PRUDENTIAL FIXED INCOME
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Perspectives

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CMBS Interest Only (IO) Securities
The Relative Value Proposition (Part I)

Commercial Mortgage-Backed Securities

CMBS Interest Only (IO) Securities
Drivers of Cash Flow and Risk (Part II)

Commercial Mortgage-Backed Interest Only (CMBS IO) securities currently offer an attractive opportunity to earn option-adjusted spreads (OAS) well beyond those offered by senior CMBS principal bonds and comparatively higher risk mezzanine bonds while actually assuming less risk. We believe this substantial opportunity exists partly because IOs are often overlooked given a relatively small market size, complex structure, and misperceptions of negative convexity. This lack of focus, however, presents investors with a unique opportunity given that the sector is currently well supported by both technical and fundamental factors which we expect to persist for some time.

This paper is the second in a two-part series. In Part I, we introduced CMBS IO securities by explaining their genesis, describing their structure, and discussing the fundamental factors that support the CMBS IO value proposition. Despite the attractiveness of the sector, however, security selection is critical. CMBS IOs are complex instruments characterized by risk factors that are substantially different than CMBS principal bonds.

In this second paper, we examine the key drivers of cash flow and risk in the CMBS IO sector including the effects of prepayments and loan concentrations. We then highlight the CMBS IO sub-sectors that we believe are most attractive given our various return and risk considerations. To finish, we delve into the importance of surveillance and careful security selection as requisites for successfully investing in this often misunderstood but attractively-priced sector.

I. CMBS IO Cash Flow and Risk Are Tied to Changes in the CMBS Principal Class

The risk and return profile of a CMBS IO is related to the two components of an IO's cash flow: 1) Notional Amount, or the value of the CMBS principal class to which the IO is linked, and 2) Class Excess Spread, the difference between the pool WAC and the coupon on the IO's reference principal class.[1] Each of these two factors changes during the life of the IO depending on a host of factors including prepayments, defaults, and coupon dispersion. And as these factors change, so too can the cash flow, return potential, and risk levels of a CMBS IO.

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[1]*The pool WAC is the weighted average coupon of the loans collateralizing the CMBS conduit deal net of servicing fees. See the link above to Part I of this paper for more details.*

Before we review the variables that can affect cash flow, let's first consider the formula used to calculate an IO's cash flow:

IO Cash Flow = Notional Amount * Class Excess Spread (Pool WAC – Principal Class Coupon)

BREAKING DOWN THE IO CASH FLOW

IO	Linked Principal Class	Pool WAC[1]	Class Coupon[1]	Notional Amount (Class Par Amount)		Reference Class Excess Spread (Pool WAC - Class Coupon)		Annual IO Cash Flow
XA	Class A	4.37%	1.41%	$100 mm	X	4.37% - 1.41% = 2.96%	=	$2.96 mm
XB	Class B	4.37%	2.81%	$200 mm	X	4.37% - 2.81% = 1.56%	=	$3.12 mm
XC	Class C	4.37%	3.00%	$100 mm	X	4.37% - 3.00% = 1.37%	=	$1.37 mm

Source: Prudential Fixed Income. Sample illustration. [1]Pool WAC and principal class coupon may change as tranches are paid down and loans are removed from the pool.

1) Notional Amount Can Pay Down Differently than Expected Due to Prepayments and Defaults

The notional amount of an IO, which is the basis for IO interest payments, can be reduced by loan prepayments, realized losses on liquidated loans, and principal recovery on liquidated loans that reduce the principal balance of the class(es) to which the IO is linked. An IO's sensitivity to each factor varies substantially depending on the seniority of its underlying class(es). An IO linked to the most senior classes (XA) is most sensitive to prepays and principal recoveries on liquidated loans given the sequential application of principal, as is illustrated on the following page. On the other hand, an IO linked to subordinate classes (XC) is most sensitive to realized losses given the reverse sequential application of losses.

Since the notional amount of the most senior and most junior classes are highly sensitive to prepays and defaults, IOs linked to classes in the middle of the capital structure (e.g., XB) are generally better protected and should theoretically trade at tighter spreads. Note the stability of the mezzanine XB OAS in the table below compared to the volatility of the senior conduit (XA) and, in particular, the junior conduit (XNR.)

CMBS IOs LINKED TO MEZZANINE CLASSES ARE MORE STABLE THAN OTHER IOs

Notional Amount Sensitivities: OAS Impact

IO Security	Pricing Spread	Model OAS (bps)				
		High Prepay Rate during YM[1]	High Prepay Rate during YM (Interest Rates Up)[1,2]	Low Default Rate, Low Severity[3,4]	Low Default Rate, High Severity[3,5]	Slower Prepay Speed During Open[6]
Senior Conduit-XA	225	334	199	42	184	262
Mezzanine Conduit-XB	225	285	285	224	224	266
Junior Conduit-XNR	1000	1034	1034	177	-6014	1034
High YM Exposure-Fannie X2	200	1699	-792	-83	-83	241
Low YM Exposure-Freddie X1	200	241	205	47	167	235

IOs linked to the middle of the capital stack are well insulated from prepays and losses

YM prepays in a high interest rate environment hurt the Fannie IO

Senior IOs are more sensitive to low severity defaults

Junior IOs are most sensitive to high severity defaults

Source: Prudential Fixed Income. Sample illustration. [1]5 CPR Assumed: 5% of the loans in their yield maintenance period prepay on an annual basis; [2]Rates are assumed to increase immediately by 200 bps; [3]1 CDR Assumed: 1% of all loans default on an annual basis; [4]20% severity assumed for liquidated loans; [5]80% severity assumed for liquidated loans; [6]70 CPY Assumed: 70% of loans in their open window prepay on an annual basis.

Prepays During Yield Maintenance Period

As we noted in our first paper in this series, after the initial lockout period, some loans can be prepaid during the yield maintenance period, which requires a single penalty that is sized based on the movement in interest rates along with the remaining loan term.

Any loan prepayments during a yield maintenance period result in premature paydown of a principal class and a faster reduction of the notional amount of any IO linked to that class. If the prepayment is not accompanied by a penalty, the yield of the IO will decline. The existence of a penalty makes things slightly complicated. If the amount of the penalty paid to the IO holder equals or exceeds the net present value (NPV) of excess interest that would have been earned on the loan for its remaining term, the realized return will improve. If the penalty paid is less than the NPV, the return will decline. It turns out that steady or declining interest rates from the time the loan coupon was set typically result in a sufficiently-sized penalty that benefits the IO OAS, while rising rates shrink the yield maintenance penalty and harm the IO OAS.

Prepays During Open Window Period

All of the loans also have an open window where the loan is freely prepayable with no penalty. Since the IO is priced assuming all loans prepay in the first month of the open window, any delay in prepayment beyond that first month provides additional excess interest to the bondholder and improves the return on the IO.

Loan Defaults, Recoveries, and Realized Losses

Recoveries on a defaulted loan occurring prior to the expected loan maturity date have the effect of repaying the senior class certificates faster than expected, thereby reducing the notional amount of an IO linked to the senior class. The premature decline in notional amount reduces future excess interest and negatively impacts the yield of the IO.

On the other hand, defaults occurring at loan maturity (maturity defaults) result in senior class certificates repaying more slowly than expected. Since the notional amount remains outstanding longer than the pricing expectation, the yield of an IO will generally improve.

When analyzing IOs attached to subordinate tranches, realized losses must also be considered. Any losses from the liquidation of a defaulted loan will be applied to the principal bonds in reverse sequential order and will reduce the yield of an IO linked to the written-down reference class. Given the relatively small size of most subordinate classes and the sensitivity to even small writedowns, the yield of an IO referencing these classes is more volatile than an IO referencing the most senior classes.

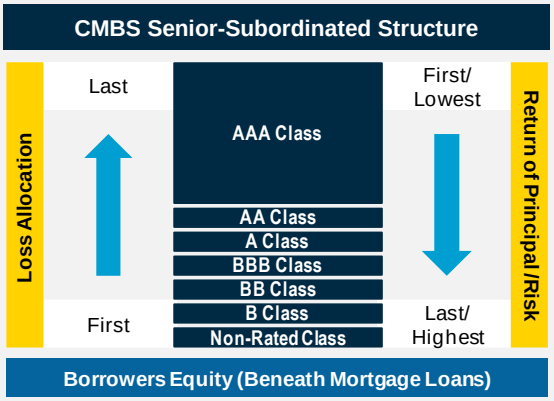
2) Class Excess Spread Can Also Change Overtime

The class excess spread, the second component of a CMBS IO's cash flow, also changes whenever a conduit pool WAC changes.[2] The "thickness" of a CMBS IO will determine the degree of OAS impact created by the change in pool WAC, as is described on the following page.

Allocation of Principal and Realized Losses

Fixed rate CMBS conduit deals typically follow a standard cash flow waterfall under which all principal proceeds from the underlying mortgage loans, whether from scheduled amortization, prepays, repays, and recoveries on liquidated loans, are allocated to bond classes in sequential class order. This sequential payment structure ensures that all class A bonds are repaid before class B receives its first dollar of principal, and so forth.

Realized losses from liquidated loans/properties are allocated in reverse sequential order and are first applied to the most junior class (NR) until the class is written off in its entirety, then to the next most junior class (class B), and so forth. Note that the borrower's equity in a property also provides protection to the CMBS loan from declining property prices.



[2] *Class excess spread is defined as the CMBS conduit pool WAC less the class coupon of the referenced CMBS principal bond.*

Pool WAC Drifts Over Time

The amount of excess spread available to the IO will be impacted by any changes in the pool WAC relative to the predicted WAC using the standard pricing convention. WAC drift results from variations in coupons and maturity dates of the loans within the pool. For example, if all loans in the pool had an identical coupon and maturity date, the pricing convention would imply zero WAC drift over time. However, if loan coupons and maturity dates vary, predicted WAC drift increases.[3]

The yield of an IO will change whenever the actual pool WAC deviates from the pricing convention pool WAC due to prepays during the yield maintenance period, liquidations of defaulted loans, and extensions past the first month of the open period. Specifically:

- *IO Yield Increases:* The removal of any low coupon loan or the extension of any high coupon loan *increases* the WAC of the remaining pool and creates additional excess spread that boosts the yield on the IO.
- *IO Yield Decreases:* The removal of any loan with a coupon above the WAC or the extension of any loan with a coupon below the WAC *reduces* the WAC of the remaining pool, resulting in less excess spread and a decline in the yield on the IO.

Sensitivity to Higher Coupon Loans

CMBS IOs are most sensitive to underlying loans with higher coupons since these loans produce more excess spread than loans with lower coupons. These higher coupon loans are typically associated with riskier properties and require substantial scrutiny given a corresponding higher probability of default.

The degree of sensitivity to high coupon loans is dependent on the degree of coupon dispersion of the underlying loans and the magnitude of difference between the pool WAC and the coupon of the underlying notional class(es). A pool of loans with homogenous underlying coupons leads to less IO sensitivity since each loan creates an equivalent amount of excess spread while a pool of loans with heterogeneous underlying coupons leads to more IO sensitivity since the higher coupon loans create a disproportionate amount of excess spread.

"Thickness" of the IO

The thickness of the IO is a critical component of risk assessment and is often a key determinent of buy/sell decisions. While the OAS of all CMBS IOs will generally drop given an unanticipated decline of the pool WAC, the thickness of the IO will determine the level of response to the drop. A high pool WAC relative to a low reference class coupon (e.g., 5.04% vs. 3.0%) results in a "thick" IO that serves to dampen the cash flow volatility of negative WAC drift. Conversely, a low pool WAC compared to a high reference class coupon (e.g., 5.04% vs. 5.0%) results in a "thin" IO and accentuates cash flow volatility.

The cash flow volatility of a thick IO vs. a thin IO is illustrated in the chart below. The example assumes each IO has a pool WAC of 5.04% and a Class B par amount of $50 million. However, the thin IO has a Class B coupon of 5.0%, while the thick IO has a Class B coupon of 3.0%.

As you can see, a 3 bps drop in the pool WAC reduces the cash flow (and corresponding market value) of a thin IO by 75%, while the same 3 bps drop in pool WAC reduces the cash flow (and market value) of a thick IO by only 1%.

THICK IOs CAN DAMPEN CASH FLOW VOLATILITY

	Thin IO	Thick IO
XB Strip (pool WAC – Class B coupon)	0.04% (5.04%-5.0%)	2.04% (5.04%-3.0%)
Annual XB payment (XB Strip*Class B par amount)	$20,000	$1,020,000
Updated Pool WAC after a 0.03% decline	5.01%	5.01%
Updated XB Strip	0.01% (5.01%-5.0%)	2.01% (5.01%-3.0%)
Updated annual XB payment	$5,000	$1,005,000
Percentage Decline of XB Payment	**75%**	**1%**

Source: Prudential Fixed Income. Sample illustration.

[3] *Calculation of the pool WAC is always based on the loan's original coupon and does not consider coupon modifications that might occur during a workout when the loan becomes delinquent.*

Certain IOs are structured to be independent of the pool WAC by referencing a principal class that has a coupon equal to the pool WAC (referenced as a WAC pass through). The WAC drift becomes irrelevant to the return on these IOs but is quite relevant to the return on the principal bonds. As illustrated below, both the thick and the independent IOs tend to be less volatile than thin IOs.

THICK AND INDEPENDENT IOs ARE LESS VOLATILE THAN THIN IOs

Class Excess Spread Sensitivities: OAS Impact

IO Security	Pricing Spread	Model OAS (bps)			
		High Coupon Loan Liquidates (negative WAC drift)[1]	Low Coupon Loan Liquidates (positive WAC drift)[1]	Low Coupon Loan Extends (negative WAC drift)[2]	High Coupon Loan Extends (positive WAC drift)[2]
Thick IO	225	200	274	236	228
Thin IO	225	56	327	165	230
WAC - Independent IO	225	225	225	225	225

Thin IOs are much more sensitive to WAC drift

WAC Independent IOs are very stable

[1] Liquidation assumed to occur in 36 months. [2]12-month extension assumed. Source: Prudential Fixed Income. Sample illustration.

II. Attractive CMBS IO Positioning Across Sub-sectors

Within the CMBS IO sector, our research and technical analysis have led us to favor select Freddie Mac, SASB, and Conduit security types to be particularly attractive due to low notional reduction risk, yield maintenance risk, and WAC compression risk, as well as relatively stable credit performance. By comparison, FNMA IOs, the last example in the chart below, face high yield maintenance risk should interest rates rise since yield maintenance penalties would be diminished.

CMBS IO RELATIVE VALUE MATRIX

IO Security Type	OAS (bps)	Spread Duration (Yrs)	Internal Rating	Risks			Upside		
				Notional Reduction Risk	Yield Maintenance Risk[1]	WAC Compression risk	Yield Maintenance Upside[1]	Slower Prepays Upside	Loan Extension Upside
FHMS X1	300	4.5	AAA	Low	Low	Low	Low	Moderate	N/A
SASB XCP	360	1	AAA	Low	N/A	N/A	Low	N/A	N/A
Conduit XB	340	5	AAA	Low	Low	Moderate	Low	High	Moderate
Conduit XA	340	3.5	AA	Moderate	Moderate	Moderate	Moderate	High	High
FNMA X1	300	4.5	A	Low	High	Low	High	Moderate	N/A

Freddie X1s exhibit low risk and provide stable performance

High YM Risk in Rising Rate Environment

Although more risky, XAs can benefit most from loan extensions

Source: Prudential Fixed Income as of February 29, 2016.
Prepayment of yield maintenance loans may provide upside in a stable or declining rate environment. On the other hand, prepayment of yield maintenance loans in a rising rate environment is a risk and may negatively impact CMBS IO yields.

Freddie Mac: Freddie Mac X1s are our preferred IO holding given very strong prepayment protection (90% to100% lockout/defeasance), pristine credit performance (since 2009, Freddie Mac K deal securitizations have only experienced a handful of defaulted and liquidated loans), and positive apartment sector fundamentals that should keep term defaults low. In addition, Freddie Mac pools are well diversified in terms of loan concentration and have minimal coupon dispersion resulting in the X1 exhibiting low risk and stable performance. Given the Freddie Mac guaranty of loan repayment at maturity though, the X1 does not have any upside from loan extension beyond 0% CPY.

SASB: In SASB deals, we favor the XCP tranche due to its low credit risk and stable profile. Given the very short XCP notional schedule (typically less than two years), it is nearly impossible for a liquidation from a term default to impact the yield. Additionally, the sharing of spread maintenance penalties is typically structured to provide yield upside to the XCP. Although

XCPs do not benefit from potential loan extensions, these securities are an attractive carry trade with pricing spreads wider than those of X1, XA, and XB IOs.

Conduit: Within the conduit space, we favor IOs linked to the middle and top of the capital structure. These XAs and thick or WAC-independent XBs are well protected from realized losses and have less exposure to WAC compression. However, the yield on these conduit IOs is still more volatile than the Freddie Mac X1s given a higher probability of term default from weaker underwriting and far more exposure to the yield maintenance prepayment option. Unlike the Freddie X1 though, the XA and XB can experience substantial upside given the extension of loans at maturity.

III. Surveillance

CMBS IOs are a complicated CMBS sector that requires careful analysis given numerous cash flow drivers and widely varying IO yields across different scenarios. Collateral credit quality, collateral concentrations, CMBS deal structure, and interest rate shifts must be considered when making security selection decisions. Additionally, constant surveillance is essential to ensure that all loans, particularly those with a high coupon, perform within expectation.

Prudential Fixed Income's Structured Product Team has dedicated CMBS analysts who conduct both fundamental and quantitative research using proprietary models. We develop valuation opinions and assign proprietary ratings to each CMBS IO based on in-depth collateral and structural analysis. The CMBS Team maintains a database that tracks the entire CMBS IO universe, detailing critical qualitative and quantitative factors in order to best identify the most attractive securities on a timely basis.

In-depth research is central to identifiying early property performance deterioration, allowing us to implement rotation trades before the market reprices for increased risk. Conversely, a sole focus on more simplistic measures such as IO slope, external ratings, and nominal spread can lead to suboptimal returns.

A sample snapshot of our preferred surveillance metrics and scenarios is illustrated below. As you can see, key loan contributors, as well as shock scenarios and troubled loan tracking, are monitored and evaluated across each IO.

SURVEILLANCE METRICS TRACKED FOR EACH CMBS IO

	Quantitative Factors	IO Example #1	IO Example #2
Model Results	Model Rating	Aaa	Aaa
	Pricing Spread	110	110
	Model OAS	292	208
Potential CPY Benefit	IO Slope	175	88
Loan Specific Analysis	Thickness	1.50%	2.13%
	Largest Negative WAC Drift-Liquidation	Loan A	Loan B
	OAS Impact-Liquidation @ 36m	-228	-93
	Largest Negative WAC Drift - Extension	Loan C	Loan D
	OAS Impact-Ext for 60 months	-80	-45
Largest Cash Flow Contributor	Loan Name	Loan E	Loan F
	Debt Service Coverage Ratio	1.5	1.35
	Includes Yield Maintenance (YM) Period?	No	No
	OAS Impact-Liquidation @ 36m	-180	-120
Loan Prepay Sensitivity	YM%	19%	5%
	OAS Impact-YM Prepay 36m	146	80
	OAS Impact-YM Prepay 36m + 200bps Shock	-203	-10
Current Problem Loans	Delinquency (DQ)%	0%	5%
	Special Servicing%	0%	0%
	OAS Impact-Default DQ/SS loans	0	-147

Surveillance focuses on key loan contributors to the IO

Interest rate shocks highlight potential risk

Troubled loans present potential downside

Source: Prudential Fixed Income. Sample Illustration.

Conclusion

CMBS IOs currently have a favorable risk-return profile and offer spreads well in excess of both senior CMBS principal bonds and comparatively higher risk mezzanine CMBS bonds. This favorable profile is well supported by both technical and fundamental factors, and we expect these factors to persist for some time.

Despite the attractiveness of the sector, security selection is critical. CMBS IOs are complex instruments characterized by risk factors that are substantially different than CMBS principal bonds. An IO investment is supported by a future stream of excess interest from a CMBS pool and offers no principal balance to be returned to the investor. As a result, IO credit risk is driven by the projected timing of potential defaults and prepays whereas the credit risk of CMBS principal bonds is primarily determined by the ultimate likelihood of default and realized loss without regard to timing. In addition, CMBS IOs are highly dependent on the highest coupon loans in the pool while principal bonds are most impacted by the largest loans in the pool. High coupon loans require substantial scrutiny when investing in IOs since a loan with a higher coupon often reflects a higher risk of default.

A successful CMBS IO strategy must begin with a thorough understanding of these unique risk factors and an appreciation for the impact each factor has upon the OAS of the IO. As we have demonstrated, potential OAS impacts are influenced by the seniority of the principal class to which each IO is linked along with the thickness of the IO. Additionally, a robust and timely surveillance process is required to provide sufficient lead time to actively trade IOs given loan performance issues, changes in the levels of interest rates/shape of the curve, and updated views on commercial real estate fundamentals.

Successful investing in the CMBS IO sector requires the resources necessary to understand and analyze constantly changing IO risk/reward profiles. An effective CMBS IO investment strategy, including in-depth and constant surveillance, can potentially boost portfolio total returns and sharpe ratios given the current OAS of approximately 250+ bps for high investment grade rated bonds.[4]

[4] *As of February 29, 2016.*

NOTICE

Source(s) of data (unless otherwise noted): December 31, 2015.

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