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Portfolio Strategies: Modelling Structured IO – Static/OAS. Recapture too.

Base MSR, Coupon Implied IOs and IOS

Executive Summary

- By no means does the IO market constitute a complete market, nor for that matter would anyone argue as a derivative market, that it is terribly liquid but certainly in a like-for-like comparison, implied price multiples appear to be relatively consistent providing a reasonable backdrop for MSR model calibration.
- While a static yield methodology might be "good enough" for point-in-time valuation, it is at most a very poor proxy for MSR or IO related relative value over time and across rate scenarios.
- Static models fall short of tracking the market and pricing economics of at least two liquid proxies for IO. For that reason, Blue Water recommends that buyers of IO structured from MSR avoid static models for pricing, bidding, or evaluating risk sensitivities.
- Adjusted for the level of relative yields, Blue Water's Dynamic OAS model effectively captures IO market dynamics across a spectrum of note rates and ages. The superior fit observed is consistent across note rate, loan age and contributing loan level attributes.
- The value of recapture activities figures meaningfully when examining relative pricing difference in OAS or Multiple-space between IOS, MSR IO and/or Fannie inter-coupon spreads and Static models do not appropriately capture yield enhancement given their constant yield structure.
- A look at OAS of Synthetic "IO" created from MSR, Implied IO values from TBA Coupon Swaps and end of day Markit IOS quotes show a difference in relative value between MSR related, IO and other market proxies which Blue Water believes is attributable to the value of the Servicer's symmetric information in terms of the borrower 'relationship'.

Towards an MSR Valuation model with Sound Underpinnings

For quite some time, understanding mortgage servicing valuation and relative value dynamics vis a vis the structured agency MBS IO market and/or derivative IOS market has been a model calibration challenge few MSR modelers have been able to resist. Notwithstanding the obvious modelling benefits one could derive from accurately modelling MSR using IO derivative securities, there are added benefits to understanding IO from MSR (MSR-IO) as a separate asset class. Proponents of this research area will claim that if we were to calibrate a structured IO model to secondary market proxies for IO, we would be better able to approximate the ultimate economics achieved while holding MSR. With such a model in hand, we would simply need to append MSR specific costs and income assumptions to create a model that would move with the broader rates market and one that incorporates all available risk neutral information (essential for derivative pricing). Such a model would track the IO market, in theory be easier to hedge, be better at back-testing and far more realistic.

In this diagnostic we ask the following questions:

- How well do our respective IO structured models perform compared to 'market' proxies?
- How does the choice of interest rate model (say STATIC or OAS), drive different fit results?
- Does model fit vary by loan features or the specific choice of loans considered?
- How do various models capture the net benefit of recapture or borrower retention?

In this paper we shall attempt to dissect various points of relative value to help in diagnosing our two modeling dynamics for IO product. The purpose of this modelling brief is to review how well our respective modelling approaches perform in matching traded IOS derivatives (IOS) and/or IO implied by inter-coupon TBA spreads (ITBA).

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The Challenge of Pricing MSR-IO

What is so hard about pricing structured IO off of MSR? For starters, there is a body of empirical evidence and literature that enforces the adage that the derivative can only be as liquid as the underlying (see Cho and Engle 1999). For this reason, pricing MSR-IO introduces the additional complexity in that the underlying, in this case, is agency Mortgage Servicing, which is a Level 3 asset class. As an illiquid level 3 asset, constructing a model on top of a model appears challenging at best and in practice next to impossible. Instead we explore a parallel approach by leveraging ancillary markets which should, theoretically, behave very similarly.

Our Approach – Comparing MSR-IO Models vs IOS and IOTBA

Our intent is to compare out of sample results between our in-house models and external price points derived from a series of external IO derivative markets. We will tier our analysis to comprise reference indications of value ("reference pricing structures"), which are prices derived from available market data in IOS and ITBA. We will then compare these results to output from our static (BWFT STATIC for short) and our OAS model (BWFT DOAS), to these different price sources. For the sake of consistency, we have taken great pains to make the analysis like-for-like in running common collateral pools through both model constructs.

Reference Pricing Structure:

a) Markit "IOS" derived pricing
b) TBA derived equivalent collateral characteristics to the Markit IO stack

Model Constructs:

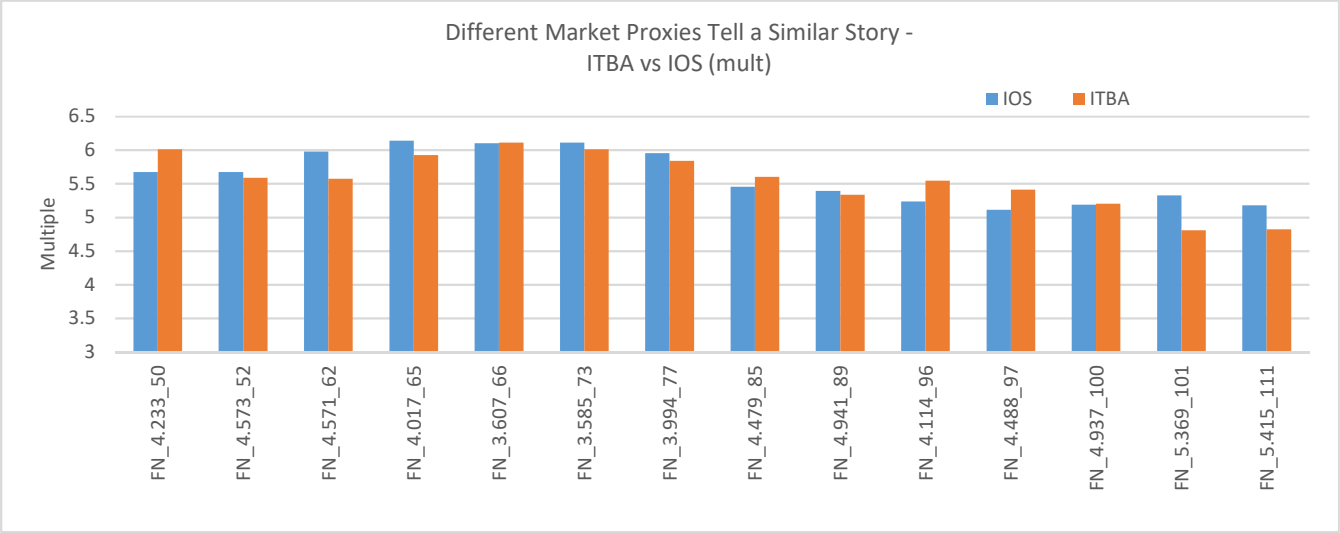
a) Static Model: MSR-IO derived equivalent collateral characteristics to the Markit IO stack run on our BWFT Static model
b) OAS Model: MSR-IO derived equivalent collateral characteristics to the Markit IO stack run on our BWFT OAS model

Since the collateral characteristics are held constant across the two price points, we can examine the model for market fit and associated performance between Static and OAS models.

Observation 1: Relevant IO markets tell a Similar Story

One obvious question asked is whether such an analysis is even possible or relevant. For this analysis to be relevant, one would need the different IO markets to be roughly similar (at a minimum). Significant price divergence would force a decision on which market to choose and which price is more correct. Despite concerns around illiquidity in IO markets, we are pleased to observe the degree to which IOS and ITBA (figure 1) appear to have very similar pricing level and dynamics across collateral**. By no means does the IO market constitute a complete market, nor for that matter would anyone argue as a derivative market, that it is terribly liquid (just look at the higher note rates), but certainly in a like-for-like comparison, implied price multiples appear to be relatively consistent providing a reasonable backdrop for MSR model calibration.** Let the model calibration begin!

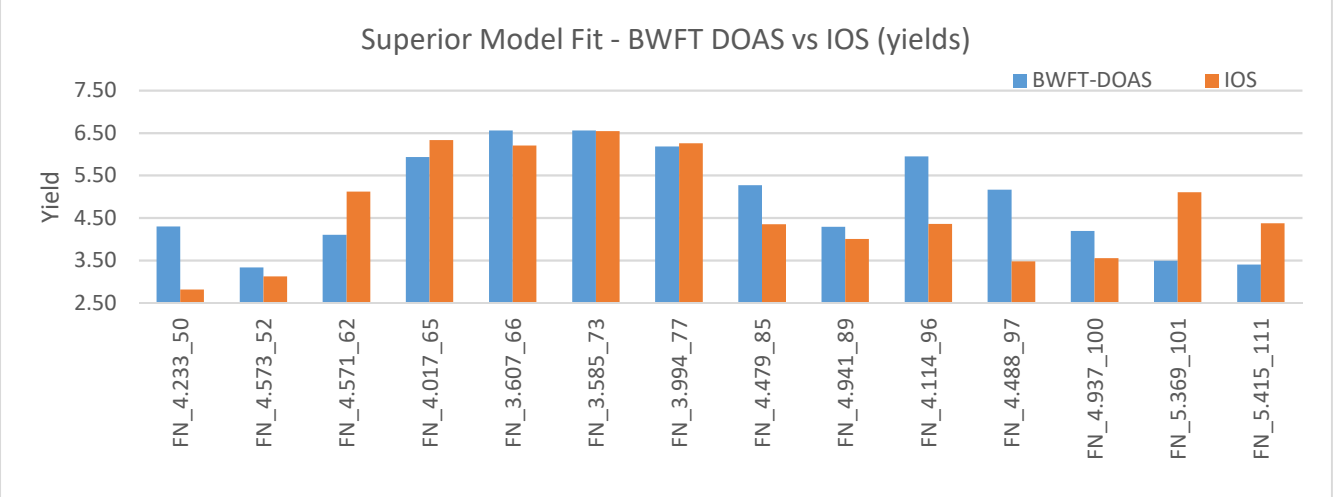
Figure 1: Similarity story – collateral adjusted ITBA and IOS . *Source: Markit IOS, Blue Water*



Observation 2: Relative Value Comparisons BWFT DOAS Fits Across Note Rates

BWFT DOAS model (adjusted for base yields) for MSR-IO captures high-level out of sample yield dynamics when compared to IOS (see figure 2). **Across different note rates and collateral characteristics BWFT DOAS effectively captures IO market dynamics**.

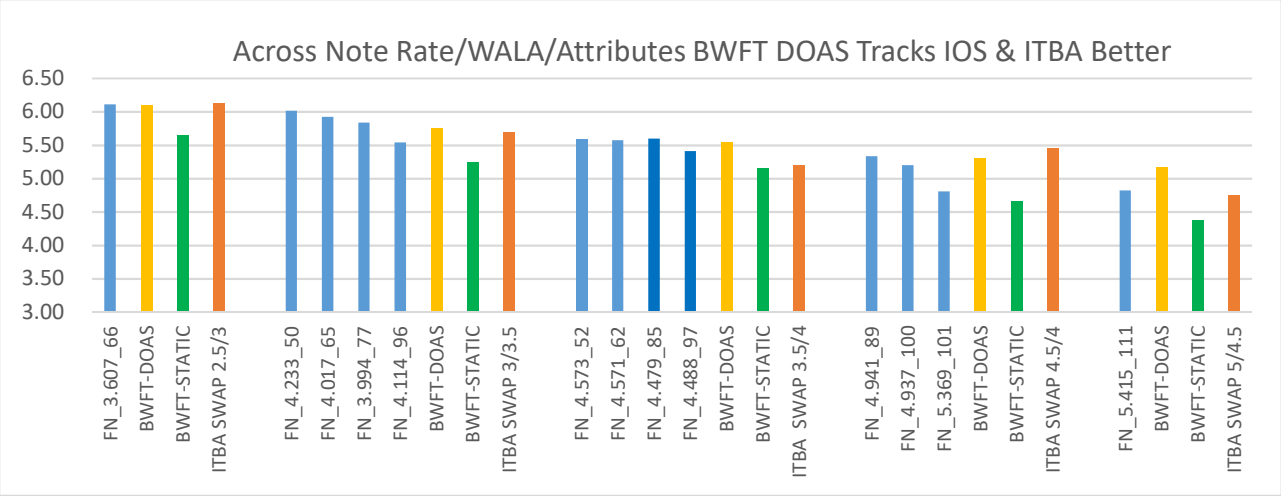
Figure 2: BWFT DOAS (adjusted for base yields)'s track IOS



Observation 3: BWFT – DOAS is more accurate versus STATIC Model

In price space, in all but a few cases, BWFT's DOAS model consistently prices IOS and ITBA more closely than our champion BWFT-STATIC model. The differences in modelling and relative value become apparent when comparing across vintage and moneyness.

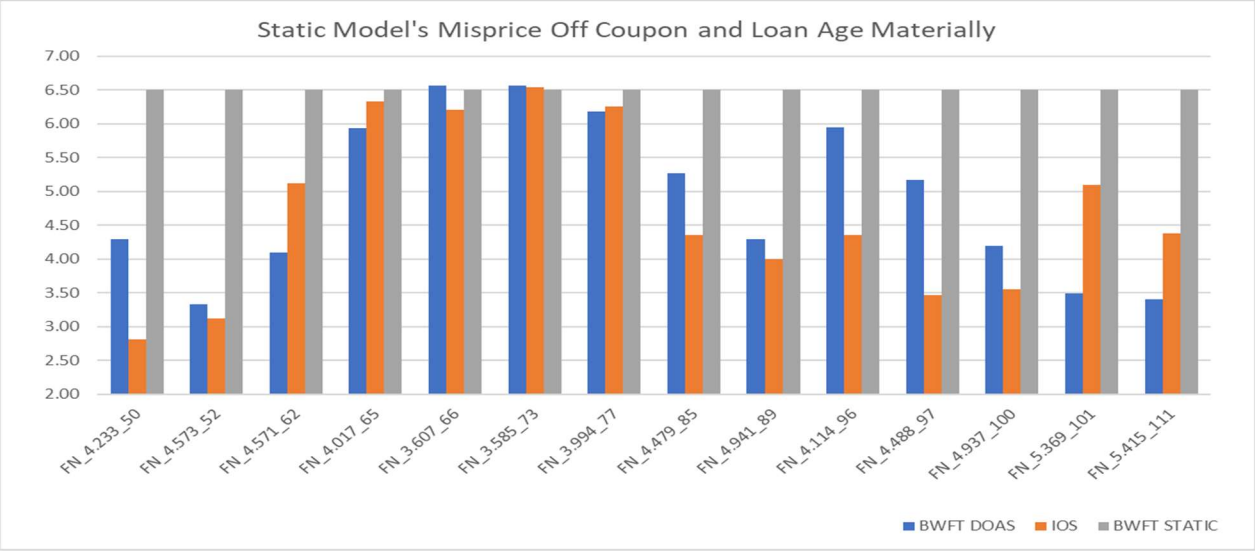
Figure 3: In a model independent analysis, BWFT DOAS tracks both measures of IO more accurately than does the BWFT STATIC model.



Observation 4: STATIC Model

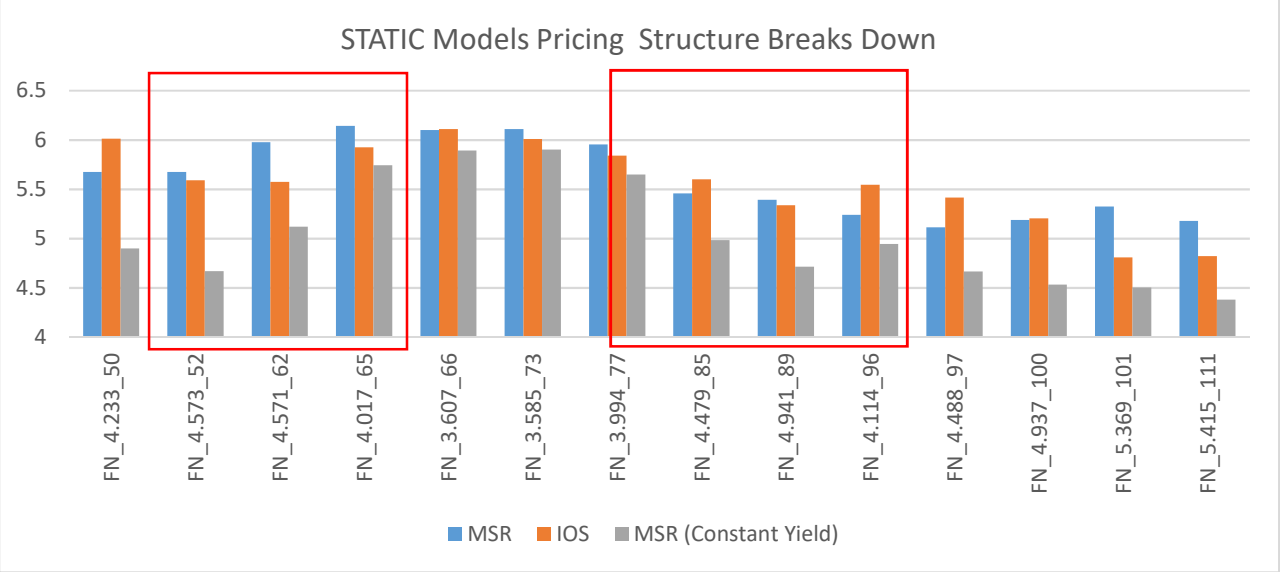
By forcing the base yield to be the same across loan age and moneyness, as typical STATIC modelling approaches would suggest, we are able to compare relative pricing performance between DOAS and STATIC models. As outlined in Figure 4, compared to the BWFT DOAS model, the BWFT Static model clearly leaves something to be desired. The yield of IOS is clearly not constant, so there must be some underlying driver for the changes that STATIC models are unable to capture; collateral characteristics such as note rates, loan ages, or even items like geographic distribution, all contribute to varying degrees. **This means that while a static yield methodology might be "good enough" for point-in-time valuations, for say par coupon, it is at most a very poor proxy for MSR or IO related relative value over time and across rate scenarios.** In practice, applying a static model could cause P&L drift over time, misprice against 'shocked values' for valuing and hedging interest rate risk, and will likely fail to be consistent with market environment changes or changes in the age of the portfolio.

Figure 4: Constant MSR yield, vs. Market-Implied IO Yields. *Source: Markit IOS, Blue Water*



As one can see, in Figure 5, the constant yield methodology also has trouble capturing the differences between different note rates/loan ages that are reflected in the IOS price, and has exaggerated pricing changes in certain areas.

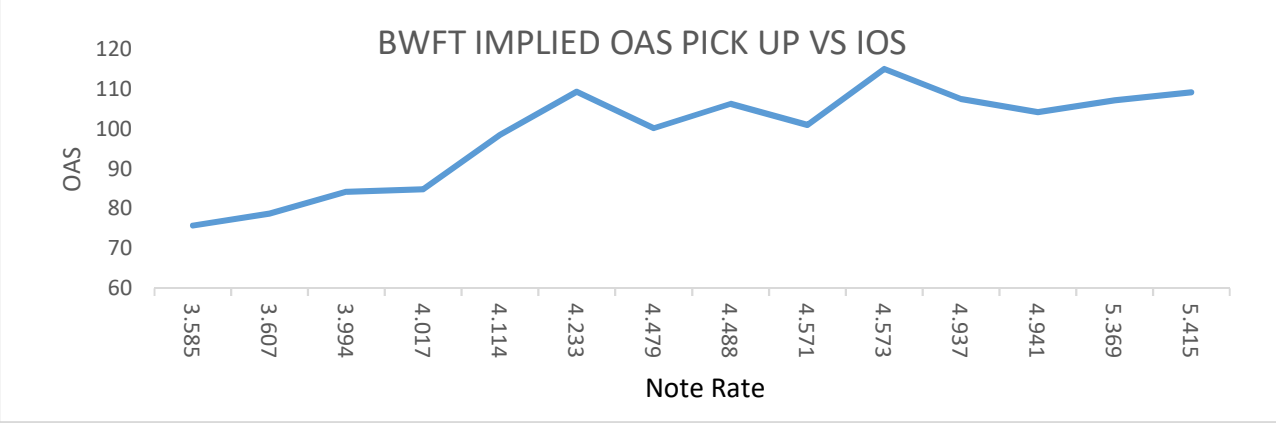
Figure 2: Comparison of Multiples: The Constant Yield method has exaggerated pricing differences in the highlighted areas. Source: Markit IOS, Blue Water



Observation 5: Putting the Model to Work – Modelling Recapture MSR-IO vs IOS

Mortgage servicers have access to relationships, something investors who buy and sell secondary market derivatives do not have. As a result, MSR models should imply a higher computed risk adjusted return (OAS) over IOS models as mortgage servicers leverage information derived from their relationship to drive recapture income. **Concerned modelers should consider the value of recapture in day to day pricing and calibration of MSR IO and compute additional OAS pick up in an incremental fashion by recovering recapture value after first pricing to IOS or ITBA.** Figure 6 shows the net OAS pickup of running IO with 10% recapture (MSR proxy) vs IO without recapture (assuming the same price). As we would expect, Figure 6 further illustrates that a higher risk premium in OAS exists as 'implied return' increases with note rate. Blue Water believes this leads to a pricing disparity that we can now easily recover using our calibrated MSR/IO model.

Figure 3: Implying the Value of Recapture. Source: Markit IOS, Blue Water



Conclusions:

Using Secondary multiple market proxies of IO (IOS and ITBA), we observe that price indications across markets prove to be relatively similar and therefore comparable. We are then able to test both the DOAS and STATIC models against our chosen set of market proxies. Our results indicate that the DOAS is vastly superior across note rates, loan features and loan age in replicating (within some neighborhood) selected market proxies. Static models fall short of tracking the market and pricing economics of at least two liquid proxies for IO**.** We dig deeper into the pricing errors observed from our STATIC model and note that for off par coupon valuations the errors are pervasive. **We suggest that market participants should avoid running valuations, shocks, and potentially hedging STATIC given their apparent disconnect with market pricing and pricing dynamics.** Finally, we examine recapture pick up using our model and show how one would be able to develop a relatively robust framework for including recapture in our DOAS framework.

Limitations of this analysis:

- Liquidity of IOS market. There is no question that the IOS market is somewhat illiquid and, for lack of a better transparent proxy, we will accept that IOS affords us daily insight on a few highly seasoned out of the money reference pools.

- TBA is priced for cheapest to deliver, i.e. it has implied adverse selection. Inter-servicer valuations can cause large variations within deliverable cohorts around speeds and therefore OAS.

-Information availability. The lack of available information presents a challenge in terms of aggregating relevant information and drawing any kind of meaningful conclusions from observations without heavily caveating the information being presented.

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