ANDREW DAVIDSON & CO., INC. the Pipeline

Valuation Commentary – January '08

Valuation Modeling Lessons of 2007

By Alex Levin

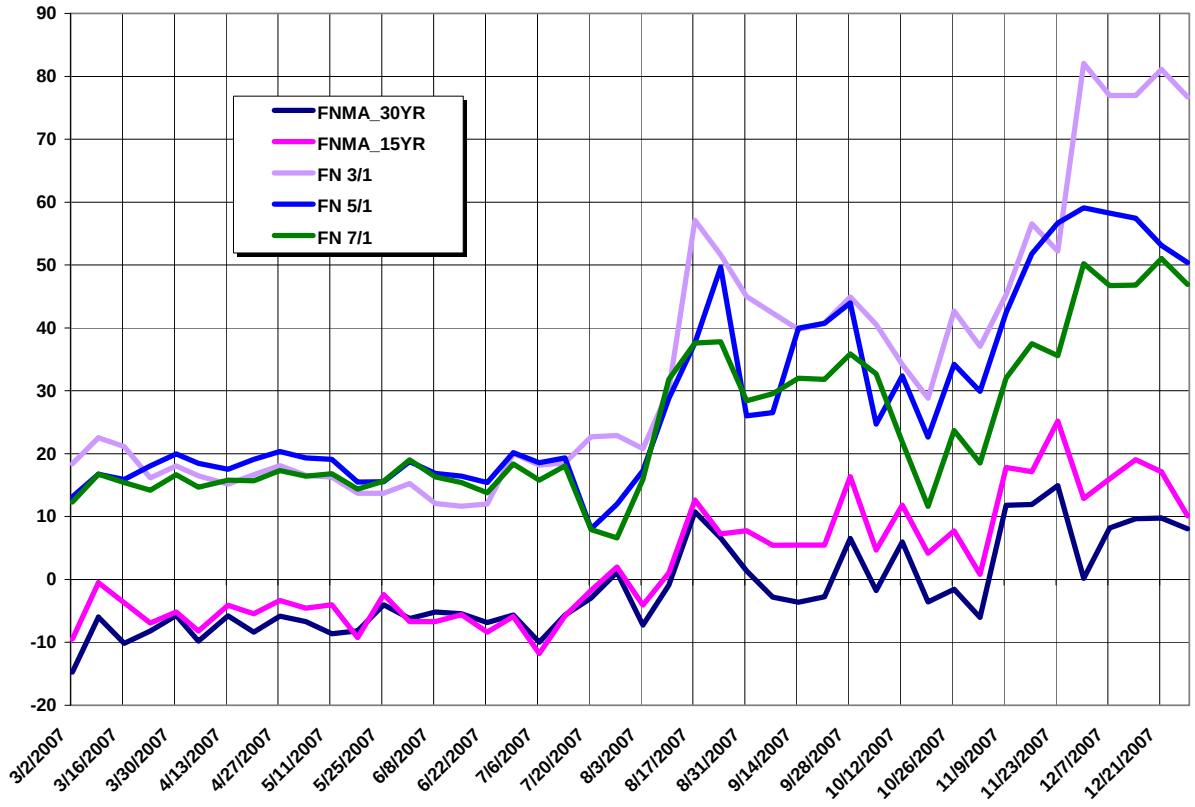
We usually end each year with an annual MBS roundup, but this time I decided to change the focus. It is hard to add much to what everyone knows. I heard that linguists announced "subprime" to be the word of 2007. It was a disastrous year for holders of long positions in MBS. After thundering losses, the non-agency MBS market froze and marks became uncertain. Agency MBS, especially hybrid ARMs, widened considerably to agency debentures, despite of having similar credit. Many investors liquidated MBS positions to raise cash.

For analysts, this situation presents an opportunity to revisit fundamental modeling methods. It turns out that each troubling point lets us learn more and leads to a reassessment of our knowledge-base. Does the OAS method still hold? Can we compute missing economic values of non-agency MBS and how? And what about the use of prOAS that AD&Co has been advocating for the last several years? In this and the next month's *Pipeline* articles, I try to offer possible answers to these questions.

Agency OAS history

Exhibit 1 depicts the crisis-infused OAS widening of the second half of 2007. It began in July-August, seemed to cool off by November and struck again in the last 2 months of the year.

Exhibit 1. Recent History of Par-Coupon OAS (AD&Co's Valuation Model)



The fixed-rates have widened by 20 bps whereas the hybrids have widened by 35 to 60 bps. In compiling the data for Exhibit 1 we employed our published OAS results that reflect the disclosed changes in prepayment views. In particular, we have been using the 0.85 turnover scale for 30-yr fixed-rate TBAs since August 31, 2007. One thing we will discuss further is that only some of the 2007 MBS cheapening is prepayment-related. As for the hybrid ARMs, even if we lowered the prepay scales further, we would not be able to explain the OAS widening – hybrids would become even wider.

The prOAS Method: Adjustments are Wanted

The prOAS method (aka OAS using the risk-neutral prepay model) has become a part of AD&Co's analytical regimen since 2003. We attribute the existence of OAS, in part, to the price of prepayment model risk, i.e. market fear that prepayment models are biased or can become biased going forward. We postulated that agency TBAs should be valued flat to agency debentures, once we account for the price of this risk.

It is obvious that the prOAS basis has widened, especially for the hybrid ARMs. It is impossible and unreasonable to attribute the 50 – 70 bps of OAS for the agency hybrids to prepayment concerns. The demand-supply balance of the entire MBS market has been shaken thereby forcing us to add a spread to the agency curve. How large should this add-in be and how should it change from one market sector to another? One can't pinpoint a unique number because we are solving one equation with two unknowns, prepay risk and liquidity risk.

Despite the seeming ambiguity, alternative methods exist to address the problem:

- One method often used by dealers is calibrating the prepay tunings to Trust IOs and POs by equating their OAS. This method is limited to the fixed-rate MBS and can't be used for ARMs. In addition, dealers' publications on Trust IOs employ various methods of "matrix pricing," i.e., reconstructing and extrapolating quotes from a few daily trades.

- Since prepayment tunings strongly affect the interest rate sensitivity, one can argue that tuning the prOAS model to OAD, rather than to OAS, can help. This approach is not limited to any particular MBS type. AD&Co has tools for carrying out this task too, and I plan to discuss the implications in next-month's article.

Limitations of Traditional OAS for Credit-Impaired Instruments

Suppose we know the price of a non-agency MBS and simply try to measure the interest rate risk. For example, the use of the traditional OAS method suggests that an ABS floater priced close to par has a very short duration. If the credit environment deteriorates, the same floater will be priced at a discount thereby gaining the OAS and the interest rate exposure (i.e. positive duration). The base OAS level is one of the key factors defining the effective duration.

When using the traditional OAS model, we replace true losses by the "equivalent" discounting. This shortcut is based on a certain assumption: the loss stream looks like an IO. Indeed, an annual loss at a constant rate of 1% of the remaining principle is equivalent to a 100 bps additional discount spread, from the pricing standpoint. However, does the loss stream look like an IO at all?

If a part of the collateral pool is already severely delinquent, it is likely to go through foreclosure, regardless of the interest rate. Hence, the loss stream of this kind resembles a PO, not an IO. Furthermore, unlike a PO, the liquidation time has little to do with interest rates. Therefore, losses streaming from severely delinquent loans look more like a portfolio of zero-coupon bonds with about positive 0.5 yr to 1.0 yr duration (compare to the typical duration range of IOs). This observation *reduces* the true option-adjusted duration (OAD), albeit slightly in most cases. It turns out that, to capture the interest rate exposure correctly, a good model must relate the nature of losses to the collateral's delinquency composition.

Furthermore, the default and loss rates can't be considered independent of the interest rates. Historical analysis points to a negative correlation between mortgage rates and the systematic component of home price appreciation (HPA). This fact suggests that losses in MBS pools should rise and fall with interest rates, which *extends* the OAD.

We conclude that the interest rate exposure of sub-prime MBS (ABS) is different from the one established without credit modeling. The concept of "Credit OAS" introduced in several previous Valuation Commentaries (see April, May, and October 2007) seems to contain the answer to the sub-prime valuation puzzle. A true exposure of an MBS or an ABS to interest rates can be either stronger or weaker than what comes from the traditional OAS method. In addition, the Credit OAS approach lets us reveal exposure to home prices.

Computing Fair Values: Marking to Model

Consider the task of valuing credit-sensitive financial instruments such as CDS, ABS, mortgage insurance, or agency guarantee, in the absence of reliable market quotes. The first thought that comes to mind would be computing the expected real-world loss and using it in lieu of the price of credit risk. This straightforward approach would not be a good one as it misses the price of loss' uncertainty and the related concept of risk-neutrality.

In order to quantify the risk-neutral conditions and link them to the financial rationale, let us consider the position of the loan insurer (limited insurance coverage), GSE (unlimited insurance) or CDS protection seller. In either case, a premium (p) needs to be charged to make the business profitable. Without doubt, the insurer must charge more than the expectation of losses (μ) in the real world. By definition, insurance provides protection against worse-than-average events, so capital must be maintained to back the obligation. This capital must stand ready and can earn only the risk-free rate (r), which is much less than a return on the capital target (R). Let us assume that the standard deviation of losses is σ and the insurer must keep the capital to cover $k\sigma$ in addition to μ. The insurance premium is proven to be in the form of "expected loss plus capital charge:"

$$p = \mu + k\sigma \frac{R - r}{1 + R - r} \qquad (*)$$

Under reasonable assumptions, the capital charge may be of the same order of magnitude as the expected loss. Formula (*) gives us the insurance premium that minimizes the insurer's capital given return target R, insurance limit k, and loss distribution pair (μ, σ). All the measurements should first be carried as present values, then can be translated into an annual fee by dividing by the annuity also known as the "IO multiple." The annualized p is known as the "guarantee fee," "insurance premium," or "CDS rate." The details of this approach will be included in a paper being prepared for the *Journal of Portfolio Management* (Spring 2008).

How does this economic reasoning relate to the risk-neutral market conditions? In the loan insurance business, the equilibrium prices get formed when insurers and clients agree on R given k thereby defining the capital charge (price of risk). In ABS investment and CDS protection, the same applies to buyers and sellers. Although a typical ABS investor may be vague in defining his "insurance limit" k, a similar practice of setting loss reserves is employed by bankers and other investors. Eventually, market players taking long and short positions agree on price of risk.

One important conclusion we can make here is that, if an analytical approach requires assessing both the expected loss and the capital charge, then the Credit OAS should deliver a richer information output set than just the present value of losses. In particular, formula (*) requires knowing the path-wise standard deviation of losses. Its direct use may be necessary to find the economic value of illiquid financial instruments or when it is hard to find an established benchmark market. Of course, if the conditions of risk-neutrality can be easily inferred from prices of traded instruments, then the explicit knowledge of μ, σ, k, etc. is not required, - it is enough to shift the distribution of modeled market factors, like home prices, to match the price of losses shown in formula (*). For example, we can use mortgage insurance quotes or agency guarantee fees to change the distribution of losses so that they match formula (*). Its right-hand side becomes the risk-neutral expectation of losses and such a model can then be employed to value "derivatives" (ABS, CDS).