Why Mortgage Backed Securities Are Negatively Convexed

When interest rates go up, fixed maturity bond prices go down and vice versa. Mortgage backed securities follow the same general rule with a fairly notable exception that relates to changes in the expected maturity of a mortgage backed security as interest rates change.

Everyone who has purchased a home using a 30-year mortgage knows that most people repay their loan much sooner than 30 years. A very common reason is the sale of one home to buy another with a new mortgage being used to pay off the old mortgage. In recent years however, the most common reason to pay off a mortgage loan has not been buying a new home but the refinancing of an existing loan with a new loan that has a lower monthly payment.

As an example, let's look at a typical homeowner with a new 6% interest rate 30-year mortgage. After taking into account the likelihood of the homeowner refinancing the mortgage or selling the home, it could well be the expectation of the investor who owns this mortgage that on average it will be repaid in about 5 years. The investor of this mortgage with a five year expected life might think of this investment as being very much like owning a five-year maturity bond.

But things do change. Let's assume that new mortgage rates suddenly decline to 5.0%. What happens? The homeowner will be very motivated to refinance the mortgage to reduce the monthly payments. The mortgage investor will not be as happy since the homeowner will be repaying the now above market 6% loan. If the investor tries to sell this mortgage to other mortgage investors, they would probably offer a price of only about 101% for this 6% mortgage since they would expect it to be repaid through refinancing in less than a year. The five-year maturity bond however would still have about five years to continue paying 6%, and its price would have increased to about 104% of par value to reflect the decline in bond yields to 5%.

Next, let's assume instead that mortgage rates suddenly increase to 7%. Now the homeowner with a 6% mortgage has almost no interest in refinancing since it would result in higher monthly mortgage payments. It would likely be the investor's expectation that this mortgage will on average now be paid off in 10 years. If the investor tried to sell this mortgage, the valuation would

be based on the expectation of ten years to repayment. Reflecting the higher yield and longer expected maturity, this price would be only about 93% of par value. In this same situation our fixed maturity five-year bond would have declined in price only to 96% of par value since it still matures in five years.

In summary, when interest rates decline, a mortgage security tends to go up in price by a lesser amount that a similar maturity bond because the expected maturity of the mortgage becomes shorter. Conversely, when interest rates increase, a mortgage goes down in price by a greater amount than the bond because the expected maturity of the mortgage becomes longer.

The magnitude of this unbalanced price volatility characteristic is measured by a financial statistic called "convexity." Specifically, if interest rates go down and a debt instrument like a mortgage goes up in price by less than it goes down in price when interest rates go up, it is know to be negatively convexed. When the opposite price effect is the case, it is known to be positively convexed. The best known positively convexed securities are the U.S. Treasury bonds that are not callable. The most well known negatively convexed securities are residential mortgage securities.

This brief analysis leads naturally to the question of why an investor would want to buy a mortgage-backed security whose price by its nature goes up less and down more when interest rates change. Investors do purchase mortgage securities because, unlike our example, mortgage securities offer considerably more yield than bonds of similar maturity and quality. Specifically, when a 5-year bond yields 6%, a mortgage with a similar expected maturity and quality provides on average about 1% more yield or in this situation 7% in total. Therefore a primary effort of mortgage owners like Anworth is to manage the effects of the negative convexity so that they do not offset the benefits of the extra yield or income earned from mortgage securities.