness, and also contributed to the melt-down in the financial system. Half of all loans were held by savings and loan institutions, which suffered massive losses as a result (Anderson 2004).

To address this situation, the National Housing Act of 1934 authorized the Federal Housing Administration (FHA) to insure home improvement, rental housing, and homeownership loans. Under the Section 203(b) program, FHA insurance required industry standardization of mortgage products. This led to improved underwriting guidelines as lenders were able to provide mortgages at minimal risks. FHA loans were more affordable to borrowers than their predecessors and carried 20-year, fully amortized loan terms, with 80 percent loan-to-value ratios.

In addition to revolutionizing mortgage design, the measures that the federal government took following the Depression paved the way for the development of secondary mortgage markets. There was great concern with regional imbalances in the cost and availability of housing credit (Carliner 1998 and Jones and Grebler 1961). To equalize these burdens, the National Housing Act provided for the establishment of National Mortgage Associations, federally chartered private firms that would purchase mortgages. However, no such institutions were privately formed, and in 1938 the federal government created the Federal National Mortgage Association (Fannie Mae) to purchase FHA mortgages. A further stimulus to secondary market development was the Housing and Urban Development Act of 1968, which recreated Fannie Mae as a government-sponsored enterprise (GSE), authorized to buy FHA and VA loans at their market values. The same act provided the Government National Mortgage association (GNMA) with the authority to guarantee securities backed by pools of mortgages and issued by private lenders. With these institutional building blocks in place, secondary markets matured rapidly during the 1980s (Bhattacharya, Fabozzi, and Change 2001).

As Quigley (2000) stresses, the construction of public housing formed the centerpiece of explicit housing policy in the immediate postwar decades. The switch toward an emphasis on ownership was gradual. The Housing Act of 1968 established Section 235, which was the first federally subsidized housing program explicitly designed to extend homeownership to low-income populations (Mitchell 1985). Another set of programs aimed at boosting affordability were those associated with the Community Development Block Grant (CDBG) program that was set up under the Housing and Community Development Act in 1974. Over the past 30 years, $108 billion in grants have been made under this program. Since 1974, about 28 percent of CDBG funds have been used for rental and homeownership assistance.

The states as well as the federal government got into the business of subsidized housing. Mortgage Revenue Bonds (MRBs) are tax-advantaged bonds issued by state housing finance agencies (Smith and Richardson 1983). These MRBs enable qualifying first-time low-income home buyers to purchase homes with subsidized mortgage interest rates to reduce monthly mortgages. Housing Trust Funds (HTFs) represent another reflection of high local ambitions in the area of housing policy. First used in the 1970s by a handful of states, HTFs are dedicated funding streams of states, cities, and localities designed to expand affordable housing primarily through new construction, rehabilitation, and mortgage assistance (Brooks 2002). For home buyers, HTFs can be used for help with down payment, closing costs, and mortgage assistance; for developers, they can be used for new construction, rehabilitation, and land acquisition.

With grand federal and state ambitions came a corresponding price tag, and it was precisely these high costs that led to a major cutback in ambitions. From 1968 to 1974, federal spending on subsidized housing soared due to programs like Section 235 (Hays 1985). As spending mushroomed, Section 235, along with most HUD programs, was frozen for reevaluation. In 1973, the National Housing Policy Review task force resolved that Section 235 was inefficient in providing housing to the neediest populations. A similar problem of rising cost led to limitations on the use of MRBs at the local level. From 1978 to 1980, MRBs issued by state and local governments grew from $3.4 billion to $10.5 billion. This figure reflects not only the construction of public housing, but also the construction of Section 235 units. After 1980, this tremendous growth led to legislative

changes to limit the issuance of MRBs. In addition, Jaffee and Quigley (2006) provide estimates suggesting that the implicit credit guarantees provided to GSEs are very costly. The authors also show the massive, and highly regressive, burden imposed by the failure to tax imputed rents on owner-occupied housing.

While political and economic considerations make it unlikely that the government's existing housing expenditures will be reduced significantly, there has recently been very little appetite for costly new schemes to further subsidize homeownership. Hence, the 1980s witnessed a major cutback in federal and local spending on housing that has continued to this day.

The new measures that have been introduced in recent years represent efforts to use the reduced funds in an ever more focused and efficient manner. The modern era also represents a change in priorities, with homeownership framed as an anti-poverty tool to stimulate wealth creation. In 1990, Congress passed the Cranston-Gonzales National Affordable Housing Act that called for expanding homeownership opportunities and affordable mortgage finance systems for all Americans (Carliner 1998). The National Homeownership Strategy outlined in 1995 further emphasized the new focus on expanding homeownership to middle-income, low-income, and minority populations (HUD 1995). The programs launched to accomplish this goal, however, have all been relatively modest in scope in order to limit costs, including: the HOME block grant program, Family Self-Sufficiency Funds, Individual Development Accounts (IDAs), the American Dream Down Payment Initiative (ADDI), the Self-Help Homeownership Opportunity Program (SHOP), and the Housing Choice Voucher Program. If one calculates the cost of these programs on a per capita basis, it is clear that it would take a massive boost in spending to produce significant improvements in the homeownership rate. For example, it has been estimated that the first 15,580 households to receive assistance under the ADDI program entailed public subsidies of $7,500 each. Even if one extrapolated linearly, it would cost many billions of dollars to increase the ownership rate by a single percentage point, and there is every reason to believe that these costs would increase as one identified households further and further removed from the margins of ownership.

Given the modest levels of federal funding granted to new affordability programs, there has been renewed interest in housing at the local level, with local governments (largely through inclusionary zoning laws) and the not-for-profit sector playing major roles. The contribution from the not-for-profit sector is best exemplified by the growth of community development financial institutions (CDFIs), which began in 1994 when Congress authorized the CDFI Fund. Grants are made on a competitive basis to CDFIs that use the capital to leverage private investments to serve low-income and underserved areas. CDFIs were given an additional boost in 1995 when their loans and investments were included as qualifying under Community Reinvestment Act (CRA) guidelines requiring financial institutions to invest in the communities where they are located. Today, more than a thousand CDFIs manage more than $10 billion in private capital (NLIHC 2006).

A particularly interesting set of schemes that represent the combined efforts of local government and the not-for-profit sector are outlined by Davis (2006) in his monograph "Shared Equity Homeownership: The Changing Landscape of Resale-Restricted, Owner-Occupied Housing." Despite the similar name, these schemes differ substantially from those described in this study. Many have been put in place by community land trusts and involve selling the land at a reduced price to financially strapped owners, who are in turn required to sell at a restricted price to others with affordability problems. These schemes are not intended to have great commercial appeal, but they do indicate that the public sector and the private sector are converging on similar concepts. One way or another, the newest innovations weaken the distinction between renting a home (with no rights to the home equity) and owning a home (with full rights to all home equity). Before describing the private SEM schemes that are the main subject of this study, we first explain why the private mortgage market based on outright ownership appears to have reached the limit of its ability to increase opportunities for first-time buyers.

Private Innovation

The interest rates associated with traditional fixed- and adjustable-rate mortgages have followed a declining trend over the past two decades. As the decline in rates slowed in the early 2000s, the mortgage market continued to fuel lending volumes by offering a number of innovative mortgage lending products, often referred to as "alternative" or

"exotic" mortgages. Affordability enhancements that have been developed include: extending the loan term on fixed-rate mortgages to 40 years from the traditional 30 years; lowering early payment amounts by locking in teaser rates during the early years of the mortgage, with a later "reset" to a higher rate; allowing borrowers to pay only interest (interest-only); and allowing borrowers to pay even less than the interest (negative amortization or adjustable-rate option mortgages). In general, the purpose of these products is to enable borrowers to exchange lower payments early in the amortization period for higher payments later.

The broad market adoption of these alternative mortgage products has been significant. In testimony before the Senate Banking Committee in September 2006, the U.S. Government Accountability Office estimated that nontraditional mortgages rose from a 10 percent market share in 2003 to a 30 percent market share in 2005. Detailed data on the take-up rates of these mortgages among first-time home buyers is hard to obtain. However, much relevant information is contained in a report by Cagan (2006) based on data from First American Real Estate Services (FARES). Table 1 shows the number of adjustable-rate mortgages issued in 2004–2005 by initial interest rate.

Table 1. Initial Interest Rates on New Arms: 2004–2005

Initial Interest Rate	No. of Loans	Percentage of Loans (%)	Original Amount (millions)
Below 2%	1,303,763	16.9	$389,196
From 2% to 3%	30,767	0.4	$9,392
From 3% to 4%	84,082	1.1	$31,931
From 4% to 5%	276,403	3.6	$101,490
From 5% to 6%	838,233	10.9	$243,068

Source: Fares data from Cagan (2006)

Table 1 indicates the large number of adjustable-rate mortgages that have been issued with very low teaser rates, implying that there will be a very large spike in payments once the teaser period ends. In addition, these loans carry very small down payments. It appears that borrowers are

choosing adjustable-rate mortgages to pay for higher-priced residences than they would qualify for with fixed-rate loans. This pattern is powerfully confirmed by Cagan (2006), who estimates that many households that chose adjustable-rate mortgages on homes purchased in the past few years now have negative equity in their homes. Table 2 records the estimated homeowner equity on properties with adjustable-rate first mortgages. The underlying data set contains 26 million residences. The value of each residence was computed as of September 2005 using an automatic valuation model. The homeowner equity in each home was defined as the current market value, less the total first and second mortgage debt at origination.

Table 2. Equity Position on Homes Purchased with ARMS

Percent Equity	2000 (%)	2001 (%)	2002 (%)	2003 (%)	2004 (%)	2005 (%)
Less than -5%	6.5	6.1	5.7	5.2	7.5	24.2
Less than 0%	8.0	7.7	7.7	7.4	11.4	32.3
Less than 5%	10.0	10.0	10.8	10.9	17.7	41.8
Less than 10%	12.7	13.3	15.4	16.0	26.5	51.8
Less than 15%	16.3	17.9	21.5	22.6	37.1	61.6
Less than 20%	21.1	23.8	28.6	30.6	48.4	70.5
Less than 25%	26.9	30.5	36.5	39.8	59.7	78.1

Source: Fares data from Cagan (2006)

Table 2 suggests that a very large proportion of those who recently took out adjustable-rate mortgages now have negative equity. The combination of low or negative equity and artificially reduced early payments is troubling to many in the financial community. In an environment that lacks substantial price appreciation (collateral), real income growth (capacity to pay), and/or interest rate declines (cost of capital), products that do not require substantial amortization can cause increased rates of default. These risks have not gone unnoticed by regulators. On September 29, 2006, the Office of the Comptroller of the Currency, the Board of Governors of the Federal Reserve System, the Federal Deposit Insurance Corporation, the Office of Thrift Supervision, and the National Credit Union Administration issued a joint press release titled "Federal Financial Regulatory Agencies Issue Final Guidance on Nontraditional Mortgage Product Risks." The report noted:

"While similar products have been available for many years, the number of institutions offering them has expanded rapidly. At the same time, these products are offered to a wider spectrum of borrowers who may not otherwise qualify for a similar-size mortgage under traditional terms and underwriting standards. The agencies are concerned that some borrowers may not fully understand the risks of these products. While many of these features exist in other adjustable-rate mortgage products, the agencies' concern is elevated with nontraditional products because of the lack of principal amortization and the potential for negative amortization" (http://www.federalreserve.gov/boarddocs/press/bcreg/2006/20060929/default.htm.)

The guidance concentrated on maintaining prudence in lending standards, enhancing risk management, and tightening disclosure requirements to ensure that consumer decisions are informed. In combination, this heightened federal concern and the apparent change in housing market momentum suggest strongly that the boom in high-risk alternative mortgages is at or past its apex.

SEM Design and Gains from Trade

The Design Challenge

Even the most affordability-oriented mortgages issued to date are pure debt instruments. Yet as pointed out in Caplin, Chan, Freeman, and Tracy (1997), more innovative mort-gages that bridge the gap between debt and equity may provide profound affordability enhancements. The "gains from trade" argument for such SEMs is that at the margin, the broad financial markets value shares in individual housing returns more highly than do those who occupy the homes. SEMs also pose less risk to borrowers than do interest-only and negatively amortizing mortgages. A 25 percent SEM when combined with a regular mortgage for 65 percent of the house value provides the first mortgage lender with significant protection, which should result in a first mortgage that will be very attractive to the secondary markets. Hence there is every reason to believe that such 90 percent finance packages that include SEM mortgages would be insured at lower cost and therefore be more attractive to many consumers than standard 90 percent loan to value ratio mortgages.

Despite this high promise, liberating the potential gains from trade deriving from SEM markets requires careful financial engineering. Such engineering was noticeably absent in the first SEMs on the market — the shared-appreciation mortgages introduced in the United States during the late 1970s. Shared-appreciation mortgages offer borrowers interest rate reductions in exchange for a contractually specified share of appreciation on the home. The Bank of Scotland issued a particularly innovative mortgage of this type in the United Kingdom in the mid 1990s (Sanders and Slawson 2005). This mortgage became due only upon sale of the property or death of the last co-borrower, involved no interest payments during the life of the loan, and incorporated an *appreciation sharing ratio* of three to one. That is, the borrower would pay 60 percent of appreciation as interest on a loan with a 20-percent down payment.

This particular shared-appreciation mortgage shares with all such products an unfortunate feature: The cost of capital to the borrower falls over time, as illustrated in example 1. The example involves a shared-appreciation mortgage with no interest during the life of the loan, and with an appreciation sharing ratio of only two to one. (The borrower pays out only 40 percent of appreciation as interest on the loan requiring a 20-percent down payment.) The effect of the period for which the mortgage is held, the holding period, in reducing the cost of capital is general. When the loan is first made, the borrower owes the lender exactly 20 percent of the value of the home. Hence the 40 percent sharing of appre-

ciation represents double this share. However, if the house doubles in value over time, then the borrower owes the lender 30 percent of the value of the home. Hence the fixed 40 percent sharing of appreciation represents far less than double this share. More generally, as the house appreciates over time, the share that is owed of the total house value rises toward 40 percent, and as it does so, the fixed 40-percent sharing of appreciation represents less and less of an incremental return.

■ **Example 1.** Consider a $100,000 shared-appreciation mortgage for 20 percent of a house valued at $500,000. There is no interest during the life of the loan, and 40 percent of appreciation is due at the end of the period for which the mortgage is held. Assume that there is real yearly house price growth of 4 percent and yearly inflation of 3 percent.

  ❍ With termination after one year, the value of the property has grown by slightly more than 7 percent, to approximately $535,000. Hence, the borrower pays back approximately $114,000 at point of termination (the $100,000 initial loan plus $14,000 of the $35,000 in appreciation). The resulting cost of capital (the interest rate that brings the terminal payment into present value equivalence with the $100,000 loan) is 14 percent per annum.

  ❍ With termination after 10 years, the value of the house has almost doubled to approximately $1,000,000. Hence the borrower pays back approximately $300,000 at point of termination (the $100,000 initial loan and $200,000 of the $500,000 in appreciation). The resulting cost of capital is approximately 11.5 percent per annum, since the tenth root of $300,000/$100,000 = 3 rounds to 1.115,

$$(3)^{0.1} \approx 1.115.$$

Given that the cost of capital is lower for those with longer holding periods, shared-appreciation mortgages are vulnerable to adverse selection. They are likely to attract particular interest from those who intend to hold them for long periods, resulting in lower returns to investors in the resulting securities. Clark, Deurloo, and Dieleman (2003) have shown that the self-selection effects can be very large, since the mobility rate for owners aged 20 to 29 over the period 1968–1993 was approximately four times as high as that of owners aged 50 and above. Moreover, the same factors that give rise to adverse selection also produce moral hazard, whereby the behavior of those who do take out this form of finance is distorted in the direction of prolonging the holding period. The fact that the term of the mortgage depends on the extent of moral hazard and adverse selection increases not only the expected payout period for investors, but also the uncertainty concerning this period. The extent to which investors dislike this uncertainty can be illustrated by the extraordinarily sophisticated partitioning of payoffs on standard mortgage securities in the United States into various temporally ordered tranches (Lowell 2001).

The long and unpredictable nature of the payoff period appears to have been the chief reason that the Bank of Scotland withdrew its shared-equity mortgages from the market. Given that the underlying mortgages had no fixed term, they were securitized in a bundle that included some standard interest bearing mortgages to provide an income guarantee (SBC Warburg Dillon 1998a, 1998b). The end result was a complex and illiquid security whose payoff profile was very hard for the market to evaluate. Investors shied away from these securities, forcing the Bank of Scotland to take the underlying mortgages off the market.

It is difficult to see how the market in SEM securities can take off if the moral hazard and adverse selection problems are not fixed. After all, one must expect that in the early days of the market, SEM securities will appeal most to buy-and-hold investors. Such investors will be looking for assurance not only on the amount of money that their investment will ultimately produce, but also on when this money will be realized. What is required is an improved pricing mechanism in which the cost of capital is independent of the holding period. Just such a pricing scheme has now been developed.

The Shared-Equity Rate

To set the design problem in perspective, note that with a standard fixed-rate mortgage, the borrower's interest cost depends only on the time for which the loan is held and is entirely independent of the value of the house or the state of the economy. The obvious limitation of the time-dependent mortgage is that it disallows any sharing of house price risk. By way of contrast, the payment to be made on a shared-appreciation mortgage depends *only* on the value of

the underlying home and is independent of the time for which the mortgage is held. The problem with this purely state dependent scheme is that the investor gets no direct compensation for the time cost of money. (Caplin and Leahy [1991] expand upon the distinction between time- and state-dependent pricing.) What is needed for the SEM market to achieve its full potential is a hybrid pricing mechanism that combines elements both of time and state dependence.

The *shared-equity* rate pricing mechanism is just such a hybrid. As with the Bank of Scotland mortgage, no payment is required during the term of the loan. Yet the amount due at termination corresponds to a share in the value of the home that increases the longer the loan has been outstanding. The rate of growth in this share is called the shared-equity rate on the SEM in question: A typical annual rate is likely to be in the 3- to 4-percent range. Conceptually, the shared-equity rate is a rate of interest charged in terms of real housing units. The dollar amount due upon termination is determined by simply combining the share of the loan due and the value of the house in the obvious manner. We illustrate the working of this mortgage with the same assumptions used in Example 1, again identifying the cost of capital for both one- and 10-year terms.

- **Example 2.** Consider a $100,000 SEM for 20 percent of a house of value $500,000 with a shared-equity rate of 4 percent. Again, there is no interest during the life of the loan; real house price growth is 4 percent; and inflation of 3 percent.

  ❍ With termination after one year, the borrower pays back 20.8 percent of the approximately $535,000 house value, with the incremental 0.8 percent share being 4 percent of the initial 20 percent loan. The total paid back is approximately $111,500 and the resulting cost of capital is approximately *11.5 percent.*

  ❍ With termination after 10 years, the borrower pays back approximately 29.6 percent of the approximately $1,000,000 house value, with the incremental 9.6 percent share being 10 years of compounded annual growth at 4 percent. The total paid back is approximately $300,000 and the resulting cost of capital is approximately *11.5 percent* (the same as for the shared-appreciation mortgage of example 1).

As this example illustrates, the shared-equity pricing mechanism makes the cost of capital to the borrower (and therefore the return to the investor) independent of the holding period. The reason for this is that the incremental growth in the share owed is constant at 4 percent over time. Hence there is reason neither for those with long holding periods to prefer a mortgage of this form, nor for distortion of holding periods by those who do take them out. This pricing mechanism therefore provides *stable investor returns* without distorting consumer behavior. Further illustrations of the distinction between the shared-appreciation mortgage and the shared-equity mortgage are contained in table 3, in which the rows correspond to rates of nominal house price increase, and the columns display costs of capital with the shared-equity mortgage and with the shared-appreciation mortgage. We use the same comparison based on the $100,000 loan on a $500,000 house, in which the shared-appreciation mortgage involves paying back 40 percent of appreciation at tenure while the SEM involves a shared-equity rate of 4 percent.

Table 3 illustrates several features of the comparison between the shared-equity rate pricing mechanism and sharing of appreciation. As already noted, the shared-equity rate cost of capital is independent of the term, and is generally 4 to 4.5 percent above the rate of house price appreciation. No such simple description can be used to summarize the cost of capital with the shared-appreciation mortgage. Looking down the one-year column, the cost of capital is double the rate of house price appreciation. However this cost falls as the term extends, with the rate of decline increasing as the rate of house price increases. The reason for this is that the share of the house that is owed increases as the rate of appreciation increases. Finally, note that we have drawn attention to the various scenarios in which the cost of capital is lower with the shared-appreciation mortgage than with the SEM. This shows that shared-appreciation mortgages would be more attractive not only to those borrowers with longer intended holding periods, but also to those with lower expectations of house price appreciation. In a competitive setting, self selection effects may significantly lower the cost of capital on the shared-appreciation mortgages and lower the returns to investors in the corresponding securitized mortgage pools.

Table 3. Comparing Annual Cost of Capital of SEM with SAM

Annual Nominal House Price Appreciation	Annual Cost of Capital				
	Shared Equity Mortgage	Shared Appreciation Mortgage			
	Term Independent (%)	1 year (%)	5 years (%)	10 years (%)	15 years (%)
0%	4.0	**0.0**	**0.0**	**0.0**	**0.0**
3%	7.1	**6.0**	**5.7**	**5.4**	**5.1**
6%	10.2	12.0	10.9	**10.0**	**9.3**
9%	13.4	18.0	15.7	14.1	**13.0**
12%	16.5	24.0	20.4	18.0	16.6

Borrower Interest

As detailed in Caplin et al. (2006), we conducted a survey in major metropolitan areas (Atlanta, Boston, Chicago, Los Angeles, Miami, New York, Philadelphia, San Diego, San Francisco, and Washington, D.C.) targeting households that felt it was at least "somewhat important" to buy their next home within the next five years. We received 1500 completed responses during February 2006. We took care to simplify the presentation of the pricing mechanism, tabulating the share that would be owed based on an initial loan for 20 percent of the house value and an annual shared-equity rate of 4 percent (see Table 4).

We used concrete examples to explain the pricing scheme and the fact that the annual interest cost exceeds the annual rate of house price increase by approximately 4 percent. After laying out the basic product, we posed a series of questions in which we offered new information on the SEM. After introducing all specific features, we posed our critical question on product interest: "How likely would you be to consider using an SEM if it is available when you are planning your next home purchase?" The possible answers to this question were: highly likely; somewhat likely; somewhat unlikely, and highly unlikely.

Two facts stand out concerning interest among renters. First, the overall level of interest was high, with some 17 percent highly likely, and 66 percent at least somewhat likely, to consider use of the SEM. Second, the level of interest varied across households in a highly reasonable fashion, suggesting that respondents had an intuitive grasp of the costs and benefits of the SEM. It had been our expectation that the new SEM would be of most interest to younger liquidity-constrained renters facing either a pressing need to move (a new child, for example) or expecting improved circumstances in the near future. In confirmation, more than 21 percent of renting households with a child under age 10 (or likely to add a child within the next five years) were highly likely to consider the product, as opposed to less than 12.5 percent of renters without young children. Similarly 22.5 percent of renters anticipating high income growth (above 8 percent per year) over the next five years were highly likely to consider use of the SEM, as opposed to only 13 percent anticipating no rise whatever in household income. While there may be some bias in question response due to probable responder awareness of the interests of the researchers, the respondents appear to have given the questions legitimate attention.

The survey produced other interesting findings concerning the motivations underlying product interest. The majority of respondents of all types reported that liberal prepayment rules were very important in increasing their interest in the SEM and chose relatively short-term SEMs in the five- to 15-year range. We conclude that most potential borrowers understand the SEM as a form of bridge finance that they would try hard to pay off in the relatively short term. In

Table 4. SEM Dynamics with 4 Percent Shared Equity Rate

Year	SEM Share (%)	SEM Incremental Share (%)
0	20.0	0.0
1	20.8	0.8
2	21.6	1.6
3	22.5	2.5
4	23.4	3.4
5	24.3	4.3
6	25.3	5.3
7	26.3	6.3
8	27.4	7.4
9	28.5	8.5
10	29.6	9.6

response to this finding, the SEMs that have been developed to date have relatively short terms of 10 and 15 years. Since the survey evidence suggests that many wish to terminate before the end of this period, it is important to allow liberal prepayment.

Investor Interest

Given a 4 percent shared-equity rate, Table 3 above shows that the cost of capital exceeds the return on housing by some 4 percent – 4.5 percent annually. Hence, this is the natural starting point for estimates of the rate of return to investors holding the corresponding SEM Securities. However, a systematic downward adjustment must be made to allow for moral hazard problems in home maintenance of a form stressed by Shiller and Weiss (1998) and Sanders and Slawson (2005). To counter this, a contract clause has been put in place allowing owners to be the sole beneficiaries of major improvements. Caplin, Pollock, and Thampy (2006) present simple calculations suggesting that a 0.5 percent annual reduction in returns would result. Following up on this adjustment, they show that well-diversified SEM Securities embedding a 4 percent shared-equity rate would provide an incremental return of some 3.6 to 3.8 percent over and above real estate returns.

To understand why enhanced residential real estate of this form creates such an attractive asset, note that it has been known at least since the work of Goetzmann (1993), Flavin and Yamashita (1998) and Caplin, Chan, Freeman, and Tracy (1999) that residential real estate returns have low volatility and excellent correlation properties, thereby offering profound diversification benefits. These early findings have been updated and confirmed in Caplin, Pollock, and Thampy (2006). So attractive is enhanced real estate that many individual investors own investment properties based on relatively low net rental yields and the anticipation of relatively significant capital growth. One can view the SEM securities now being designed as tools for making such investments available to the mass market, with low transactions costs and greater diversification across markets.

Given that many investors in asset-backed securities may be interested in assurances not only on the amount of money that their investment will ultimately produce, Caplin, Pollock, and Thampy (2006) show that the time path of payoffs is both relatively easy to predict and is tilted toward the short to medium term. By tracking the simulated pattern of mortgage prepayment and mortgage termination, they are able to build a model of monetary flows over the life of each security. While this work suggests large payoff spikes on hitting the 10- and 15-year marks, the most striking feature is the relatively smooth pattern of payouts in all other periods. The work also makes clear how easy it would be for investors to smooth the flow of payments over time by investing in funds of different vintages.

One unknown in terms of investor interest is the impact of the self-selected nature of first-time buyers on returns. Unfortunately, little is known concerning how the markets selected by less well-to-do first-time buyers have historically performed relative to the broader market. Mills and Lubuele (1994) and Van Order and Zorn (2000) find little difference in default behavior between low and moderate-income neighborhoods of U.S. cities. Quercia et al. (2000) show that in Dade County, Florida, appreciation rates in areas of below-median-income households are at least as high as those in other areas (see also Can 1990). Yet they comment also on the striking lack of knowledge in this area: "Unfortunately, despite widespread interest, the topic of appreciation in low-income or underserved neighborhoods has received little attention." (Quercia et al. 2000, p.2).

More broadly, there is little consensus on what drives variations in rates of house price appreciation within any given metropolitan area. Smith and Tarsek (1991) showed that prices of low-quality homes in Houston were less volatile than their high quality counterparts in boom-bust cycles. Case and Shiller (1994) found the same result for low-priced homes in Los Angeles. However, the result was entirely reversed in Boston, where Poterba (1991) showed that high-priced properties experienced lower appreciation rates during the 1980s than did their low-priced counterparts. The explanations that have been offered for the observed relative price patterns include: the sectoral composition of employment; changes in employment locations; job-induced migration into or out of the metropolitan area; broad changes in metropolitan demographics; and availability of land for construction. Case and Mayer (1996) indicate just how complex these factors have been in driving the dynamics of house prices in the Boston metropolitan area.

All of these problems suggest the need for highly localized house price indices, which in turn require an understanding of the rich underlying spatial structure. However, until recently, the focus has been on building city/SMSA level indices. In the literature on repeat sales indices, the focus has been on a richer specification of the error term, with Case and Shiller (1987) accounting for heteroskedasticity and Goetzmann and Spiegel (1997) taking account of spatial correlation. The hedonic price literature has focused on similar issues, and most attempts to model spatiotemporal structure have restricted attention to information that can be learned from nearby properties (Pace et al. 1998; Gelfand et al. 2004). Deeper understanding of neighborhood dynamics requires a combination of massive data tapes and heavy reliance on non-linear methods of estimation. Use of such intensive techniques is now under way (Meese and Wallace 1994; Anglin and Gencay 1996; Clapp 2004), but this work remains in its infancy due to the very high costs in terms of data and computational power. We believe that understanding of neighborhood effects on house price appreciation will radically improve if SEM markets develop, since their existence will motivate the financial community to invest in such knowledge. Until that happens, the presumption must be that affordability-enhancing mortgages issued to first-time buyers will be securitized along with other forms of SEM in an effort to more closely replicate returns on the typical broad-based housing index.

SEMs and Affordability
SEMs and Other Innovative Mortgages

The survey produced powerful evidence of potential interest in using the SEM to improve housing affordability. Particularly important in this regard are comparisons with interest-only and the negatively amortizing mortgage. We asked those respondents who reported familiarity with either of the mortgages questions concerning the comparison with the SEM. The essential findings related to renter preferences in this regard are summarized in Table 5. Note that we have divided households into three categories: those headed by couples, female-headed, and male-headed. The central finding is that people prefer the SEM over both other products in a head-to-head comparison; and the SEM is the first choice among the three products for the majority of respondents. We now provide detailed examples illustrating why so many renters see the SEM as particularly responsive to their needs.

Table 5. SEMs and Other Mortgages

	SEM over IO		SEM over NA		SEM First	
	N	%	N	%	N	%
Couple	243	65	90	77	90	60
Female Head of Household	98	69	25	85	25	60
Male Head of Household	45	54	20	56	20	31

The Maximum Affordable House at Origination

To understand interest in the SEMs among those with affordability problems, we calculate the maximum affordable house at the time of mortgage origination for those who use SEMs and for those who use regular mortgages. Table 6 presents these calculations for households with varying levels of income and available assets. It is assumed that 30-year mortgage finance is available at 7.5 percent per annum, that up to 20 percent of house value, and 95 percent in total, is borrowed with a SEM, and that up to 40 percent of income can go to mortgage repayments.

With an SEM, as opposed to a traditional mortgage, a household with an income of $20,000 and assets totaling $10,000 is able to afford a home that is 24 percent more

Table 6. Maximum Affordable House with SEM ($) and Percentage Improvement in Value over Standard Mortgage

Income ($)	Assets ($)				
	10,000	15,000	20,000	25,000	30,000
20,000	126,756 (+ 24%)	132,708 (+ 24%)	138,660 (+ 24%)	144,613 (+ 24%)	150,565 (+ 24%)
30,000	142,857 (+ 0%)	190,133 (+ 24%)	196,086 (+ 24%)	202,038 (+ 24%)	207,991 (+ 24%)
40,000	142,857 (+ 0%)	214,286 (+ 7%)	253,511 (+ 24%)	259,464 (+ 24%)	265,416 (+ 24%)
50,000	142,857 (+ 0%)	214,286 (+ 0%)	285,714 (+ 13%)	316,889 (+ 24%)	322,841 (+ 24%)
60,000	142,857 (+ 0%)	214,286 (+ 0%)	285,714 (+ 0%)	357,143 (+ 18%)	380,267 (+ 24%)

valuable. As the asset level increases, this pattern continues. However, as income increases, the affordability advantage resulting from use of the SEM gradually disappears. The reason for this is that at some point the borrower achieves an income level that makes it possible to pay regular mortgage interest on the most valuable house that their assets will permit them to purchase. Of course, as assets increase, the payment on a regular mortgage starts to constrain the maximum house value, and it is at this point that the additional borrowing power of the SEM kicks in. For a household with income of $40,000 and assets of $20,000, the SEM once again enables the purchase of a home that is 24 percent higher in value. This same 24 percent increase in house value applies also for a household with annual income of $50,000 and assets of $25,000, and for a household with income of $60,000 and assets of $30,000.

The phenomenon illustrated in Table 6 is general. As soon as the income constraint on borrowing is binding, the SEM relaxes the affordability constraint by opening up a new source of funds that does not increase monthly mortgage payments. Hence the SEM is particularly useful for those who are income constrained.

Speeding the Transition to Ownership

We consider now the transition to ownership. For simplicity, we stick with the market assumptions above and consider a household with $30,000 in assets and $50,000 in income that can afford a house worth 24 percent more if using the SEM. The question now is how long it would take for the larger house to be affordable using only a standard mortgage. A key variable in this waiting-time calculation is the proportion of income the household is able to save while in the current home (that is, after paying for rent and all other living expenses). We use a 5 percent saving rule for simplicity, whereby in each year before moving to the new home, the household sets aside 5 percent of its income to pay for the home. For most of the households we are considering, resources are tight, so that setting aside 5 percent of income on top of already high rental payments is likely to represent a considerable effort. Again, the qualitative morals are general, although every change in household economic characteristics requires the details to be re-computed.

The three curves in Figure 1 represent the combinations of income growth and house price growth that make possible a house purchase within one, five, and 10 years. The figure shows that if real house prices do not grow at all, then real income growth of more that 24 percent annually will be necessary for the household to afford the home in one year; real income growth of 4 percent will be needed to move in five years; and real income growth of 1.4 percent annually to purchase the home in 10 years. Ever higher levels of real income growth are needed to afford the given home if the rate of house price growth increases. With real house price growth at its historical average of some 4 percent per year, real income must grow by more than 8 percent annually to afford the home within 5 years. Table 7 illustrates that this phenomenon is more general, by showing that with historical real price growth of some 4 percent, this same 8 percent real income growth is needed for the household to be able to use regular mortgage finance to purchase the home with a five-year delay. In general, if house prices rise even at a moderate rate, the affordability equation works powerfully against renters. It is for this reason that surveys suggest such profound interest among renters in using SEM finance to speed the transition to ownership.

Figure 1. Delayed Purchase
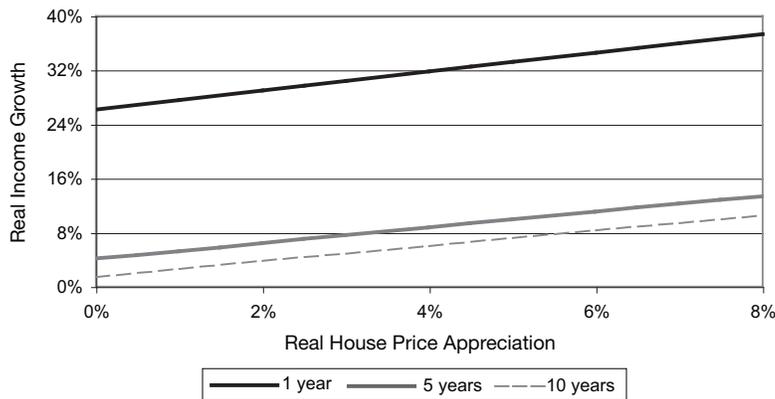
Note: Assumptions are identical to those underlying Table 6.

Bridging Benefits

Consider a household that is deciding which of three strategies to pursue: immediately buying the largest possible home with only regular mortgage finance; immediately buying the largest possible home with a SEM; and delaying the purchase for 10 years, saving and allowing assets to accu-

Table 7. Real Income Growth Required to Purchase SEM Home in Five Years

Income ($)	Assets ($)				
	10,000 (%)	15,000 (%)	20,000 (%)	25,000 (%)	30,000 (%)
20,000	8	8	9	9	9
30,000	N/A	8	8	8	9
40,000	N/A	4	8	8	8
50,000	N/A	N/A	6	8	8
60,000	N/A	N/A	N/A	7	8

Note: Assumptions made are the same used to compute Table 6; one additional assumption is that there is a 4 percent per year real house price appreciation.

mulate in the meantime, and then buying the largest possible house in year 10 using regular mortgage finance. We compute the maximum value home that this household is able to afford in year 10 under each of these strategies.

The first point to note is that, relative to buying the lower-priced home without a SEM, the choice of SEM financing results in the buyer owing the lender an incremental 9.6 percent share in the value of the home (the SEM debt having risen from 20 percent to 29.6 percent of the house value). The actual impact on affordability in year 10 depends on many factors: how rapidly house prices grow; how rapidly income grows; the interest rate on newly issued standard mortgages at the end of year 10; how much the household saves each year; and the interest rate on savings. In order to study this, we continue the example above while making additional assumptions relating to changes over time. In particular, we assume that real house prices grow by 4 percent annually, that the nominal interest rate on the standard mortgage remains constant at 7.5 percent, that the household sets aside a constant proportion of its after-tax income each year; and that all such savings earn real interest of 1 percent during the holding period.

Given all of the above assumptions, it is the rate of real income growth that is the key determinant of year 10 housing affordability. Figure 2 plots the maximum affordable house in year 10 as a function of the rate of real income growth for a household under each of the three possible strategies: immediately buying the largest possible home with only regular mortgage finance; immediately buying the largest possible home with a SEM; and delaying the purchase for 10 years, and then buying the largest possible house in year 10 using regular mortgage finance. Note that the house prices recorded on the vertical axis are all initial prices. This enables us to abstract from the impact both of general price inflation and house price increases. The question is simply how large a house will be affordable in 10 years, and we do not want the answer to that question to be distorted by price inflation in the intervening period.

Clearly affordability is highest if the household buys without the SEM, second highest if the household uses the SEM, and lowest if the household does not buy the home and thereby misses out on housing appreciation. Yet a striking finding is that even with zero real income growth, using the SEM leaves year 10 house affordability equal to $275,000. Even in this disappointing case, the use of SEM finance would result in year 10 housing affordability exceeding current affordability without a SEM. The mere fact that the household bought the house earlier would provide it with a growing level of net equity in the home. Note also that the gap in housing affordability in year 10 is typically far smaller than the 24 percent gap between the house initially purchased without the SEM and the house purchased with the SEM. The figure powerfully illustrates the bridging benefits of the SEM, which enables households immediately to move to homes that align closely with their improving prospects.

Figure 2 has two features that show transaction costs of buying and selling a home, which are set at roughly 6.5 percent. First, note the break in affordability for those who use the SEM and yet who have rates of real income growth below 1.4 percent. This discrete drop is associated with the fact that if this household pays off the SEM in year 10, the current house has to be sold to raise the necessary revenue, giving rise to round-trip transaction costs. On the other side of this, note that there is a particularly small gap (roughly 5 percent) in housing affordability between the household that uses a SEM and the household that does not in year 10 if the rate of real income growth is 1.5 percent. This reflects the additional transactions costs that are incurred when the household rejects SEM finance and moves into a starter home, which it trades in at a later date. Taking account of the second set of transaction costs is even more damaging to households that upgrade at the end of year five. Such a household may be worse off in terms of housing affordability than a household that remains in the house originally purchased with the SEM.

While year 10 affordability with and without the SEM does not differ all that much, the affordability position of the renter is significantly worse than that of the SEM user. Even with 4 percent real income growth annually, the household that waits has essentially failed to make any headway against the housing market, as rising income has only just

Figure 2. Housing Affordability in Year 10 with 4 Percent Real House Price Growth
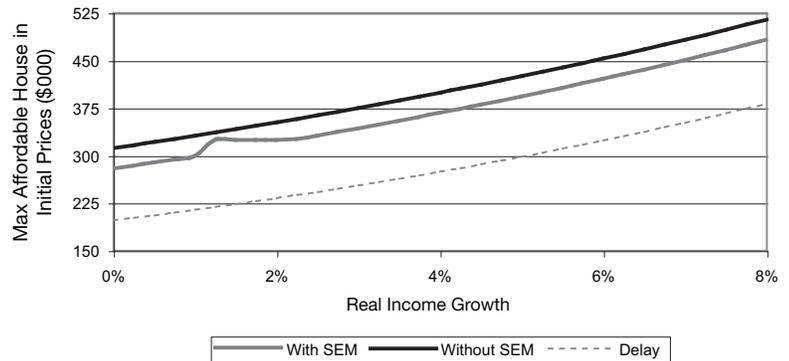
Note: Assumptions are identical to those underlying Table 6.

kept pace with rising house prices. In contrast, the household that used the SEM is able to afford a home worth far more. The household that used the SEM both lived a superior lifestyle for 10 years and ended up in a superior affordability position at the end of this period. This again illustrates how hard it is for renters in the current market to keep up with even moderately increasing house prices.

SEMs and Homeownership

The above indicates that many households could potentially benefit from the SEM in terms of affordability. This section takes up the issue of how this would translate in terms of the homeownership rate.

Limitations of the Static Methodology

Current approaches to estimating the impact of new mortgages on homeownership follow the three-stage methodology espoused by Savage and Froncek (1993). One first gets economic data on a broad universe of renters from a source such as the Survey of Income and Program Participation (SIPP). One then sets up an artificial mortgage qualifier to compute the maximum affordable house for each renting household and for each mortgage type. Finally, one develops a model of household-specific housing consumption and asks whether the household is or is not able to afford the house in question with the given mortgage. Repeating this for all renters in some universe produces the answer to the question of what proportion of those households could move to ownership based on any given mortgage innovation.

The report by Listokin et al. (2001) titled, *The Potential and Limitations of Mortgage Innovation in Fostering Homeownership in the United States*, represents the current state of the art in this literature. Following Calhoun and Stark (1997), their model assumes that current renters would seek to conform to the behavior of comparable renters who previously moved to homeownership. They allow for differences in house prices as well as in renter incomes across eight major geographically dispersed MSAs, as well as for distinctions in property tax rates, closing costs, and other home-buying expenses. In addition, given their concern with the extent to which new affordability-oriented mortgages expand affordability, they pay particular attention to accuracy in the mortgage-qualification program. Finally, they carefully separate renters into various categories to get information on the ability of mortgage innovation to impact ownership rates for subgroups of particular interest, such as ethnic minorities and recent immigrants.

As with most of the literature using this general methodology, the conclusion is fundamentally pessimistic. Listokin et al. estimate that currently some 4 percent of renting households can afford a moderately expensive target house using traditional mortgages. Using the most innovative affordability-directed mortgages that they model, they estimate that another 4 percent of renters cross this threshold. Even when they relax the affordability standard by considering far lower priced homes, they find that only 10 percent of renters can afford such a house in the current market, doubling to 20 percent with the most permissive mortgage. The overall conclusion is that even if households were willing to move to very cheap homes, more than 80 percent would be left entirely untouched by the new mortgages.

While Listokin et al. are very careful, there are sharp limitations inherent in work of this type, as they themselves acknowledge. The first problem is the interdependence between savings and home purchase decisions. It may be rational for a renter to delay saving until ready to move to homeowner-

ship. It may be equally rational for a renter who expects to be unable to afford a home to maintain low assets. However, new mortgages might change the incentive to save by giving hope to those currently unable to afford a home that their efforts would be worthwhile. The second and more basic problem is the static nature of the calculations. To understand why the failure to consider life cycle dynamics is so important, Table 8 reproduces 2000 Census data concerning the proportion of households of different ages and demographic categories that rent rather than own their homes. Averaging across household types, the table shows that almost 60 percent of households under 35 were renters, as opposed to less than 20 percent of those of age 65 or above. Understanding the impact of new mortgages on the transition out of the rental sector is the central task in predicting the dynamics of homeownership.

To illustrate the limits of their static methodology, Listokin et al. consider the counter-factual performance of their estimation procedure. Using data from the 1993 SIPP, they estimate that 3.2 million total renter households and 0.35 million black renter households could at that point afford a "modestly" priced home. Yet between 1993 and the first

Table 8. Renting Rates by Age for Various Household Types: 2000 Census

Age	All Households (%)	Married Couple (%)	Male Head of Household		Female Head of Household	
			Family (%)	Single (%)	Family (%)	Single (%)
< 35	59.2	39.0	60.1	74.0	74.8	80.2
35 – 44	32.1	18.2	40.0	55.2	52.8	55.5
45 – 54	23.5	11.4	31.8	49.1	40.3	41.1
55 – 64	19.7	9.5	27.9	42.9	30.2	34.5
65+	19.6	7.8	17.2	32.0	18.6	30.3

quarter of 1999 there was in fact a net increase of 7.8 million new homeowners, of whom 1.2 million were black. Moreover almost 90 percent of the 456 households from the 1993 SIPP that made the transition to ownership by 1999 purchased homes more that exceeded by 50 percent the maximum affordable house computed according to the 1993 data.

The basic methodological problem is that long-run affordability problems are inferred from a lack of current assets. Listokin et al. show that 95 percent of the renters that their study characterizes as unable to afford the moderate priced home are down-payment constrained. In practice, many of these households are at early stages in the life cycle, and while they currently have low assets and low income, both of these are on a growth trajectory. Households of this type are characterized in existing studies as being permanently locked out of homeownership. The lack of fit between model predictions and outcome is hardly surprising in light of the static nature of the computations.

It is clear that a robust understanding of the impact of mortgage innovation on homeownership requires a rich model of consumer behavior over the life cycle. Ideally we would do this in the context of a model of optimal consumer behavior over time. Unfortunately, such a research-intensive strategy is not feasible given current limits on resource availability. Instead we employ a simple estimation procedure designed to provide a very rough set of order-of-magnitude calculations. This estimation procedure relies strongly on our survey data. The strength of these data is that we asked households to provide information on their expected future incomes, expected future choices, and the impact that a change in mortgage finance structure would have on these choices. Yet because there are many critical holes in the data, we are explicit in acknowledging the very wide range of reasonable estimates of the SEM-induced increase in the homeownership rate.

Percentage-Years of Homeownership

We estimate the impact of the SEM by computing its impact on the total "percentage-years of homeownership." We treat the United States as comprising a constant population, with each person making tenure decisions over a full life cycle of 60 household years, between ages 20 and 79. With one in 60 of the population being of each age, the overall rate of ownership in the population is found by adding up the percentage of households that own across all of the 60 age brackets. It is this number that we define as the total percentage-years of homeownership. Dividing this by the available total of 6000 such percentage-years (100 percent for each of the 60 years) produces the overall homeownership rate.

Given that the current ownership rate is close to 70 percent, we assume that in the current market in steady state, there are a grand total of 4200 (70 x 60) percentage-years of homeownership. The question of how to estimate the impact of the SEM on the ownership rate reduces to how it impacts this total. The actual computation is based on subdividing the population into four distinct groups according to current and potential future behavior in terms of home occupancy. Our results are summarized in Table 9, the explanation of which follows immediately.

Table 9. Current Percentage-Years of Ownership: Best Estimate

Household Type	Estimated Percentage of U.S. population (%)	Total Percentage-Years	Current Percentage-Years of Ownership	Current Percentage-Years of Non-Ownership
Currently Unconstrained	40	2400	2400	0
Absolutely Constrained	15	900	0	900
Potentially Interested Owners	40	2400	1800	**600**
Potentially Interested Renters	5	300	0	**300**
All Groups	100	6000	4200	1800

- **Currently Unconstrained.** The currently unconstrained comprise those households who are able to achieve ownership as soon as they would like even in the current market. For this group, the SEM is irrelevant to the time path of homeownership. Our crude procedure for identifying these households is to count the 40 percent or so of households that achieve ownership by age 35 as fundamentally unaffected in terms of ownership behavior by the SEM. In total, this group accounts for 2400 of the current 4200 percentage years of homeownership.

- **Absolutely Constrained**. The absolutely constrained sit at the opposite end of the spectrum from the currently unconstrained. These are households that could never earn enough to consider themselves viable candidates for homeownership. We crudely assume that this constitutes 75 percent of the approximately 20 percent of households that do not attain ownership by age 65, amounting therefore to 15 percent of total households. Like the currently unconstrained, this group is unaffected by the SEM. In total, this group accounts for 900 (15 X 60) percentage years of non-ownership.

- **Potentially Interested Owners.** Given that the ownership rises over time to roughly 80 percent for those aged 65 and above and that the currently unconstrained comprise half of this group, the remaining 40 percent comprises households that will eventually make the transition to ownership but may need alternative mortgages (such as the SEM) to hasten this transition. In total, this group accounts for 1,800 percentage-years of homeownership and 600 percentage-years of non-ownership.

- **Potentially Interested Renters.** The remaining 5 percent of the population comprise those who remain lifetime renters in the current market, yet might in principle be able to make the transition to ownership with new affordability-oriented mortgages such as the SEM. In total, this group accounts for 300 percentage-years of non-ownership.

The critical question is how the development of the SEM market would affect the bolded entries in the lower right hand corner of Table 9, which represent the 900 percentage-years of non-ownership among potentially interested owners and renters. How many of the 900 percentage-years of non-ownership would shift into ownership?

Survey Evidence

Our estimate of the impact of SEM introduction on percentage-years of ownership has two stages. The first stage estimates the proportion of each potentially interested group that would use the SEM to speed the transition to ownership. The second stage estimates how many more years of ownership would result from these switches. Our final estimates of the SEM's impact on ownership come from combining these estimates on the basis of the household-year methodology outlined above. Data relevant to both of these computations can be found in our survey of consumer interest.

The first question posed on the survey concerns the anticipated delay until ownership among potentially interested owners who face some constraints in the current market. We posed the following question: "Regarding the next home you buy: Please provide your best estimate as to how many years until you move in." The responses have an extremely simple pattern. For renters of all ages and of all household types, the mean answer was in the 3.5 year range.

We also asked about the likely qualitative impact of SEMs on the speed of transition to ownership: "How likely would you be to consider using a SEM to speed up your next home purchase?" The possible answers were highly likely, somewhat likely, somewhat unlikely, and very unlikely. In Table 10 we provide statistics both on those that answered highly likely (HL) and those that answered either highly likely or somewhat likely (HLSL: at least somewhat likely).

Table 10. Likelihood of Considering SEM to Speed Transition to Ownership

	N	ALSL (%)	HL (%)
Couple	509	66	22
Male Head of Household	103	62	19
Female Head of Household	262	65	19
Assets < $15,000	588	67	20
Delay 5+ years	274	63	17

Note that in addition to providing basic information by household type, the Table contains rows indicating interest in SEMs among those who anticipate particularly long delays (defined as five years or more) as well as those with low assets. This information is relevant to our understanding of behavioral differences between potentially interested owners and potentially interested renters.

To a first approximation, Table 10 suggests that interest is high across all demographic groups and is little impacted by the length of the currently anticipated delay and the current level of assets. Among all relevant demographic groups, 15 to 22 percent would be highly likely to consider using the SEM, while 60 to 67 percent would be at least somewhat likely to consider its use. These high numbers testify to the potential of the SEM to impact choices made by first-time buyers.

The Impact of SEMs on Homeownership: A First Pass

We make first-pass estimates of the impact of the SEM on household-years of homeownership in the population as a whole, starting first with the potentially interested owners who are estimated to account for 2,400 percentage years, 1,800 of which currently comprise ownership. The question of interest is the extent to which the SEM cuts into the remaining 600 percentage years of non-ownership. We first make inferences based on the survey sample and then make impressionistic adjustments to allow for the fact that the survey is not likely representative of the broader group of potentially interested households. As will be obvious, these estimates are no more than crude first approximations.

Our first approximation derives from our assumption that the potentially interested owners in our sample comprise all respondents who are currently renters, since we take it for granted that they anticipate becoming owners later in life. Our survey responses suggest that these respondents expect a delay of approximately 3.5 years. In interpreting this result, it is important to note that survey respondents were self-selected to be at least somewhat interested in making the transition to ownership within the next five years. Hence the fact that they are generally optimistic about making the transition within a few years does not

mean that the same is true for the broader set of potentially interested owners. SEM use cuts the typical wait down by something in the order of four years.

The next approximations relate to market penetration. We first assume that some 25 percent of all potentially interested households end up using the SEM. This assumes take-up rates of approximately 75 percent among those who are highly likely to consider SEM use, and 25 percent among those who are somewhat likely to so consider. Note that we use the same estimate for potentially interested renters as for potentially interested owners, since the findings in Table 6.3 suggest that low assets and long anticipated delays have little impact on interest in the SEM. Potentially interested renters represent the limit of this category, typically having low assets and very long anticipated delays to ownership, possibly even having given up hope.

The final ingredient necessary to complete this first-pass estimate is a conjecture on the average additional years of ownership for lifetime renters who use the SEM to make the transition to ownership. Without any information relevant to when they would make this transition, we blindly assume that they would make the transition on average at age 50, producing 30 years of ownership.

We are now in a position to compute our first pass estimates. Among potentially interested owners, who make up 40 percent of the population, our best estimate is that 25 percent would use the SEM and that this would speed up their transition to ownership by an average of four years. Overall, this represents 10 percent of all households speeding up by four years, resulting in an additional 40 percentage-years of ownership. Among potentially interested renters, who compose 5 percent of the population, we estimate that 25 percent would use the SEM, comprising 1.25 percent of the total population. Multiplying 1.25 by 30 produces an additional 37.5 percentage-years of homeownership. These computations are summarized in Table 11.

Adding up the incremental percentage-years of ownership across potentially interested owners and renters, we arrive at our best estimate of 77.5 additional percentage-years, which corresponds to a 1.29 percent increase in the overall rate of homeownership in the United States.

Table 11. SEM Impact on Percentage-Years of Ownership

Household Type	Estimated U.S. population (%)	Estimated SEM Use (%)	SEM Use as Percentage of U.S. Population (%)	Average Increase in Years of Ownership	Incremental Percentage-Years of Ownership	Incremental Rate of Home Ownership (%)
Potentially Interested Owners	40	25	10	4	40	0.7
Potentially Interested Renters	5	25	1.3	30	37.5	0.6
All Potentially Interested Households	45	25	11.3	6.4	77.5	1.3

It is clear that the above estimates are approximate in the extreme. Taking only two of the above approximations, if the take-up rate of the SEMs is only 15 percent as opposed to 25 percent, and if the average additional number of years of ownership is three rather than four, the impact on the ownership rate would be reduced to 9/20 of 1.29 percent, or roughly 0.6 percent.

On the other hand, if the take-up rate is 35 percent with an average of five additional years of ownership, then the ownership impact would be increased to 7/4 of 1.29 percent, which is well above 2 percent. Of course the estimates could be greatly improved were additional resources devoted to analyzing potential consumer take-up of SEMs.

Conclusion

We have presented evidence suggesting that well-designed SEMs have the potential to liberate significant gains from trade, improve housing affordability, and increase the rate of homeownership. Hence SEMs would seem to represent a worthwhile addition to the marketplace. Yet given their novelty, it is clear that the introduction of SEMs would require major overhauls of the regulatory, legislative, and fiscal structures relating to U.S. mortgages. Should such an overhaul occur, it would provide a timely reminder of the institution-building role at which the federal government has on occasion excelled.

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