A Practical Analysis of Shared-Appreciation Mortgages

J. Austin Murphy
Oakland University

General analysis

Shared-appreciation mortgages (SAMs) are mortgages that provide the lender with a specified percentage or share of the appreciation on the collateral during a specified period. In return for the share of appreciation, the borrower is granted a reduction in the coupon rate charged on a conventional fixed-rate mortgage.

By trading a portion of volatile appreciation potential for a fixed-payment reduction, borrowers can lower the often heavy dependence of their wealth on fluctuations in the value of their homes and thus reduce risk.[1] These instruments are especially beneficial to the borrower in times of high interest rates, when mortgage payments might otherwise be unaffordable.

The lender, on the other hand, benefits from the appreciation potential of the SAM. If the lender holds a diversified portfolio of SAMs, the volatility of the appreciation can be much less than for an individual homeowner.[2]

In addition, the appreciation potential provides the lender with some protection against inflation risk.[3] The protection against inflation risk is greater if the lender holds a diversified portfolio of SAMs because the average appreciation on a portfolio of residences is generally more highly correlated with inflation than the appreciation on an individual residence that has a significant amount of unsystematic risk.[4] This inflation protection is especially valuable to the lender in times of high and volatile inflation rates.

Thus, SAMs provide risk-reducing benefits to both parties to the mortgage contract and can be especially beneficial in times of high interest rates and inflation rates. In addition, Anders has cited the possibility of financial institutions hedging SAM investments with certificates of deposit (CDs), the returns on which are tied to real estate indexes or portfolios[5] Although interest in SAMs declined as inflation and interest rates declined in the 1980s, the recent upward trend of consumer prices has begun to reawaken interest in such instruments.[6]

Although SAMS can provide substantial benefits, Freiberg has noted several problems with them.[7] For instance, the treatment of capital expenditures and home improvement expenses in computing base figures from which shared appreciation can be measured is a particularly thorny problem that can create incentives for homebuyers to over- or under-indulge in maintenance-type expenditures if the SAM contract is not carefully constructed. In addition, estimating and incorporating different cross-sectional terms and interest rates into SAM contracts that adjust for differences in expected future appreciation for different homes requires especially careful analysis to avoid violating anti-redlining rules. Finally, Freiberg illustrated the complexity of analyzing and valuing various SAM contractual features such as call risk, which Kling also represented as a major disadvantage of SAMs.[8]

The problems with SAMs, however, are not insoluble. For instance, as noted by Freiberg, it is possible to appraise the value of home improvements at the same time the final appraisal of the entire home is conducted for the purpose of selling and/or paying off the SAM contract.[9] Making the actual deduction allowed for a home improvement to be determined by a third-party appraisal, after it has been at least partially "consumed," should create few, if any, incentives to over- or underindulge in home expenditures. In addition, differences in SAM contract terms and rates can be offered for different homes without violating anti-redlining rules if scientific regression and/or other analyses are employed.[10] Finally, as with other complex financial instruments like convertible bonds,[11] option pricing theory can be used to simplify SAM analysis and facilitate pricing and specification of optimal contractual terms.[12]

The implications of SAM pricing models are especially important to policy analysts, who need pinpoint accuracy to be able to value and issue SAMs. In recent research, Murphy developed a complex option pricing model of SAMs that improves on earlier SAM valuation models like that of French and Haney by providing precise estimates of value as opposed to wide ranges.[13] Some of the implications of this model that may be useful to policy analysts follow.

Pricing analysis

Contractual terms of SAMs typically provide for a mortgage coupon rate that is one-third less than that offered on conventional fixed-rate mortgages. For this reduced interest rate, lenders are provided with a share of the appreciation on the home. Although the share of

appreciation accruing to the lender should depend on economic factors like the level of interest rates and inflationary expectations as well as the inflation variance, lenders in the past have used a static rule of thumb of a one-third share that was not changed for fluctuating economic conditions.[14] Such static pricing may have resulted in significant misvaluation of the SAMs and led to the failure of the SAM market to grow and develop.

In table 1 are listed the shares of appreciation indicated from the Murphy model that are required for different interest rate and inflation scenarios given a one-third reduction in the coupon rate from the market fixed-mortgage rate.[15] When mortgage rates are 13 percent and past inflation is 5 percent, lenders should require an appreciation share of 74 percent (see table 1). Because such conditions of high interest rates and low inflation rates were in effect in the early 1980s, it can be assumed that lenders dramatically mispriced the SAMs when they accepted only a one-third share of appreciation. Such mispricing may have led to lender dissatisfaction with SAMs and a failure to further promote or even offer the mortgages. Lenders may have failed to increase their share of appreciation because of a lack of understanding of the instruments or because of a lack of demand from customers for SAMs with high lender appreciation shares, or both.

Table 1. **Required Appreciation Shares on SAMs***

Mortgage Rate (%)	Inflation Rate (%)	Appreciation Standard Deviation (%)	Required Appreciation (%)
6	3	7.0	26
9	8	7.4	20
13	5	7.2	74
15	10	7.8	41

*Assumes a one-third reduction in the mortgage rate.

It is interesting to observe that the required appreciation share is a negative function of the spread between mortgage rates and inflation rates. Obviously, the more interest rates exceed inflation rates, the lower is the total expected house appreciation relative to the one-third reduction in interest rates offered on the SAM, and so the required share of appreciation to the lender must be larger.[16]

In addition to indicating precise tradeoffs between coupon reduction and appreciation shares, the more complex valuation model also can be used to conduct simulations and evaluate the riskiness of SAMs. In particular, various changes in interest rates and expected appreciation rates are simulated for the interest rate environment of September 15, 1988, and SAM model value changes are compared with value changes on conventional fixed rate mortgages. As shown in table 2, SAMs can be about as sensitive to interest rate changes as conventional mortgages if appreciation rates are uncorrelated with interest rates. However, interest rates often move in conjunction with (and because of) inflation. In cases of a one-to-one relationship between interest rates and appreciation rates, the riskiness of SAMs is less than half that of conventional mortgages (see table 2). Thus, the typically positive correlation between inflation and interest rates implies that SAMs generally will have less interest rate risk than conventional mortgages.

Table 2. **Interest Rate Sensitivity of SAMs**

Security	Increase in Expected House Appreciation per 1% Rise in Interest Rates (%)	Security Value Change (%) for a Change in Interest Rates Equal to: -4%	0%	+4%
SAM	0.0	11.4	-0-	-13.2
SAM	0.5	8.1	-0-	-11.7
SAM	1.0	3.4	-0-	-6.9
Conventional fixed-rate mortgage	(irrelevant)	11.6	-0-	-15.6

A regression of inflation rates on interest rates over the past 30 years (1958-87) revealed that inflation rates tend to move by 0.80 percent for every 1.00 percent change in interest rates (with a correlation of 0.69). This finding implies from table 2 that SAMs should be approximately one-half as sensitive to interest rate movements as conventional mortgages. However, the overall volatility of SAMs would be expected to exceed that of conventional mortgages, just as Altman found the annual return standard deviation of convertible bond portfolios to exceed that of straight bond portfolios (3.64 percent versus 2.33 percent).[17] In addition, as shown by Leeds for a similar type of mortgage (the price-level adjusted mortgage),

the extra volatility of a pure SAM portfolio likely could not be hedged with CDs tied to real estate indexes unless the CDs had maturities (and call features) that matched those of the SAMS.[18] Nonetheless, the portion of SAM volatility unrelated to interest rate changes could be diversified away in a portfolio of standard interest-rate-sensitive instruments and could therefore contribute less to the risk of fixed-income portfolios than conventional mortgages.[19]

Conclusion

Although SAM originations have not been extremely large to date, this article provides additional evidence on the characteristics and potential of this type of mortgage. One important implication of this article is that rational SAM pricing may result in lenders having to require appreciation shares that are unacceptably high to borrowers in times of high real interest rates. Thus, SAMs may be a viable product only during times of low real interest rates, such as periods of both high inflation and high interest rates. Another modeling implication important to both lenders and regulators is that SAMs have approximately half the interest rate risk of conventional fixed-rate mortgages.

Author

J. Austin Murphy is associate professor of finance at Oakland University School of Business Administration, Rochester, Michigan.

Endnotes

1. A. Dougherty, R. Van Order, and K. Villani, "Pricing Shared Appreciation Mortgages," *Housing Finance Review* 1 (1982): 361-75.

2. Harry M. Markowitz, *Portfolio Selection: Efficient Diversification of Investments* (New Haven, Conn.: Yale University Press, 1959).

3. Dougherty, Van Order, and Villani, "Pricing Shared Appreciation Mortgages," 1982.

4. Markowitz, *Portfolio Selection,* 1959.

5. G. Anders, "Ranieri's Thrift Deal Nets Him Huge Mortgage Bond Portfolio," *Wall Street Journal,* January 9, 1989, C1.

6. Ibid.; R. Rundle, "A Foot in the Door," *Wall Street Journal,* May 19, 1989, R5.

7. L. Freiberg, "The Problem with SAM: An Economic and Policy Analysis," *Housing Finance Review* 1 (1982): 73-92.

8. Ibid.; A. Kling, "Son of SAM: A Proposal for a Deferred-Payment Mortgage," *Housing Finance Review* 1 (1982): 93-102.

9. Freiberg, "The Problem with SAM," 1982.

10. J. Barth, J. Corder, and A. Yezer, "Financial Institution Regulations, Redlining and Mortgage Markets," *The Regulation of Financial Institutions,* Proceedings of the Federal Reserve Bank of Boston Conference (Boston: Federal Reserve Bank, 1979), 101-43.

11. J. Austin Murphy, " A Discounted Cash-Flow Model of Convertibles Subject to Multiple Calls in a World of Refunding Costs and Stochastic Interest Rates," *Southern Economic Journal* 56, no. 1 (July 1989): 87-104.

12. D. French and R. Haney, "Pricing the Shared-Appreciation Mortgage in a Stochastic Environment," *Housing Finance Review* 3 (1984): 431-43.

13. J. Austin Murphy, "A Note on SAM Pricing" (Working Paper, Oakland University, 1989); French and Haney, "Pricing the Shared-Appreciation Mortgage," 1984.

14. Ibid.

15. Murphy, "A Note on SAM Pricing," 1989.

16. These results are similar to the value ranges computed using the French and Haney (1984) model. However, it is important to point out that the Murphy model values from "A Note on SAM Pricing," 1989, were nearer the upper end of the French and Haney range for scenarios with high real interest rates and nearer the lower end for scenarios with low real interest rates. These results reflect the fact that early prepayments are more probable when real interest rates are low (and property appreciation is relatively high); the Murphy model precisely incorporates such prepayment probabilities, whereas the French and Haney model employs only arbitrary ranges.

17. E. Altman, "Risk and Return Experience in the Corporate Convertible Debt Market" (New York University Working Paper Series no. 500, 1988).

18. E. Leeds, "Interest Rate Risk with Price-Level Adjusted Mortgages," *Housing Finance Review* 8 (1989): 107-16.

19. Markowitz, *Portfolio Selection,* 1959.