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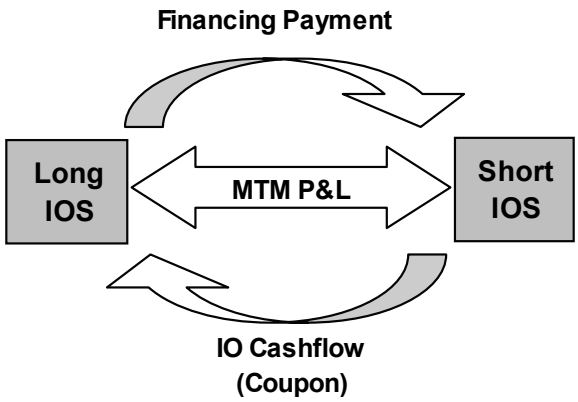
Agency MBS IO Products: Hedging and relative value

- **IOS offers synthetic IO exposure; in an IOS contract, the long investor receives the interest payment on a reference cohort and pays Libor financing**
- **Inverse IOs are structured securities that pay a strike rate minus Libor and amortize down with collateral**
- **The major risk factors on IO product are prepayment risk and financing risk**
- **Due to the embedded financing in IOS and inverse IO products, curve exposure matters; hedging duration with 10-years or TBAs alone will leave investors exposed to curve risk, especially flatteners**
- **Traditional IO product has negative duration and is often hedged by purchasing TBAs. This position is short convexity and implicitly expresses a steepening view**
- **Inverse IOs typically have positive duration and negative convexity; hedging with TBAs can reduce some of the convexity risk**
- **Relative value measures include OAS, which measures long term value, and hedge-adjusted carry, which provides a short term measure of the cash flow earned while holding an IO position, after hedging duration and incurring convexity costs**
- **Hedging IIO by selling duration can be expensive in the current environment, reducing returns due to the steep rolldown of the curve. Investors may consider holding inverse IOs unhedged and relying on carry to offset any selloff or flattening losses**
- **Hedge-adjusted carry currently points to considerable value in IO product, particularly IOS and inverse IOs off of premium collateral**

Exhibit 1: IOS is a synthetic Total Return Swap
A diagram showing the monthly exchange of IOS cashflows



Note:
Long IOS investor is also known as the Floating Rate Payer
Short IOS investor is also called a Fixed Rate Payer
Source: JPMorgan

Interest only product has provided some of the highest returns in mortgages over the past few years as prepayments have been historically slow and rates remain low. Today, IO securities still offer some of the widest spreads in agency MBS, with some premium IOs offering over 500 OAS currently. In this article, we examine two main types of IO securities, fixed rate IO and inverse IO, and look at the related risks, hedging, and relative value in the current environment.

IOS

Trading in cash fixed rate IO has been around for over two decades. The introduction of synthetic instrument IOS (Interest Only Synthetic) in April 2010 has revolutionized the market. Investors need to worry less about the idiosyncrasies on individual pools of collateral backing cash IO bond such as Trust IOs and structured IOs. Each IOS contract references a broad set of securities instead. Furthermore, the increase in liquidity accompanying a standardized IO product has attracted a broader investor base.

The IOS also has several advantages over cash IO instruments. There are no capital requirements to enter the contract beyond margins. Financing at 1-month Libor is locked in for the term of the contract, in contrast to repo financing of cash IO bonds. Additionally, levered investors can combine the implicit financing in an IOS contract with additional leverage to achieve higher ROE (return on equity).

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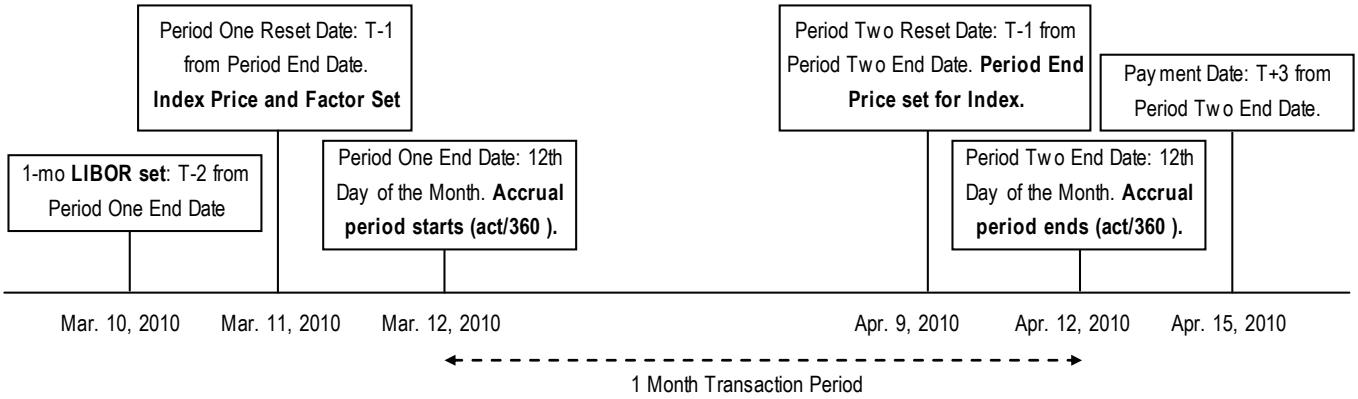
Exhibit 2: Cashflow diagram: monthly exchange of IOS cashflows



Interest Payment = Coupon * (Daycount 30/360) * Notional * Period One End Index Factor

Financing Cost = LIBOR * Period One End Index Price * (Daycount A/360) * Notional * Period One End Index Factor

MTM Index Price Change = [(Period Two End Index Price * Period Two End Factor) - (Period One End Index Price * Period One End Index Factor)] * Notional

Source: JPMorgan

IOS offers synthetic exposure to the interest only cash flows of agency MBS via a total return swap[1]. In an IOS contract, the long investor pays a monthly floating financing rate of 1-month Libor and receives a monthly coupon payment (Exhibit 1). The notional balance used in calculating the payments amortizes down along with the pools referenced in the IOS contract. For example, IOS FN-5010 would pay down as the 2010 30-year 5% cohort. In this way, the IOS contract mimics an agency MBS IO position, financed at 1-month Libor.

There are currently 15 IOS contracts traded in the market, encompassing 3.5% to 6.5% coupons on vintages dating back to 2003.

The reference securities are designed to be as generic and inclusive as possible. For example, on the 2009 IOS contracts, all eligible Fannie 30-year pools are included and aggregated. Eligible pools are:

1) Fannie 30-year pools with the "CL" prefix that were *issued* in 2009 with the stated corresponding coupon
2) For the three launch indices, each pool must have at least 90% of its balance originated in 2009
3) Pool loan age must be less than 15 months on index roll

Practically, these aggregates are the typical coupon/vintage generics used in mortgage prepayment analysis. Technically, there is a small difference in that these are issue-year aggregates whereas the market convention for segregating cohorts uses origination year. This difference is generally negligible.

The IOS indices follow several day count and calendar day fixing conventions. Monthly payment exchanges are anchored to the Period End Date, the 12th of each month, as follows:

1. Settlement payments are made T+3 , after Period End Date
2. Reset Date is the day before Period End Date (T-1). On Reset Date, Index Factor and Period End Price are observed and fixed.
3. The one-month Libor rate observed on the day before Reset Date (i.e. T-2 from Period End

1 IOS is administered by MarkIt. For official documentation, please visit: http://markit.com/en/products/data/indices/structured-finance-indices/ios/ios.page?

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Date) is used for computing Financing Payments for the month following.

4. Index Factor is published on Reset Date, using the most recently published pool factors. Generally, pool factors are released by the agencies on or before the 5th business day of each month. The calculation agent, MarkIt, is committed to collect and collate this information and publish the official Index Factor by the 11th.
5. Period End Price is the end of day (EOD) price observed on each Reset Date. This price becomes the Commencing Index Price for the next computing period.
6. Marked to market (MTM) gain/loss is the difference between Commencing Index Price and Period End Price (i.e. month over month change in index price fixings), multiplied by the respective Index Factor.
7. Financing payment is calculated from the 12th of each month to the 12th in the month following (i.e. from one Period End Date to the next) based on an actual/360 day count.
8. Interest cashflow (coupon payment) is computed using a 30/360 day count; this adheres to the mortgage payment convention.

Exhibit 2 shows a sample cashflow exchange timeline during a monthly payment cycle.

IOS initially launched with 3 traded contracts, all based on 2009 vintage collateral. Since then, Markit has added securities based on 2010 collateral; 2006-07 6.5s; and 2003,2005, and 2008 5s and 5.5s. New indices should be rolled out on an annual basis for new collateral. Three Ginnie indices referencing the 2010 vintage Ginnie II 4s, 4.5s and 5s. were rolled out in May 2011.

Inverse IO

Inverse IO bonds are structured CMO tranches that offer a monthly floating coupon based on a strike rate minus a reference rate, typically 1-month Libor. The IO part of the name comes from the fact that the bond receives no principal payments (although notional pays down along with collateral), while the inverse part of the name is due to the bond coupon falling as interest rates increase, which is in contrast to traditional floaters.

Inverse IOs are created as a by-product of constructing floaters from fixed-rate collateral. The floater receives the principal payments from collateral, along with a floating coupon. The interest not paid to the floater is used to create an inverse IO. The cap of the floater sets the floor of the inverse IO. When the floater reaches its maximum coupon, the inverse IO falls to its minimum coupon. For example, creating a 7% cap floater receiving 1m Libor + 50bps would result in an inverse IO receiving 6.5% - 1m Libor. If 1-month Libor climbs to 6.5%, the floater gets a 7% coupon, while the inverse IO receives no coupon. Conversely, if 1-month Libor falls to zero, the floater will earn 50bps of coupon, while the inverse IO picks up 6.5%.

Inverse IOs can also be created with added coupon leverage. By reducing the notional balance, a CMO desk can create inverse IOs with a greater coupon. The dollar amount of coupon paid to the tranche remains constant; however, the smaller amount of notional may allow levered investors to obtain higher returns due to a potentially lower margin requirement on the smaller notional. For example, rather than creating the 6.5% - 1m Libor security above, a desk can create a 13% - 2 x 1m Libor inverse IO with half the balance of the original security. This security provides investors with a coupon of up to 13% of notional balance, helping meet high yield targets.

Inverse IOs are attractive to levered investors with a high return target. After duration and convexity risks, inverse IOs often trade with a wide OAS, as we discuss below. This OAS concession is a result of some liquidity concessions and the heightened prepayment and rate sensitivity relative to a floater or fixed-rate collateral. Fund managers who are able to manage the risks embedded in an inverse IO can pick up spread in the product.

Yield curve risks

The biggest concern for investors in Trust IOs and IOS is prepayment risk. Very slow prepayments are good for IOS investors since the balance falls little over time, resulting in more interest cash flows. Fast prepayments can quickly reduce the value of the interest only cash flows. Hence, as rates fall, IOS securities will decrease in value, in contrast to most bonds. The negative duration on IOS is one of the defining features of the product.

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Exhibit 3: Model interest rate exposure and hedging with collateral

Base case analytics and residuals hedging with TBA collateral on various IOS and inverse IO bonds, as of 2/28/2011

	Analytics							FN 4.5 Hedge							& 3Yx7Y Cvx Hedge	
					Dollar Partial			HR to	Residual Dollar Partials			Residual Dollar Cvx & Vega				
Security	$ Dur	$ Cvx	Cvx HR*	Vega	2Y	5Y	10Y	Collat	2Y	5Y	10Y	Cvx	Cvx HR*	Vega	Cost*	Resid Vega
IOS 45.09	-4.6	-5.6	0.019	-1.1	0.50	-0.94	-4.12	-0.87	1.06	0.14	-1.22	-7.1	0.024	-1.2	0.21	-1.3
IOS 55.08	-4.9	-3.1	0.011	-0.7	0.37	-1.43	-3.86	-0.94	0.98	-0.26	-0.72	-4.8	0.016	-0.9	0.15	-0.9
IOS 65.67	-2.2	-1.1	0.004	-0.2	0.35	-0.60	-1.91	-0.41	0.62	-0.09	-0.53	-1.9	0.006	-0.3	0.06	-0.3
FNR 2009-94 SD	0.8	-0.8	0.003	-0.4	0.96	0.49	-0.70	0.14	0.87	0.31	-1.18	-0.6	0.002	-0.4	0.02	-0.4
FNR 2010-99 NS	0.4	-3.1	0.010	-1.0	1.23	0.92	-1.70	0.08	1.17	0.81	-1.98	-2.9	0.010	-1.0	0.09	-1.0
FN 4.5 TBA	5.3	-1.8	0.006	-0.2	0.65	1.24	3.35									

* Convexity hedge ratio assumes hedging with 3Yx7Y ATM straddles along with a duration hedge using TBAs. Cost reported is option premium of hedge in points of notional

Collateral characteristics for IIOS

IIO	Collat	WAC	WAM	WALA
FNR 2009-94 SD	Seas 6s	6.55	309	46
FNR 2010-99 NS	4.5s	4.96	342	14

Source: JPMorgan

IOS contracts also exhibit negative convexity similar to pass-throughs. In general the convexity on IOS will be more negative than on collateral; effectively, much of the collateral's *dollar* duration sensitivity to rates is leveraged onto a lower dollar price IO strip, magnifying the impact of rate movements. The combination of negative duration and large negative convexity make it important for investors to understand and hedge the interest rate risks appropriately.

Inverse IOs (IIO) are subject to prepayment risk as well, with fast prepayments decreasing the value of the security and slow prepayments leading to more cash flows. However, the IIOs also have coupon risk. The coupon on an inverse IO decreases in a selloff as the index rate approaches the strike. This effect has the potential to dominate any increase due to slower prepayments, so that inverse IOs can have positive duration, depending on the collateral characteristics and structure.

Inverse IOs have negative convexity, but less so than traditional IOs. This is due to the inverse nature of the coupon. As rates rally, faster prepayments shorten the window of cash flows, which reduces bond value, but the coupon increases, which increases bond value.

The relationship among rates, prepayments, and coupon paints an interesting partial duration profile in inverse IOs. Increases in the short rate will decrease bond coupon but leave prepayments largely unaffected. Hence, 2-year and 5-year partials are positive. Increases in longer rates will slow borrower prepayments but are less meaningful for bond coupon, hence 10-year partials are negative. Owning an inverse IO without hedging the curve is effectively holding a steepener. For this reason, investors in inverse IOs must be particularly concerned about flattening curve scenarios.

IOS investors have similar concerns due to the financing leg of the IOS contract. An increase in short rates will not affect the IO portion of the cash flow, but a long IOS investor will have to pay a higher financing cost, effectively giving IOS a similar steepening duration profile. The sensitivity to short rates is not as large a component of the duration in IOS (for example in our model 2-year partial duration is only around 10% of the total duration). Nevertheless this remains a concern for IOS investors as well as for inverse IOs.

Exhibit 3 shows base case analytics for a few IOS and inverse IO securities.

Hedging strategies

IOS and inverse IO bonds offer high returns and potential for leverage to investors willing to accept negative convexity and liquidity concerns. Because of the high sensitivity of returns on these products to changes in

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rates, investors will want to hedge interest rate risks to lock in a high return.

Hedging with collateral

A common hedge for both IOS and inverse IO product is to buy (for IOS) or sell (for inverse IO) the current coupon pass-through security to produce a zero duration position. For example, an investor in IOS 6.5 could purchase duration through buying FN 4.5s so as to make the trade duration neutral. For small changes in rates, the investor would be protected.

The benefit of using collateral is that it hedges mortgage basis risk as well. For example, suppose mortgages outperform in a rally. In that case, current coupon yield will drop further, relative to Treasuries and swaps, causing faster prepayments and worse performance on IO product. An investor hedging with swaps would incur this basis risk, whereas a TBA hedge would provide a buffer; outperformance of the hedge would offset the effect of the incremental boost in prepayments on IO value.

IOS investors who buy collateral to hedge duration are tacking on additional negative convexity. Since the IOS asset is already negatively convex, the result is a position that is effectively short volatility. As long as rates remain rangebound, this strategy can earn valuable carry. But investors concerned about large selloffs may need to consider hedging the convexity through options.

Investors hedging inverse IOs are selling pass-through securities, which will offset some of the negative convexity on the inverse IO with the positive convexity of the hedge. In other words, when rates rally (in a parallel shift), the decrease in coupon on the inverse IO can be partially offset by the increased callability of the hedge instrument.

The examples in Exhibit 3 bear out these implications. IOS 4.5 and 5 are strongly negatively convex, with between 1.5 and 3.5 times the negative dollar convexity of current coupon TBA. Buying IOS 4.5 and hedging duration by purchasing 87% of FN 4.5 TBA leads to a position that has no duration but -7.1 dollar convexity. An investor looking to hedge this would need to buy 2.4 times the IO notional of 3Yx7Y ATM straddles. This may be prohibitively expensive and would require further duration hedging as well, highlighting the challenge of managing prepayment risk.

Hedging with Treasuries/swaps

Hedging with collateral, investors can obtain a zero duration asset that is protected from parallel shifts. Of course, the yield curve does not always shift in parallel. Buying or selling TBAs alone leaves the investor exposed to changes in the shape of the yield curve. For example, as we discussed earlier, an inverse IO is effectively a steepener. Adding a short TBA position compounds the steepening view due to the heavy duration of the current coupon pass-through on the 10-year point of the curve. Hence, investors may want to hedge directly with several Treasury or swap instruments, or superimpose an additional curve hedge on top of a collateral hedge.

Partial duration profiles for IOS and inverse IOs show the curve exposure (Exhibit 3). Unhedged, both IOS and inverse IOs have positive duration to the short end of the curve and negative duration on the long end. IOS has more strongly negative duration on the 10-year, reflecting the increased sensitivity to prepayments, which are more a function of long rates. After hedging with TBAs, the 10-year exposure remains negative, although less so on IOS. For inverse IOs, selling collateral increases the negative duration on the 10-year, nearly doubling it on the high coupon collateral IIO (FNR 2009-94 SD). Both sets of securities exhibit curve steepening exposure. In steep curve environments as the current one, investors will want to consider adding a flattener to balance this risk.

Option-based strategies

In addition to hedging duration, investors can hedge the large negative convexity in IO product by purchasing swaption straddles. For example, IOS 4.5 hedging with TBA 4.5s has a negative convexity of -4.8 (Exhibit 3). Hedging this with 3Yx7Y ATM straddles requires $1.6mm notional of straddles for every $100mm notional of IOS. This would cost about 5 ticks. The trade is neutral to convexity and has residual negative vega exposure.

In practice, hedging with options does not fully account for the convexity costs because prepayment behavior may not necessarily follow the model, especially for

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large changes in the rate. An alternative is to rebalance duration hedges more frequently.

Vol hedging

In addition to hedging convexity, investors may consider hedging vega exposure. Increases in volatility will increase the likelihood of borrower prepayments, hurting IO valuations. There is a second order effect in terms of greater option cost and resulting higher mortgage rates, but that effect is small. Indeed the vega exposure on IOS and inverse IO securities is negative and of greater magnitude than for current coupon passthroughs (Exhibit 3), a fact which is compounded by purchasing TBA collateral to hedge duration.

The high cost of hedging in the current environment

Investors have enjoyed two years of high returns on IO product as prepayments have remained historically slow despite record low rates. Inverse IOs in particular have done extraordinarily well due to the high coupon earned with 1-month Libor near zero.

As the economy picks up, investors are increasingly concerned with selloff risk. Given how steep the yield curve is and the fact that short rates are near the zero bound, the main risks seem to be a flattening or general selloff of the curve.

For IOS, a selloff scenario is helpful, reducing prepayment activity. But for inverse IOs, large selloffs will substantially decrease the coupon payment, dwarfing any potential improvement from slower prepayments.

Both IOS and inverse IOs express a steepening view if unhedged, as we discussed above, as slow prepayments help while low short rates improve coupon and financing. For that reason, a bear flattening, where short rates sell off relative to the long end, is a major risk to watch for.

The problem with hedging in the current environment is the high cost of rolldown with the steep curve. For example, the 5-year Treasury rolls down roughly 45bps of yield over 1 year. At a duration of 4.7, it costs a short investor over 2 points in rolldown over a year.

The high rolldown can eat returns. Exhibit 4 shows one year P&L on an inverse IO for a range of interest rate scenarios, along with hedging costs using a 2s/5s/10s Treasury hedge. The one year unhedged return ranges from 2.8 points of notional in the base case to 0.4 points

Exhibit 4: Hedging inverse IO is expensive…
12-month return (p&l in points of IIO's notional) profiles of FNR 09-94 SD under -50bp to +200bp and flattening rate shocks, hedged (with 2s/5s/10s Treasuries) and unhedged, COB 2/28/11

	Parallel Shift						Flattening		
	-50	Base	+50	+100	+150	+200	50	100	150
Total PnL									
Unhedged	2.13	2.77	2.52	2.08	1.33	0.40	1.98	1.16	0.37
Treasury Hedge	-0.72	-0.60	-0.46	-0.32	-0.17	-0.02	-0.23	0.13	0.48
Total Hedged	1.40	2.17	2.06	1.76	1.15	0.39	1.75	1.29	0.85
PnL from Market Value Chg									
Unhedged	0.10	-0.03	-0.40	-0.88	-1.46	-2.09	-0.58	-1.13	-1.66
Treasury Hedge	-0.48	-0.35	-0.22	-0.07	0.08	0.23	0.02	0.38	0.73
Sub-Total	-0.38	-0.38	-0.61	-0.95	-1.38	-1.86	-0.56	-0.75	-0.93
PnL from Cash flow									
Unhedged	2.03	2.79	2.92	2.96	2.79	2.49	2.55	2.29	2.03
Treasury Hedge	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25	-0.25
Sub-Total	1.78	2.55	2.68	2.71	2.54	2.24	2.31	2.04	1.78

Flatteners assume the 2-year rate sells off the given amount but 10-year is unchanged
Source: J.P. Morgan

Exhibit 5: IOS can benefit from hedging
12-month return (p&l in points of IOS notional) profiles of IOS 2008 5.5% under -50bp to +200bp and flattening rate shocks, hedged (with 2s/5s/10s Treasuries) and unhedged, COB 2/28/11

	Parallel Shift						Flattening		
	-50	Base	+50	+100	+150	+200	50	100	150
Total PnL									
Unhedged	-4.65	-0.45	2.85	5.52	7.01	7.88	0.24	0.76	1.23
Treasury Hedge	5.38	3.05	0.80	-1.36	-3.43	-5.41	2.46	1.88	1.32
Total Hedged	0.74	2.59	3.65	4.16	3.59	2.47	2.70	2.63	2.55
PnL from Market Value Chg									
Unhedged	-1.69	0.03	1.84	3.45	4.55	5.19	0.10	0.12	0.11
Treasury Hedge	3.22	0.88	-1.37	-3.53	-5.60	-7.59	0.30	-0.28	-0.84
Sub-Total	1.54	0.91	0.47	-0.07	-1.05	-2.40	0.40	-0.16	-0.73
PnL from Cash flow									
Unhedged	-2.96	-0.48	1.01	2.06	2.47	2.69	0.14	0.63	1.12
Treasury Hedge	2.16	2.16	2.17	2.17	2.17	2.18	2.16	2.16	2.16
Sub-Total	-0.80	1.68	3.18	4.23	4.64	4.86	2.30	2.79	3.28

Flatteners assume the 2-year rate sells off the given amount but 10-year is unchanged
Source: J.P. Morgan

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in the +200 scenario and the +150 flattener (where the 2-year rate rises 150bps and the 10-year is constant). Hedging costs 60bps of return in the base case, but barely improves performance in large selloff scenarios. The hedge still costs 2bps of return in the +200 scenario; hedging only defrays losses in a flattener. This is because the hedge implicitly expresses a flattening view; in a parallel shift, it simply does not pay to hedge.

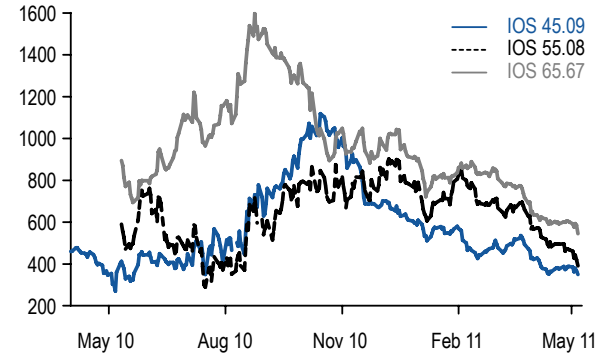
The sensitivity of the inverse IO to flatteners can be seen in the returns. The P&L due to market value changes is much more negative on a 100bps flattener (where the 2-year sells off but the 10-year doesn't) versus a 100bps parallel shift. In the flattener scenario the inverse IO earns 1.2% of return unhedged, compared to 2.1% in the parallel shift. The lower coupon resulting from the short rate selloff is somewhat compensated by slower prepayments in the parallel shift, whereas the flattener really only hurts coupon. Hence, a curve hedge can provide a buffer against this risk.

Of course, an investor can look at the unhedged returns under all scenarios and make a case for not hedging at all in today's environment. Given that hedging is so expensive in the base case, it does not substantially boost returns except under sharp bear flatteners, where it increases return from 37bps to 85bps. Still, the unhedged position does not lose money. An investor can simply assume the risk, especially if their view is that the Fed remains on hold for a long time. The carry on holding the inverse IO over the next year (2-3 points of return) is sufficient to withstand any loss in value from small selloffs.

Hedging is more important for IOS. Most IOS securities currently earn a negative yield in the base case and carry poorly; it is only by pairing the IOS with positive carry assets such as collateral or Treasuries that investors can earn a return. As we discuss later, the combination of IOS and TBA positions can provide high carry even after accounting for convexity costs. Hedging by buying duration in Treasuries alone also adds strong carry and rolldown of the hedge (Exhibit 5). In our estimation IOS 5.5 returns 2.6 points of PnL in the base case, of which 3 points comes from the hedge. In exchange, investors give up large upside if rates sell off in a parallel shift. In a +200 scenario, investors would pick up nearly 8 points of return unhedged.

IOS is subject to flattener risk as well due to the embedded financing leg. Although a parallel shift of

Exhibit 6: OAS have tightened from the wides but are still some of the largest spreads in mortgages
OAS on selected IOS securities



Source: J.P. Morgan

100bps produces over 5 points of unhedged return, a 100bps selloff on the short end drops that return to less than a point. It is important to keep this in mind when selecting hedge instruments. Hedging with TBAs alone keeps the steepening bias inherent in IOS.

Measures of relative value

In analyzing relative value among IO product, one of the primary metrics is option adjusted spread. The OAS on IO securities tends to be in the hundreds of basis points, although the level can vary quite a bit depending on rates and curve. In steep curve environments, for example, IO bonds tend to widen as slower future prepayments add value in models. In environments where speeds have slowed, models fit on historical experience can run fast, showing IO bonds to be tighter than may be expected.

For example, as prepayment expectations have fallen over the past year, IOS OAS has come in gradually. Last fall IOS 4.5 and 5.5 traded over 1000 OAS. IOS 6.5 crossed 1500 in 2010. All three securities are trading in the 350-550 range now (Exhibit 6).

OAS provides a useful benchmark of long term value, but often much of the spread investors earn comes from longer tails where prepayments are expected to slow. It can be years before investors are able to recover this value. As a shorter term alternative, the hedge adjusted carry offers a view of relative value for one or two month horizons.

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The hedge adjusted carry is the value investors earn from holding a security for a short horizon (earning coupon plus any expected price appreciation), net of hedging duration with swaps and incurring expected convexity costs. The raw carry on IO bonds can be obtained from Bloomberg's HZ1 screen. We assume a one month horizon and short term projected speeds, then calculate the forward price for a total return of Libor. The difference between this forward price and today's price reflects the cash flows earned by investing in the security and hence is the one-month carry.

We then use our model partial durations to hedge with 2s/5s/10s swaps and subtract the carry on the hedge instruments to get duration hedged carry. Carry plus rolldown on each swap is calculated by

(1m Fwd Rate – Spot Rate) x Dollar Duration

The full hedge-adjusted carry also subtracts convexity costs, approximated by

½ x Vol^2 x Convexity

taking into account both convexity on the IO security and convexity of the hedge position. For volatility, we use the 1Mx10Y swaption implied vol over the number of business days during the month. More details are available in our "MBS Valuation Using Hedge-Adjusted Carry Analysis" article from 3/28/2008.

In addition to fully hedging with the swap curve, we also calculate hedge-adjusted carry using duration hedging with collateral. In that case, we hedge by buying the TBA coupon with the greatest recent issuance and do not hedge the curve exposure. Duration hedged carry and convexity costs are calculated similarly, with the carry of the TBA being the roll.

IOs and carry

IO assets have some of the best hedge-adjusted carry in mortgages currently (Exhibit 7). HAC on TBA collateral ranges from slightly negative to 4 ticks for super premiums. HAC on IOs are 5-7 ticks. Starting with nominal carry, the wings of the IOS coupon stack have positive carry while the middle coupons have flat to slightly negative nominal carry. With hedging, carry improves substantially. Hedging with collateral adds as much as 11 ticks to IOS positions; with Treasuries it may be 2-3 ticks higher due to the strong rolldown. In our view a duration hedge is necessary to capture the value embedded in IOS.

Recall that an IOS position combined with a TBA hedge often has large negative convexity. Although prepayment risk is less of a concern on lower coupons and on super-

Exhibit 7: Hedged adjusted carry on IO and inverse IOs are among the best in the mortgage market
Hedge adjusted carry and imputed ROE on select IOS and inverse IO instruments, as of 4/8/11

						Hedging w/2,5,10 swaps			Hedging w/ FNCL 4.5					
	$Price	Proj CPR	$ Dur	$ Cvx	Nom. Carry	Carry from Hedge	Dur Hdged	Fully Hdged	Hdge Ratio	Carry from Hedge	Dur Hdged	Cvx Cost	Full Hdgd	B/E CPR
IOS														
IOS 3.5 ('10)	25.02	2.8	-0.9	-1.7	**6.0**	0.8	6.7	**4.6**	-0.2	1.9	**7.8**	-2.6	**5.3**	2.8
IOS 4.0 ('09)	24.77	6.1	-2.3	-3.0	**5.5**	3.1	8.6	**4.9**	-0.4	4.9	**10.4**	-4.8	**5.5**	6.5
IOS 4.5 ('09)	25.34	8.3	-4.0	-4.6	**5.1**	5.9	11.0	**5.4**	-0.7	8.5	**13.6**	-7.6	**6.1**	9.3
IOS 5.0 ('09)	25.27	10.4	-5.2	-5.1	**5.2**	8.1	13.3	**7.2**	-1.0	11.2	**16.4**	-8.7	**7.6**	13.9
IOS 5.5 ('08)	21.25	19.6	-4.9	-2.7	**1.2**	8.1	9.3	**6.2**	-0.9	10.6	**11.8**	-5.5	**6.3**	21.0
IOS 6.0 ('08)	20.79	22.3	-3.8	-1.6	**1.5**	6.0	7.6	**5.9**	-0.7	8.1	**9.6**	-3.5	**6.1**	23.5
IOS 6.5 ('06/'07)	21.42	23.0	-2.3	-0.7	**2.1**	3.5	5.7	**5.0**	-0.4	5.0	**7.2**	-1.9	**5.3**	23.0
IIO									**Comment**					
FNR 10-67 SD	11.41	19.1	0.3	-0.9	**5.6**	-2.5	3.1	**2.0**	5.57 strike/seasoned FN 5.5					
GNR 09-87 AS	13.84	24.1	0.1	-0.4	**6.3**	-2.1	4.2	**3.8**	6.85 strike/G2 6					
FHR 3792 SB	13.75	5.2	0.9	-1.2	**9.6**	-4.2	5.4	**3.9**	5 strike/high LTV Gold 4.5					
GNR 10-153 SY	17.25	13.4	1.2	-1.5	**12.4**	-4.8	7.7	**5.6**	6.65 strike/G2 5					

COB 4/8/11 Proj CPR: model 1yr proj. to fwd curve B/E CPR: B/E prepay to produce same fully hedged carry as IOS 6.5s

Source: J.P. Morgan

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premiums (where buyouts dominate), prepay volatility is an important concern for middle coupons such as 5s and 5.5s. These coupons have a slight edge in carry, earning 1-2 ticks more for adding prepayment risk. One way of looking at the tradeoff is to see the breakeven CPR for each coupon that equalizes the carry across IOS coupons. The breakeven prepays on IOS 4.5, 5, and 5.5 are 1CPR, 2.5CPR, and 1.5CPR higher than our model estimates, respectively. The "cushions" in the middle of the stack are only slightly higher than on the wings. The problem is that the middle of the stack has had much greater prepay volatility even after adjusting for rates. Volatility works both ways; thus, if prepays underwhelm versus expectations, the middle of the stack will have the most to gain.

Inverse IOs (IIOs) throw off a significant amount of current carry. Adjusted for price differences (inverse IOs are currently priced at 50-70% of comparable collateral fixed rate IOs), the unhedged carry on IIOs is significantly higher than on IOS. Of course, as we explained above, by not hedging inverse IOs, investors remain exposed to flatteners. Hedging the curve reduces carry by 3-6 ticks in our sample of bonds.

Hedge adjusted carry should not be the only metric for measuring value. Its main shortcoming is that the carry calculation assumes that under rates unchanged scenario, the bond price stays the same. For prepay sensitive securities like IO, this may not hold true. The rationale is that even if rates stay unchanged, IO cash flows can change due to prepay changes. The best example is the turnover WALA ramp for discounts. Over time, as discount speeds ramp up, the value of discount IOs will decrease. In theory, the large premium that new WALA IOs command over seasoned IOs is partly due to near term carry differences. For premiums, the opposite is true as burnout slows speeds and increases IO value. Model valuations for this "time value" are significant, ranging from-3 ticks/mo on IOS 3.5 ('10) to -2.5tick/mo on IOS 5s ('09). On the other end of the spectrum, super premiums accrete in value over time: +0.4tick/mo on IOS 5.5s, +0.8 tick/mo on IOS 6 and +1.4 tick/mo on IOS 6.5s. Fully accounting for time value, the relative value of IOS across the coupon stack starts to tilt decidedly in the favor of premiums in the current environment. We would be cautious about relying too much on model valuations, which is the main reason why we want to look at HAC in the first place. However, in cases where HACs are comparable, we prefer IOs where "time value" is more favorable, in this case, premium IOs.

In the current environment where volatility is at historic lows and falling further, IO instruments should outperform other assets because they earn carry and efficiently express short volatility/convexity views. Within the space, we think high strike inverse IOs off premium collateral are attractive for executing carry trades as funding rates should be slow to rise, and when they do, premium speeds should fall, mitigating coupon risk. In addition, we prefer IOS off of credit impaired premium collateral, where high carry combines with historically slow and slowing prepayments.

In summary, IO and inverse IO product offers an efficient way to express prepayment views. IOs add carry to fixed income portfolios, but investors must be careful in hedging to avoid prepayment and rate risks. In a low yield environment and with the Fed on hold, we think these bonds offer value.

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