

## Valuation Commentary

### Valuation Q&As. Part 2: Valuation of MBS with OAS and prOAS

by Alex Levin

#### **Methodology**

#### **Q. Many instruments are still valued using the static method... Is OAS truly necessary?**

**A.** If we review our mathematical education and knowledge (ranging from Calculus I to a PhD), we will find a single intuitive motivation for every theorem, lemma or solution technique and that is our desire to express the unknown through the known. In finance, we strive to compute the unknown price of an MBS using known prices of other fixed-income instruments. Unfortunately, no static measure can be strictly derived for an MBS using direct relationships to other instruments. It is impossible to postulate a well-defined rule that would point us to the right yield or Z-spread to use.

MBS are embedded-option instruments and, as such, should be valued using adequate techniques. For example, options are not valued using a single interest-rate path and nor should MBS. The OAS approach is just an extension of option pricing. Indeed, any option pricing can be considered an application of the OAS method— just with OAS set to zero.

Perhaps the only reason some practitioners still employ the static method is that MBS are bonds with options, not just options. If we applied the static approach to options, we would get nonsensical values.

#### **Q. How many paths...?**

**A.** The [October 2003 Pipeline](#) discusses this subject by documenting accuracy when pricing various pass-throughs. Since the release of version 5.2 in July 2004, our OAS system has been reporting sampling accuracy in computing either price or OAS. Note that version 6.0 and above allows for pricing pass-throughs via backward induction— no random paths are used. The CMO universe is very vast and may include features such as “sticky jumps” that require a large number of paths to be properly valued. In practice, cashflow vendors parse non-agency CMOs and ABS deals that are slower than agencies which leads to accuracy limitations. We experience no problems running 500 - 1000 paths for agency CMOs, but see slow processing when running even 100-200 paths for some complex-collateral non-agency deals.

#### **Q. AD&Co's prOAS concept sounds attractive, but does the MBS market actually use it?**

**A.** We have received a lot of praise from both industry practitioners and academics. We have formulated well what Wall Street has known for years: MBS-specific risk is caused by prepayment uncertainty and is directional. Every prepay model is just a good guess leaving investors with enough risk to demand compensation: the OAS.

We have observed and quantified many interesting market facts. Here is one of them: using critical turning points of a very volatile 2003 market, we compared predictions of price changes for the entire Trust IO market with actual moves. Four times out of five, the prOAS model predicted moves better than the OAS model did.

Another notable fact that is hard to miss— sharp rate drops always inflate OAS for the MBS premiums; sharp surges do same for the discounts. This stubborn directionality can only be explained by common prepay model concerns: refinancing or turnover.

**Q. Why are empirical durations reported by brokers shorter than AD&Co's prOAS for premium MBS?**

**A.** Many brokers report empirical sensitivity to a point of the yield curve (such as the 10-yr swap), which practitioners interpret as “empirical durations.” Consider, for example, high-premium MBS such as FN7.5 or FN8.0. AD&Co's effective duration will be normally seen in a 1.5-1.7 yr range. During the first half of 2005, brokers reported near-zero and even negative empirical exposure to the 10-yr rate. These two views may not be as contradictory as they seem. Premium MBS are driven by interest rates that are much shorter than the 10-yr. With the curve being flattened, a positive exposure to the 2-3-yr sector may be translated into a seemingly negative exposure to the 10-yr rate. Hence, the reported number represents a methodological confusion that should not be compared with the option-adjusted duration.

A more accurate assessment of empirical duration is required for a well-based judgment. One possible approach would be to produce a complete set of empirical key rate durations first and then add them up.

**Versions**

**Q. What are the differences between the AD&Co OAS model versions?**

**A.** From 5.0 to 5.1: integration with interest rate library allowing for model selection and calibration to ATM swaptions.

From 5.1 to 5.2: conceptual improvement of forward settlement. Read more in the [July 2004 Pipeline](#). Version 5.2d featured integration with then-added two-factor Gaussian model.

From 5.2 to 6.0: integration with the new active-passive decomposed (APD) prepay model, adding the option to value fixed-rate pass-throughs via backward induction. Read more in the [May 2005 Pipeline](#).

From 6.0 to 6.1: fully adequate MSR analytics are added. Pay-up calculator is automated.

From 6.1 to 6.2: links to [Chasen](#) are added.

Along with the library development, we added more features and coverage into our Excel-based OAS application. For example, since the release of version 5.2b, we enable users to employ “enhanced collateral data,” i.e. loan size, LTV, geography, etc., that can be loaded via embedded Bloomberg links. Once the enhanced data is loaded, the system adjusts refinancing and turnover scales thereby modifying prepayment speeds in various scenarios. This development was the key to measure pay-ups in the specified pool market.

Another example is the development of the new HEL prepay model – it has been done in the APD form and is available in OAS version 6.0 and later.

**Excel-based OAS**

**Q. Can the Excel-based OAS application price portfolios?**

**A.** Yes, it can. A single position is represented by just one line on a spreadsheet. Hence, one Excel page can hold 65,500 portfolio items, and as if this is not enough, pages can be multiplied. For example, one can have a page for a bank's fixed-rate MBS portfolio ('MBS') and another page for a TBA market monitor ('TBA'). If an MBS is modeled using enhanced data, this MBS will be stored on two

pages: usual descriptive information (WAC, WAM, Price, etc) on the MBS page; and enhanced information (LTV, loan size, FICO, geography, etc) on the Enhanced Data page. In essence, the Excel-based OAS is laid out as a relational database. Each page represents “records” in rows and “fields” in columns.

We ran 40,000+ instruments in one 50 MB spreadsheet file for a major consulting project and gained confidence in this technology.

**Q. Can a user “break” links or in-cell formulas?**

**A.** The Excel front-end including Bloomberg-data feeds, enhanced data look-ups and TBA look-ups for the pay-up analysis is driven by a VBA code, not in-cell links or formulas. Hence, no links or formulas can be broken. However, columns (fields) cannot be moved, deleted or otherwise manipulated.

**Corporate Solution**

**Q. What can AD&Co offer to a client looking for a corporate-wide valuation system?**

**A.** Along with the Excel-based OAS, AD&Co has developed an Access-based system that is almost as interactive as the Excel application, but is better suited to systematic and disciplined risk assessment of portfolios. The system covers both MBS and non-MBS instruments such as interest rate derivatives. A rigorous risk system allows for summarizing exposures in many dimensions, measured per strategy or portfolio. Different key players (analysts, traders, managers) can see the firm’s position and risk reports synchronously. An elementary knowledge of MS Access is needed to operate the system; an advanced one is needed to change the system’s design.

Self-integration of our library into a client’s corporate-wide frame remains a powerful alternative. It does require internal programming resources, but lets our customers manipulate input data and present valuation results in many ways.



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