

The Hybrid ARM Handbook

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THE LB HYBRID ARM PREPAYMENT MODEL

Introducing the LB Hybrid ARM Prepayment Model

In the following pages, we introduce our recently released hybrid ARM prepayment model. Hybrid ARMs are gaining stature in the mortgage market in light of the impressive issuance. Given the recent sell-off and the increased homogeneity in the mortgage market, investors will need to look at non-index sectors like hybrid ARMs to outperform the benchmark index. From this perspective, we felt the need for a robust pricing tool that will enable investors to identify relative value opportunities.

Hybrid Prepayments

We first discuss the recent prepayment experience on hybrids and then compare model projections with the historicals.

- **Refinancings:** One notion that exists among investors is that refinancings on hybrids are extremely fast. As we will show, agency hybrid prepayments are actually better behaved than fixed rates. While on the non-agency side, jumbo hybrids have been slightly faster than fixed-rates, alt-As, particularly those with penalties, display muted refinancing profiles. Model refinancings are calibrated to the most recent prepayment wave and do reflect the super-fast prepayments in some sectors. Projected speeds for agency 5/1 hybrids at a 200bp rate incentive are 64% CPR while those for their jumbo counterparts are 80% CPR.
- **Turnover:** On the turnover front, hybrid ARMs have been much faster than fixed rates (especially 3/1s) because a significant portion of hybrid borrowers are homeowners with a short-horizon. Turnover in the model is calibrated to the speeds on balloons in 94-95. Given that housing market in the mid-90s was weaker than present, turnover assumptions in the model are conservative.

Relative Value: Hybrids look Compelling versus Fixed Rates

After discussing the prepayment characteristics of hybrids, we provide a relative value framework based on our model. According to our model, hybrids look compelling versus their fixed rate counterparts. Par-coupon hybrids are currently priced at L+25-30 bp on an OAS basis. In contrast, 30-year and 15-year current coupons are priced at L-10bp and L+5bp, respectively. One concern hybrid investors have is around tail valuations, especially on the lower strike 5/1s which could have negative values. Our model captures the discount values of these tails and the pick-up in spread versus fixed-rates fully reflects their worth.

Hedging Hybrid Pipelines

While this piece focuses on how relative value players can use this model to analyze hybrids, the model can also be a valuable tool for risk management. More specifically, originators should be increasingly worried about the growing risks from pipelines, especially since there is no liquid forward market for hybrids. Using our model as the basis, we provide a framework for hedging hybrid pipelines. There are significant residual risks in a hybrid after duration and convexity are hedged out. To offset these residual volatility and mortgage exposures fully, originators can use a combination of options and fixed rate mortgages. (Please see appendix A for an in-depth analysis or our publication in the *MBS & ABS Weekly Outlook*, October 27 2003.)

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This section highlights the growing importance of the hybrid sector, especially in light of growing homogeneity in the mortgage market.

Strong growth in hybrid ARMs. Size now comparable to 15-year TBAs.

A premium market provides more opportunities for investors to outperform the Index.

The coming months will see mortgage investors move into non-index sectors in a bid to enhance total returns.

WHY LOOK AT HYBRID ARMS?

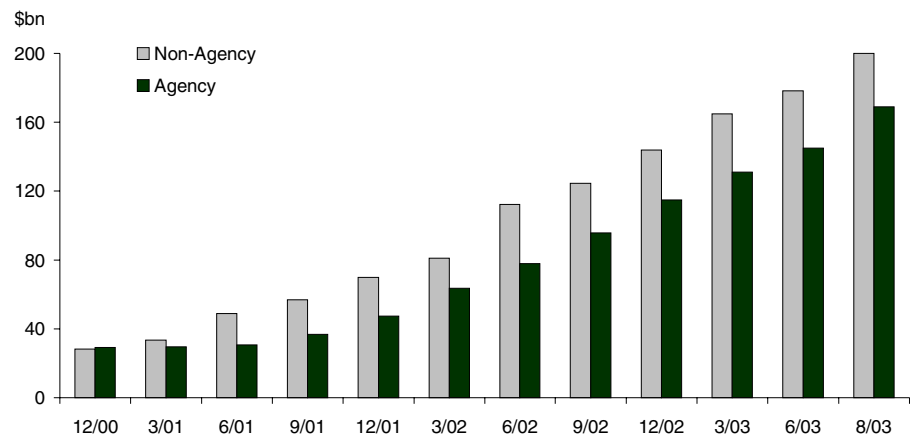
The aim of this piece is two-fold: to highlight the growing importance of hybrids as a mortgage sector and to present the recently released hybrid ARM prepayment model. The hybrid sector really warrants attention now more than ever. Thanks to low short-term rates, the hybrid market has grown at a tremendous pace in the past several months (Figure 1) and is now comparable to the 15-year agency market in size. In light of its current size and the likely growth over coming months, mortgage investors cannot overlook the hybrid sector. Further, as we discuss below, opportunities to outrun the benchmark Index through security selection will dwindle during coming months and investors will need to turn to sectors like hybrids as a result.

The Inevitable Out-of-Index Trade

Strong growth apart, there are other important reasons for mortgage investors to look at the hybrid sector. The most prominent of these is the increased concentration risk in the fixed-rate mortgage market. With the strong refinancing wave during the past several months, the homogeneity in the MBS index has increased substantially. Consequently, investors cannot outperform the Index through security selection alone. Further, as we have often times discussed, there are several opportunities to outperform the benchmark MBS Index in a premium environment. There are enough moving parts in Index securities alone, which provide significant relative value opportunities for investors. For instance, the dispersion of speeds in pools with similar incentives and the resulting total returns is substantial enough to allow for opportunities to outperform the benchmark.

In a discount market, on the other hand, the dispersion in returns across Index securities is not significant enough to allow outrunning the Index through security selection alone. In light of the recent sell-off, then, coming months are going to prove increasingly challenging for mortgage investors from the standpoint of enhancing total returns. Consequently, we expect a significant shift in mortgage investor strategy - investors will increasingly need to play in sectors like jumbo fixed-rates and hybrid ARMs in a bid to enhance total returns. From this perspective, we present the recently released LB hybrid ARM prepayment model.

Figure 1. **Outstanding Balance in Securitized Hybrid ARMs**



In this section, we discuss the refinancing and turnover properties of hybrids and compare model predictions with the historical experience

Refinancings on hybrids have been slower than fixed rates in agencies and comparable to fixed-rates in jumbos.

Speeds on hybrid pools with penalties are 25% CPR slower than their non-penalty counterparts

Refinancings on newer hybrids are about 50% slower than their seasoned counterparts

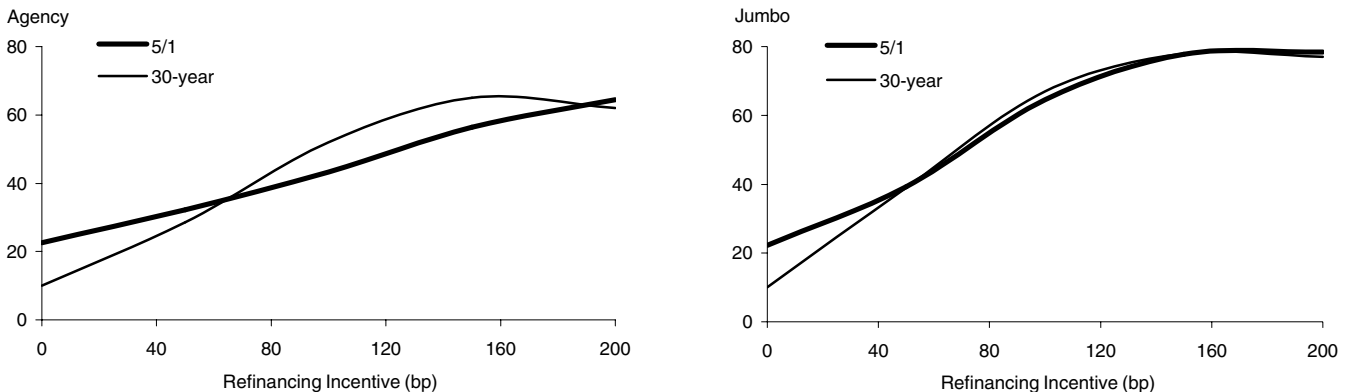
THE LB HYBRID ARM PREPAYMENT MODEL

Refinancings: Not All Hybrids are made Equal

One concern for investors has been ‘the super fast refinancings on hybrids’. It is true that speeds on jumbo hybrids have shot through the roof at times. However, this has *not* been the case with all hybrid sectors. As we show below, **agency hybrids and alt-A hybrids with penalties have been a lot better behaved**. The following points are noteworthy:

- **Jumbos versus Agencies:** Refinancings on jumbo hybrids have been rather fast, with their peak speeds topping 80% CPR. These relatively fast speeds have been due to the larger loan-balances and a greater concentration of California. In agency land, however, hybrid refinancings have been slower than fixed-rates. This is likely due to the greater concentration of purchase borrowers as well as marginally weaker credits in hybrids.
- **Alt-As and Penalty Pools:** Like in fixed-rates, refinancings on alt-A hybrids have been slower than those on their jumbo counterparts. Weaker credit, lower equity or the lack of documentation limits the refinancing options available to these borrowers, muting speeds. Speeds on alt-A pools with a 200bp refinancing incentive, for instance, have been about 10% CPR slower than comparable jumbo pools. This is even more pronounced when the alt-A pool has prepayment penalties. A reasonably big portion of the alt-A hybrid market has prepayment penalties, typically for a 3 or 5-year term. Based on the recent refinancing experience, speeds on hybrid pools with penalties are 25-30% CPR slower than their non-penalty counterparts.
- **Seasoning Ramp for Refinancings:** Similar to fixed-rates, refinancings on newer hybrid pools are significantly slower than their moderately seasoned counterparts. Appendix A3 compares the refinancing curve for newer (0-12) WALA 5/1s pools with their seasoned counterparts. As seen, refinancings on newer hybrids are about 50% slower than their seasoned counterparts. This effect, however, is a bit muted in jumbo hybrids i.e., the differences between newer WAM pools and their seasoned counterparts are not as substantial.

Figure 2. Refinancings on Hybrid ARMs and Fixed-Rates, % CPR



Time-period: 1/01 to 6/03 for agencies and 1/02 to 6/03 for non-agencies; 12-24 WALA pools

Refinancings: Model Projections versus Historicals

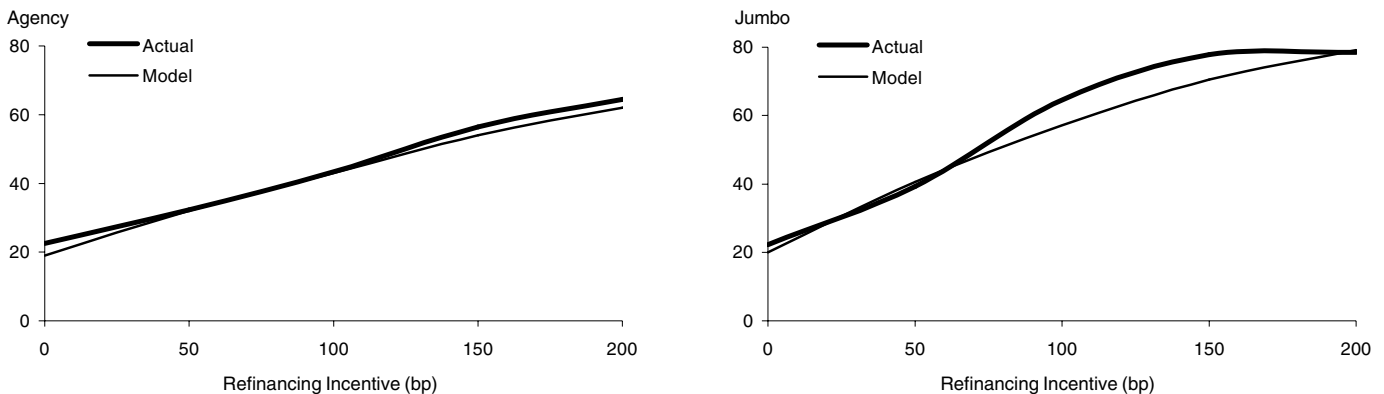
Our model has been calibrated to the recent refinancing experience. Projections on agency hybrids reflect the average speeds seen during Jan-01 to Jun-03 while jumbos are based on the time-period starting Jan-02. The LB model not only has good fits for refinancings on on-the-run hybrids, but it also captures differences between penalty/non-penalty pools and new/seasoned pools fairly accurately.

Both agency and non-agency model projections are on top of historical refinancings.

Model captures the impact of penalties.

- **Good fits overall:** Figure 3 compares the historical speeds on 12-24 WALA agency and jumbo 5/1 hybrid pools with model projections. As seen, model forecasts for hybrids are right on top of historical averages. For example, the forecast for agency hybrid pools with a 200bp refinancing incentive is about 65% CPR similar to historical speeds.
- **Impact of Penalties:** Our model captures the impact of penalties on refinancings and at the margin, is a bit conservative (Appendix A2). For example, the model projected difference between 200bp in-the-money 12-WALA pools with and without penalties is 22% CPR, slightly slower than the 23% CPR observed historically.
- **Seasoning Ramp:** The model captures the impact of seasoning on the refinancing ramp accurately in both jumbos and agencies (Appendix A4). In agency hybrids, refinancing projections on brand new pools are about 50% as fast as moderately seasoned pools similar to historicals. In jumbos this ratio is about 75%, once again on top of historicals.

Figure 3. 5/1 Hybrid Prepayments: Historical versus Actual, % CPR



12-24 WALA pools. Actual prepayments are based on hybrid speeds during 1/01 to 6/03 for agencies and 1/02 to 6/03 for non-agencies

Having looked at refinancings, we discuss the turnover properties of hybrids.

A self-selection of borrowers with a short horizon results in faster turnover.

We use balloon prepaays to estimate turnover

Hybrid turnover is faster in a strong housing market and on flat yield curve originations.

Discount Prepayments: Shorter Horizon = Faster Turnover

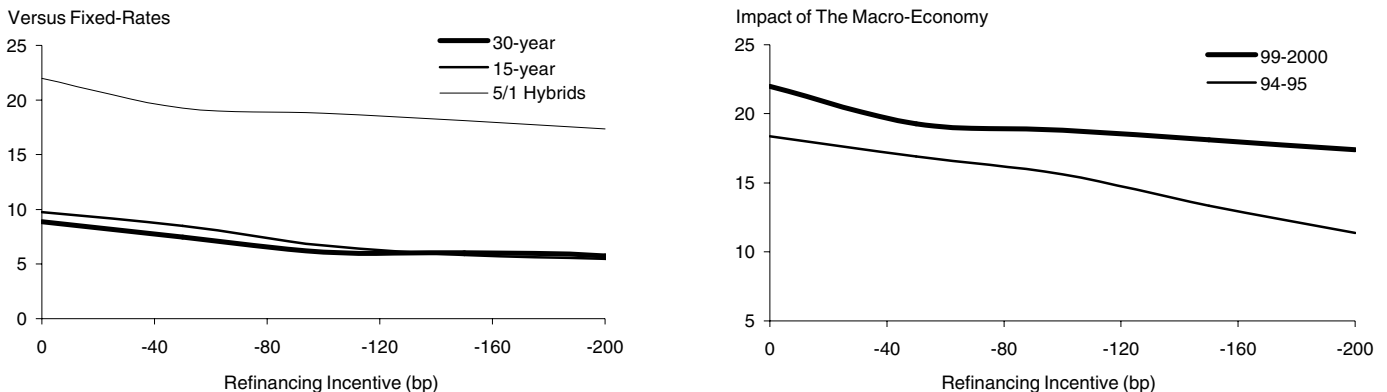
The profile of a typical hybrid borrower gives some insight into the turnover behavior of hybrids. Home-owners who are likely to move during the next few years would take up a hybrid to avoid paying up for the greater optionality in a 30-year fixed-rate mortgage. Second, when the curve is sufficiently steep, even home-owners who do not have plans of moving, could choose a hybrid due to attractive low short-term rates. This has important implications. Turnover on hybrids should be high, even in a discount environment, due to the shorter horizons of the underlying borrowers. However, this is less true for ARMs originated in a steep yield curve environment, since more borrowers could take up a hybrid to simply lower borrowing costs.

Estimating Hybrid Turnover

There is limited information on the prepayment behaviour of hybrid ARMs in a discount environment, as the surge in supply came about after 2001. Furthermore, the limited available data does not allow for capturing the impact of variables like strength of the housing market. To study hybrid turnover characteristics, then, we use balloon mortgage prepaays as a proxy. The profile of borrowers opting for balloons and hybrid ARMs is very similar i.e., both have shorter horizons than their fixed-rate counterparts. As a result, it is reasonable to use balloon prepayment history (in combination with hybrids) to gain insights into the behaviour of hybrids in a discount environment:

- **Faster than fixed-rates:** Turnover on hybrids is significantly faster in comparison to fixed-rates due to a self-selection of shorter horizon borrowers into the former (Figure 4). Further, turnover on hybrid ARMs stays well above that on fixed-rates even in a discount environment due to the greater share of borrowers with a shorter horizon.
- **Relevance of Macro-economic Variables:** Variables like strength of the housing market and slope at origination have a significant impact on the turnover of hybrids. For the purpose of comparison, consider two time-periods: 99-2000 and 94-95. The housing market was stronger in the former and hybrids were originated in a relatively flat yield curve environment. As discussed earlier, turnover on hybrids issued in a flat curve environment should be faster due to a greater share of borrowers with a shorter horizon. Further, a strong housing market should bode

Figure 4. Turnover on 5/1 Hybrids, % CPR



Agency hybrids and fixed-rates. The first plot is for 99-2000.

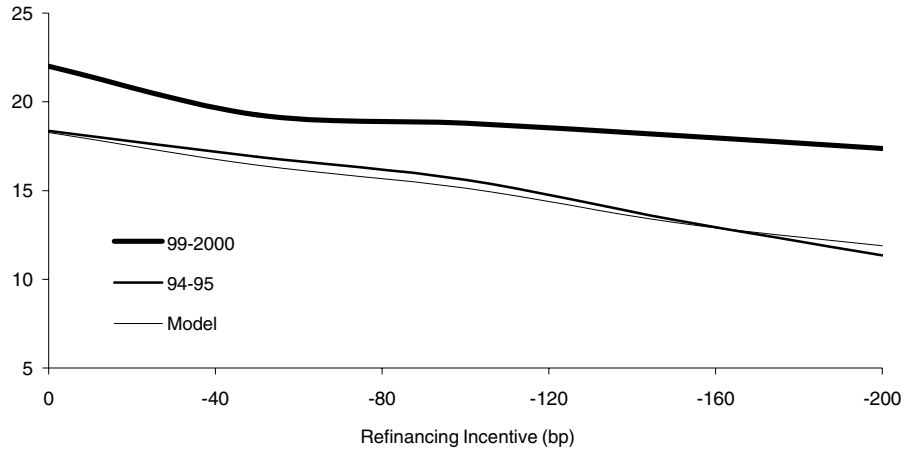
well for hybrid turnover, like in fixed-rates. Consequently one would have expected turnover in 99-2000 to be faster and this has indeed been the case. As seen in Figure 4, hybrid turnover was about 3-4% CPR faster in 99-2000 due to the aforementioned effects.

Model Projections are Conservative

Based on 94-95, model turnover assumptions are conservative.

So what time-period does one calibrate current hybrid turnover to? During the past two years, hybrids have been originated in a rather steep yield curve environment similar to '92-'93. Further, the housing market today has not been as strong as that during '99-'00. That said, while there have been some signs of softening more recently, the housing market hasn't been as bad as '94-'95 either. We would, however, be conservative and calibrate hybrid turnover to the discount environment in 94-95. As shown in Figure 5, model projections for current coupon and 200bp discount 5/1 pools are 18% and 12% CPR respectively, similar to the 94-95 experience.

Figure 5. Turnover: Model Projections versus Historicals, % CPR



In this section, we present model valuations and show why the tail has negative valuations in some cases.

VALUATION AND RISK MEASURES FOR HYBRIDS

Having reviewed our calibrations, we now use the model to ascertain hybrid valuation and risk measures. To begin, hybrids look attractive versus their fixed-rate counterparts. The following points are noteworthy with respect to valuation of hybrids:

Hybrids look attractive versus fixed rates.

Hybrids versus fixed-rates

Par-coupon hybrids are currently priced at L+25-30bp based on our model. In comparison, 30-year and 15-year current coupons are priced at L-10bp and L+5bp respectively. As we discuss in greater detail later, hybrids look attractive as substitutes for fixed-rates.

Despite lower nominal spreads, 3/1s have an OAS pick over longer resets.

3/1s vs. 5/1s vs. 7/1s

Nominal spreads on par coupon agency 3/1s are about 30-40bp lower than longer resets. However, the optionality on 3/1s is lower than longer resets and more importantly, the tails in these hybrids have significantly higher value. Consequently, shorter-reset hybrids pickup 5-10bp pickup in OAS versus their longer counterparts.

Jumbos pick-up xxxbp in spread versus agencies, after accounting for their worse optionality.

Jumbos versus Agencies

On a nominal spread basis, jumbo hybrids are priced about 35-40 bp wider than their agency counterparts. After accounting for the slightly greater optionality in the former, jumbos pick 15-30bp in OAS versus their agency counterparts.

Premium Hybrids

Premium hybrids pick up about 5-10bp versus current coupon hybrids in the model. In 5/1s, the value of the tail is less negative in premiums due to less in-the-money options and lower balances backing the tail.

5% first reset caps now appear fairly priced.

5/2/5s vs. 2/2/5s

The hybrid market has come a long way from not differentiating between cap structures to fairly valuing tails with more out-of-the-money caps. The fair value of pay-ups for 5% first reset caps in par priced 5/1s over 2/2/5s, for instance, is about 12-16/32nd, close to market premia. However, as we discuss later, 6/2/6 caps still appear underpriced versus their 5/2/5 counterparts. The more important issue is the duration arising from the tails – even in 5/2/5s, the tail adds about 0.2-0.3 years in duration.

Figure 6. Model Risk Measure for Different Hybrids

Sector	Coupon	Price	OAS Valuation*				
			OAS	OAD (yrs)	OAC (yrs)	Option Cost (bp)	Vega (32nds)
Agency							
3/1	4.0	102-05	35	2.1	-1.3	46	-1
5/1	4.5	101-28	34	2.5	-1.5	49	-3
7/1	5.0	102-23	24	2.6	-1.9	61	-3
Jumbo							
3/1	3.9	101-00	72	2.2	-1.2	44	-2
5/1	4.6	101-00	48	2.3	-1.8	65	-3
7/1	4.9	101-00	39	2.7	-2.1	72	-4
30-year	5.5	100 10	-2	3.9	-2.6	74	-7
15-year	5.0	101-28	10	3.3	-1.3	41	-4

As of 11/10/03

The tail is worth more than par in most cases.

Is the Tail a Positive?

One area of hybrid valuation which continues to concern investors is the value of the tail or the floating leg. In most cases, hybrid tails are worth more than par since the hefty net margin (about 225bp) from the back-end more than offsets the increased optionality arising from the caps. Par coupon 3/1 tails, for instance, are worth about 4-8/32nd. That said, hybrid tails are worth less than par in some cases, especially in 5/1s with 2% first resets.

2% first resets in a 5/1 are significantly in-the-money.

Why is this the case? A part of the explanation for the discount tail value on a 2/2/5 capped 5/1 is the in-the-money first reset caps. Figure 7 shows the strikes on the first reset caps on various hybrid ARMs in relation to the forward CMT rates. As seen, the first reset caps on

Figure 7. The 'In-the-Money' of First Reset Caps on Hybrids

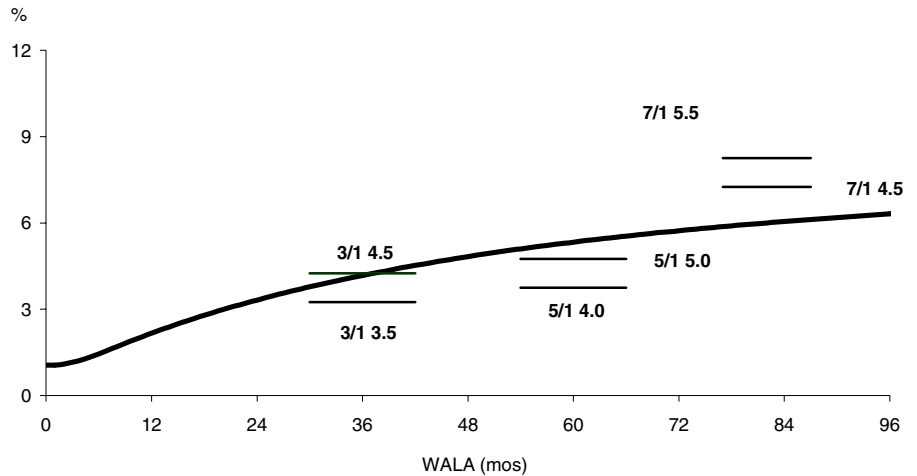
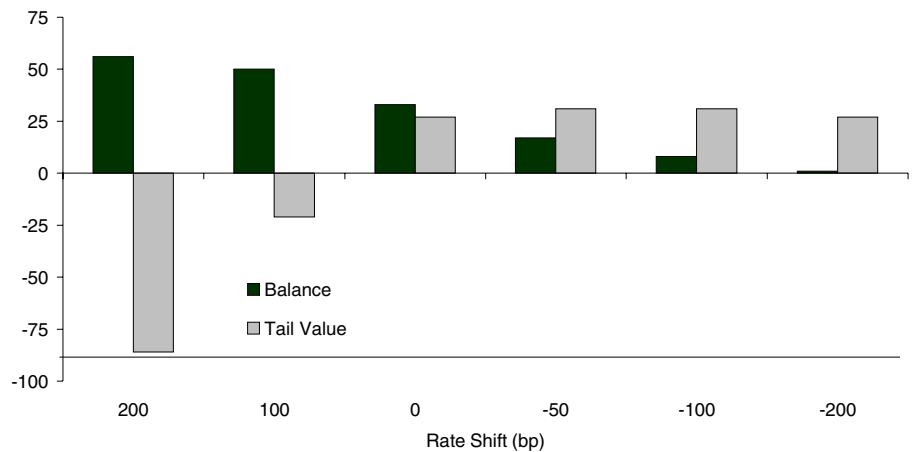


Figure 8. Scenarios With Negative Tail Value Have Greater Balances Backing the Hybrid Tail



5/1s are most in-the-money. However, heavily in-the-money first reset caps alone do not explain the negative value of these tails. In light of the generous net margins, the tail could be worth more than par despite the hybrid being capped out on the first reset date.

Scenarios with negative tail values have greater balances backing the hybrid.

In fact, even in 5/1s with 2/2/5 caps, the tail has a positive value at static pricing speeds. What causes the tails to be worth less than par is that the balance backing the hybrid is greater in those scenarios where the tail is worth less than par. Both negative tail valuations and higher balances are caused by the same factor—higher rates. Consequently, although the tail has a positive value at static pricing speeds, once you account for optionality, it could end up with a negative value.

Figure 9. Tail Valuation in Agency Hybrids

Hybrid	Caps	Coupon	Price	Duration	Tail Value (32nd)
3/1	2/2/6	3.50	101-00	2.7	6
3/1	2/2/6	4.50	102-24+	1.6	14
5/1	2/2/5	4.00	100-12	3.4	-12
5/1	2/2/5	5.00	102-26	2.0	-1
5/1	5/2/5	4.00	100-25	3.2	3
5/1	5/2/5	5.00	103-02	1.8	8
7/1	5/2/5	4.50	100-31+	3.4	-1
7/1	5/2/5	5.50	103-04	1.8	2

HYBRID PORTFOLIOS AND RELATIVE VALUE

The Right Benchmark for Hybrids

Shorter hybrids are good substitutes for debentures while longer resets ought to be compared with fixed-rates.

In this section, we present a relative value framework. We view the hybrid sector as consisting of two different sub-sectors. Shorter-resets like 3/1s are more similar to debentures and other bullets, while longer hybrids like 7/1s make good substitutes for fixed-rate mortgages. This is because, with increasing reset-maturity, the risk profile of hybrids looks more like fixed-rate mortgages.

Shorter Hybrids versus Agency Debentures

Short hybrids pick up 40bp in OAS versus debentures.

While hybrids have tightened somewhat in recent weeks, they continue to be the most attractive asset class among the short duration alternatives. In particular, hybrids look compelling versus short-dated high quality assets such as agency debentures. As shown in Figure 10, 3/1 hybrids currently offer a 50bp pick-up in yield spread, for a moderate increase in optionality. On an OAS basis, this translates into a 40bp advantage.

Jumbo 7/1s vs. Dwarf TBAs

Jumbo 7/1s pick 50bp versus 15-year TBAs with a very similar convexity profile.

Hybrids also look compelling versus their fixed-rate counterparts. In the sell-off in July / August, hybrids had widened by 20-30bp versus their fixed-rate counterparts on the heels of heavy supply. Since then, although hybrid spreads have come in, fixed-rates have tightened by a similar amount if not more. Consequently, we find hybrids attractive as substitutes for fixed-rates. One trade we like is to buy jumbo 7/1s versus agency 15-year TBAs. 7/1 jumbos offer a 50bp pick-up in nominal spread with an almost identical convexity profile. This translates into a 40bp OAS pickup in hybrids versus their dwarf counterparts.

Within the hybrid market, these are our views:

Jumbo hybrids have lagged agencies in recent weeks.

- **Agency versus Non-Agency Hybrids:** While hybrids are currently cheap as an asset class overall, we prefer non-agency hybrids over agencies. From the widest levels in about 3-years at the end of August, agency hybrid spreads have tightened by about 30bp while their jumbo counterparts have tightened only 10-15bp.
- **Jumbos vs. Alt-As:** Similar to fixed-rates, refinancings on alt-A hybrid pools are slower than their jumbo counterparts. Speeds are even slower on alt-A pools with penalties. At about a 15bp spread sacrifice, the non-agency market now seems to be pricing alt-A pools fairly. However, deals with a greater share of penalties still continue to offer value as the market is a bit conservative around paying up for penalty pools.

While the non-agency market is close to pricing alt-As accurately, pay-ups for penalties in agency land are still off their fair value.

Figure 10. **3/1 Hybrids versus a Combination of 2- and 5-yr Debentures**

Security	Cpn	Face	Static Analysis				OAS Analysis			Option Cost
			Price	Yield	Avg Life	Z-Spread	LZV	LOAS	OAD	
3/1 Hybrid	4.00	100	101-14	3.40	4.1	75	75	34	2.5	41
2yr Deb	2.13	79	99-21	2.29	2.0	22	-8	-8	2.0	0
5yr Deb	3.63	23	99-10	3.78	5.0	36	-4	-4	4.5	0
Portfolio				2.88		28	-7	-7	2.5	0
Difference				0.52		47	82	41	0.0	41

As of 11/10/03

- Hybrids with deep out of the money caps are underpriced.*

 - **Agency Penalty pools:** In agency land, hybrid pools with penalties are seriously under-priced. This appears to be a result of agency hybrid buyers using the fixed-rate market as a benchmark for pay-ups on penalty pools. One needs to, however, bear in mind that penalty pools in hybrids should command a bigger premium since roll specialness is not as issue in this sector. Even on a 101-dollar priced 5/1 hybrid, the fair pay-up for penalties is about 10-12/32nd. In comparison, the market is paying up only 4-6/32nd for penalty pools in the agency hybrid market.
 - **Out-of-the Money Caps:** The hybrid market has come a long way in differentiating cap structures. From near zero, the market pay-ups for 5/2/5s over 2/2/5s have now come closer to full valuations of about 12-16/32nd. That said, the market is still under-pricing more out-of-the money caps. 6/2/6s should command a significant (10-12/32nd) premium over 5/2/5s in light of the steep forward curve. However, the current pay-ups for 6/2/6 cap structures are barely 3-4/32nd.
- Long sequentials without a hard takeout look attractive versus those with a take-out.*

 - **Value in Structure:** In hybrid structured land, there are opportunities in longer sequentials with 6/2/6 caps and without a hard take-out. To begin, the value of a 5/1 hybrid tail with 6/2/6 caps is 24/32nd. This large positive value stems largely from the generous margins and significantly out-of-the-money caps. In a structured deal, most of the value of the tail resides in the last cash flow senior tranche, usually a bullet sequential. As such, last sequentials in deal without a hard takeout ('the sequentials') should command a 24/32nd premium over those with a take-out ('the bullets'). In stark contrast, the sequentials are trading at a 10-15bp pick-up in spread versus the bullets. Consequently, sequentials without a takeout appear to be underpriced by about 1.5 points!

Summary Recommendations in the Hybrid ARM Sector

	View/Trade	Rationale
Shorter Hybrids vs. Debentures	Buy 3/1 hybrids versus short debentures	Pick up 50bp in nominal spread with limited increase in optionality
Long Hybrids vs. Dwarfs	Buy jumbo 7/1 hybrids versus DW TBAs	Pick up 50bp in nominal spread for a similar convexity profile; Pick up 40bp of OAS.
Non-Agencies Hybrids	Buy non-agency hybrids versus their agency counterparts	Though spreads have come in somewhat, non-agencies remains about 15bp cheap to agencies on a nominal spread basis.
Alt-A with Penalties	Buy alt-As with penalties in agency land.	The penalty is worth about 8-12/32nds even on a 101 dollar priced hybrid, significantly over current market pay-ups.
Cap Structure	Favor 6/2/6 caps over 5/2/5s in 5/1 hybrids	6/2/6 caps are worth about 10-12/32nd versus 5/2/5s
Hybrid CMOs	Favor bullet sequentials with no hard takeout.	Bullet sequential with 6/2/6 caps has worth 10-15bp in nominal spread over a structure with a hard take out.

CONCLUSION

Since you've made it through the piece this far, the least we can do is offer a quick summary. First, we hope to have conveyed that this sector is important not only for its growing size but also for its role in a mortgage market which will look increasingly homogenous. A discount environment will reduce the dispersion in returns across Index securities, limiting the opportunities from security selection.

To address the need to understand value in the hybrid ARM sector, then, we have created a hybrid prepayment model. In a nutshell, our prepayment model is based on two broad prepayment experiences: On the refinancing side we used the most recent refinance experience of Jan 2002 to June 2003 and for turnover we were a bit conservative, using the 1994 to 1995 discount period. Based on this conservative model, hybrids currently look attractive versus fixed rates at a pick 25-30bp in OAS. With these broad themes in mind we outline relative value opportunities. To begin, we like shorter resets versus agency debentures, a trade which offers a pickup of 50bp in nominal spread and adds limited optionality. In longer resets, we like jumbo 7/1s which offer 40bp in OAS versus Dwarf TBAs. We also prefer non-agency hybrids versus agency hybrids, as they remain 15bp cheap despite some recent tightening. Lastly, we like alt-A hybrids with penalties and prefer 6/2/6 cap structures versus 5/2/5s.

APPENDIX A. HEDGING HYBRID PIPELINES

The Objective of Hedging Pipelines: Risk Minimization

We assume that the objective of hedging pipelines is risk minimization and not to enhance returns.

The objective of hedging a pipeline is usually *to preserve value over a short (6-8 week) horizon*. Risk management in the context of a hybrid pipeline has a very different connotation from portfolios – the aim is not to enhance returns when hedging a pipeline and as such, there is limited room for relative value or macro bets. Consequently, the key driver of hedging strategy for pipelines should be risk minimization. If possible, originators should hedge out all the risks in the pipeline. One way to do this would be to sell hybrid ARMs forward (for the purpose of this analysis, we ignore the risk arising from fallout¹). In the absence of a liquid forward market, originators are forced to devise an alternative hedging strategy for hybrids.

A Framework to Hedge Hybrid Pipelines

Since it is not possible to hedge out risk in a pipeline entirely, *what risks should we hedge?* Here is the methodology we adopt:

We gauge residual exposures using historical volatility in risk factors and model sensitivities.

- Without delving deeper, duration and curve risk in a hybrid definitely require hedging. We use the model to arrive at the duration and curve hedges for different hybrid ARMs.
- We gauge the magnitude of the residual risks by:
 - Assessing the worst 5% moves in different risk factors over a 2-month horizon using historical volatility.
 - Multiply these potential changes in risk factors by model sensitivities (Vega, spread duration etc.) to arrive at risk exposures.
- We then identify ways to hedge out residual risks that are significant *and* can be hedged through reasonably liquid instruments.

Hedging Duration and Curve Exposure

Longer resets need a bigger share of 5-year swaps in their hedge portfolio.

Duration and curve risk are exposures that originators *should* hedge out. While everyone would agree that these are substantial risks that need to be managed, there is uncertainty around the hedge-ratios. We would use model generated durations and key-rates to arrive at the appropriate hedge amounts for hybrids. Figure 1 shows the mix of swap instruments required for hedging out the curve exposure in par coupon hybrid ARMs, based on our model. For illustration, par-coupon 5/1 hybrids need a combination of \$45mn 2-year swaps and \$63mn of 5-year swaps to hedge duration and curve exposure. As seen, the share of 5-year swap instruments in the hedge portfolio increases with the length of the fixed leg.

¹ The home-owner has the option to not take up a mortgage offer, usually over a 45 day window from application date.

A1. Mix of Hedge Instruments Required for Duration/Curve Exposure in Hybrids

	Duration	Key Rates		Notional of Swaps		
		2-Yr	5-Yr	2-Yr	5-Yr	
3/1	3.5	2.71	1.13	1.68	58	38
5/1	4.0	3.50	0.88	2.76	45	63
7/1	4.5	3.75	0.85	2.90	44	66

As of 10/7

We chart the historical volatility in different risk factors.

Sensitivity to overall mortgage spreads is greater in longer resets.

There is significant residual exposure in a hybrid after duration and curve exposure are hedged out.

Historical Volatility in Different Risk Factors

We estimate the potential change in different factors - rates, implied volatility and spreads – over a given horizon, based on historical movements (Figure 2). For the purpose of illustration, a one-sigma move in rates over a 2-month horizon is 45bp. We also show the historical volatility in hybrid and 30-year fixed rate spreads. What is the relevance of fixed-rate spreads? Hybrid spread changes are correlated with overall mortgage spread movements and this component of spread exposure can be hedged out using fixed rate mortgages. Further, we would expect this sensitivity to secular mortgage spreads to increase with length of the fixed-leg². For example, with every 10bp widening in 30-year fixed rate spreads, 3/1 spreads change by 3.5 while 7/1s widen by 7bp (Figure A3). Based on these sensitivities, we can split hybrid spread volatility into two components – the first driven by mortgage spread changes and the rest, idiosyncratic to hybrids.

Residual Risk Exposures

Through the rest of the discussion, we will use risk exposure to mean losses from a 2-sigma move in a risk factor over a 2month horizon. Figure 5 compares the exposure from volatility factors with that from spreads. We compute these exposures using historical volatility in different risk factors and model sensitivities. We also compute the total exposure of a hybrid to the various risk factors assuming that changes in rates,

² We estimated this sensitivity of hybrid spreads to fixed-rate mortgage spreads through two different sources - par coupon balloon rates and Fannie commitment rates for hybrids - that gave similar results.

A2. Historical Volatility in Various Factors

	Factor	1-Month	2-Months	3-Months
Convexity Losses	Rate Move (bp)	32.0	45.0	57.0
Vega	Implied Vol (bp)	6.5	8.8	10.0
Hybrid Spreads	Hybrid OAS (bp)	6.5	8.0	9.0
Mortgage Spreads	CC OAS (bp)	7.0	8.0	8.5

* Standard deviation in rate movements and implied volatility measured from 1/94 to 9/03. Mortgage and hybrid spread volatility estimated during the time-period 1/98 to 9/03

A3. Sensitivity to overall Secular Mortgage Spread Changes

	Mortgage Spread Sensitivity (a) (bp/bp)	Mortgage Spread Volatility(b) (bp)	Idiosyncratic Spread Volatility (c) (bp)
3/1	0.35	2.8	5.2
5/1	0.55	4.4	3.6
7/1	0.70	5.6	2.4
15-years	0.90	7.2	0.8

^a Mortgage Spread sensitivity expressed as the change in hybrid OAS per 1bp change in 30-year fixed rate OAS (estimated from balloon rates and Fannie commitment rates for hybrids)

^{b, c} We decompose hybrid spread volatility into two components – the first is related to secular mortgage spread movements and the residual is idiosyncratic to hybrids. For 3/1s, we extrapolate the decline in mortgage spread sensitivity based on duration.

volatility and spreads are uncorrelated. The total exposure is less than sum of the individual risk exposures as a result. The following points are noteworthy with regard to the residual risk exposures in a hybrid:

The exposure of hybrids to mortgage spreads and volatility factors increases with the reset maturity.

- The residual risks in a hybrid after hedging out duration and curve exposure are not insignificant. The total risk from volatility and spreads, assuming these different factors are uncorrelated, could be as high as ½ to ¾ points over a 2-month horizon.
- The exposure to volatility factors as well as mortgage spreads increases with the length of fixed-leg. The exposure to mortgage spread movements, for example, increase from 5/32nd in 3/1s to 13/32nd in 7/1s.

Implications for Hedging

Originators cannot ignore the residual risks in a hybrid hedged with bullets.

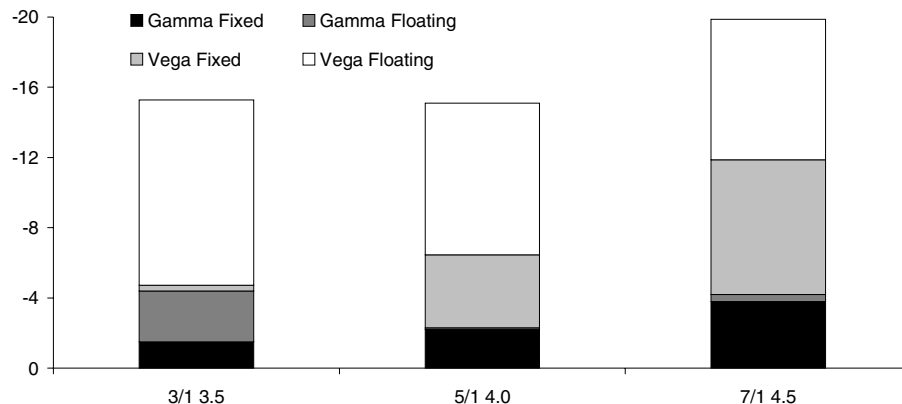
The important implication of the above analysis is that originators would be taking on significant risks when hedging pipelines using swaps alone, especially in longer reset hybrids. It is worthwhile trying to hedge the risks from volatility and mortgage spread factors in hybrids. In the following analysis, we show ways to hedge out residual risk exposure in hybrids with and without options.

Using Options

We show the amount of option and mortgage spread hedges required to accurately hedge these risks.

Originators could use a combination of options and fixed-rate mortgage hedges to hedge out the residual risk exposure in hybrid ARMs. Figure 6 shows the amount of swaptions and mortgages that hedge out exposure to the volatility factors and mortgage spreads

A4. 'Risk Exposure' to Volatility factors on Hybrids, 32nd



Based on model sensitivity and a 2-sigma change in different factors over a 2-month horizon. The gamma losses are computed based on actual price changes and not

A5. Losses over a 2-month Horizon from Volatility and Mortgage Spread Factors, 32nd

	Price	Volatility Factors	Mortgage Spreads	Idiosyncratic	Total
3/1	100-31	11	5	7	14
5/1	100-08	13	9	6	17
7/1	100-08	16	13	5	21

respectively. We chose 2yr 5yr payer swaptions as a hedge for volatility and current coupon dwarfs for the mortgage spread exposure. For illustration, 5/1 hybrids require \$66mn of 15-year hedges to offset their mortgage spread exposure. After accounting for the Vega of the dwarf hedges, one requires \$51mn of ATM 2yr 5yr payers to hedge the residual volatility exposure.

In the absence of options, originators could use dwarfs as a hedge for both volatility and mortgage spread risks.

Without Options

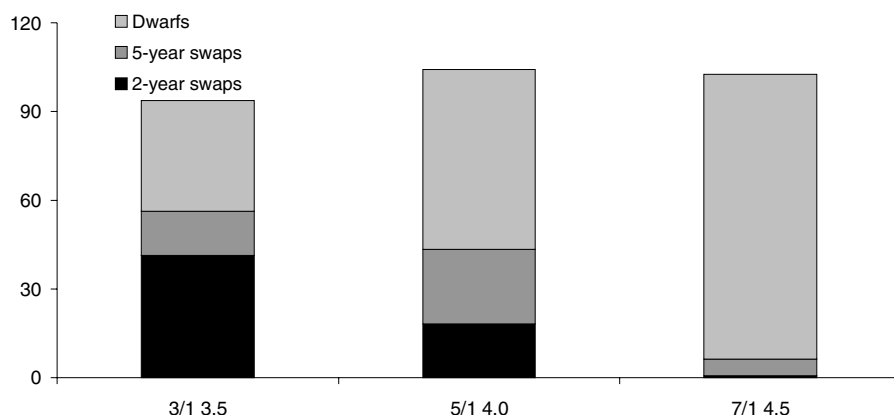
Originators who cannot use options could use just mortgages to minimize the overall exposure to volatility and mortgage spreads. Figure A7 shows the ‘optimal’ mix of hedge instruments that would minimize the residual risk exposure of hybrids. For illustration, a par coupon 3/1 requires \$40mn of 2-year bundles, \$17mn 5-year swaps and \$35mn 15-year current coupons to hedge curve exposure and minimize risks from volatility and mortgage spreads. One intuitive trend that falls out of this analysis is that longer-reset hybrids require a greater share of dwarfs. In 7/1s, for instance, the optimal mix consists of nearly all 15-year current coupons. This is because the volatility and mortgage spread exposure of longer reset hybrids is a lot higher.

A6. Face Amount of Swaptions and 15-year Current Coupons Required for Hedging out Residual Exposures in Hybrids, \$mn per \$100mn of hybrid

	Hedging only one of the two exposures (a)		Hedging Volatility and Spread Exposure Together	
	Dwarf 5.0s	2yr 5yr Payers	Dwarf 5.0s	2yr 5yr Payers
3/1 3.5	30	88	30	56
5/1 4.0	62	117	62	51
7/1 4.5	91	133	91	42

^a If you were to hedge only one of the two exposures, these would be the hedge ratios
^b We lower the face amount of options to reflect the vega exposure from the 15-years.

A7. Mix of Hedge Instruments (by face amount) which minimizes exposure to Gamma, Vega and Mortgage Spreads



Amounts in \$mn per \$100mn of hybrid ARM

A8. Residual Risk in a Hybrid with Option and Mortgage Based Hedges, 32nd

	Only Duration & Curve Hedges	Options + Dwarfs	Dwarfs Alone
3/1 3.5	14	7	10
5/1 4.0	17	6	8
7/1 4.5	21	5	8

Based on 2 standard deviation moves in risk factors over a 2-month horizon

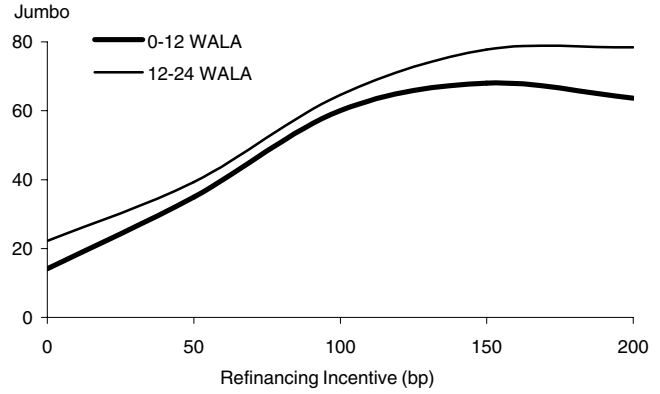
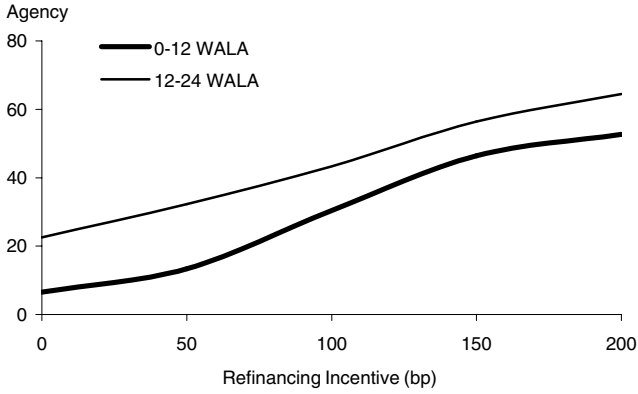
The incremental risk from not using options is limited.

Impact on Residual Risk

Figure A8 shows the residual risk exposure in hybrids with different levels of hedges. Once we layer in option and mortgage hedges the residual risk exposure drops substantially, especially in longer resets. For example, the risk exposure on a 7/1 drops from 21/32nd to 5/32nd with the use of options and mortgages. When using mortgages alone as a hedge for both volatility and spread factors, the risk exposure is not significantly different from using a combination of mortgages and options. For example, in the case of a 7/1, the overall exposure increases from 5/32nd to 8/32nd.

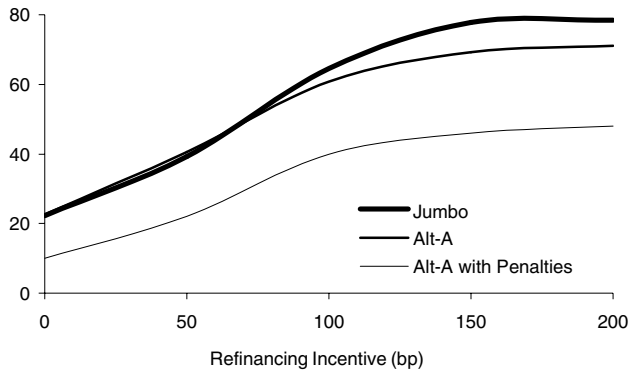
APPENDIX B. HYBRID PREPAYMENTS

B1. The Refinancing Ramp Seasoning in Hybrid ARMs, % CPR



Compare 0-12 WALA pools with 12-24 WALA pools

B2. Alt-A Pools, especially those with Penalties, have been Significantly Slower, % CPR



12-24 WALA pools. 1/2002 to 6/2003

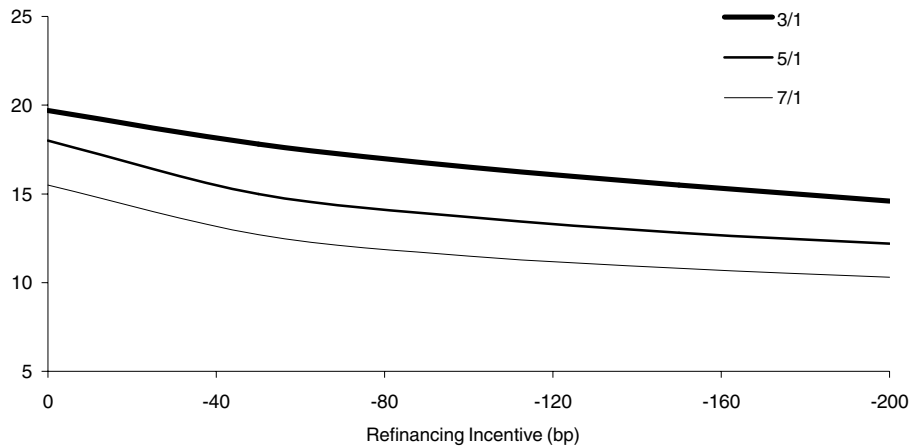
B3. The Impact of Penalties on Hybrid Prepayments: Model versus Historical

Penalty vs. Non-penalty

Rate Shift (bp)	Historical Diff (CPR)	Model Diff (CPR)
0	13	7
50	19	12
100	21	16
150	23	20
200	23	22

12-24 WALA pools

B4. Model Projected Turnover on Agency Hybrids, % CPR



APPENDIX C. ACCESSING THE HYBRID ARM MODEL ON LEHMANLIVE

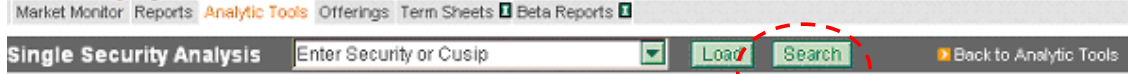
Loading an Agency Hybrid

One can load both agency hybrid pools and generics in the Calculator.

- **Generics:** One can load an agency generic by typing in 'HFN <program> <coupon>'. For example, HFN 5/1 4.5 should pull up a FN 5/1 pool with 4.5% coupon. Alternatively use the 'search' button to pull up an agency generic.
- **Pools:** To pull up an agency pool, type in <Agency> <Pool Number>. For example, FN 685500.

D1. Bringing Up Agency Hybrids in the Calculator

JS Mortgages



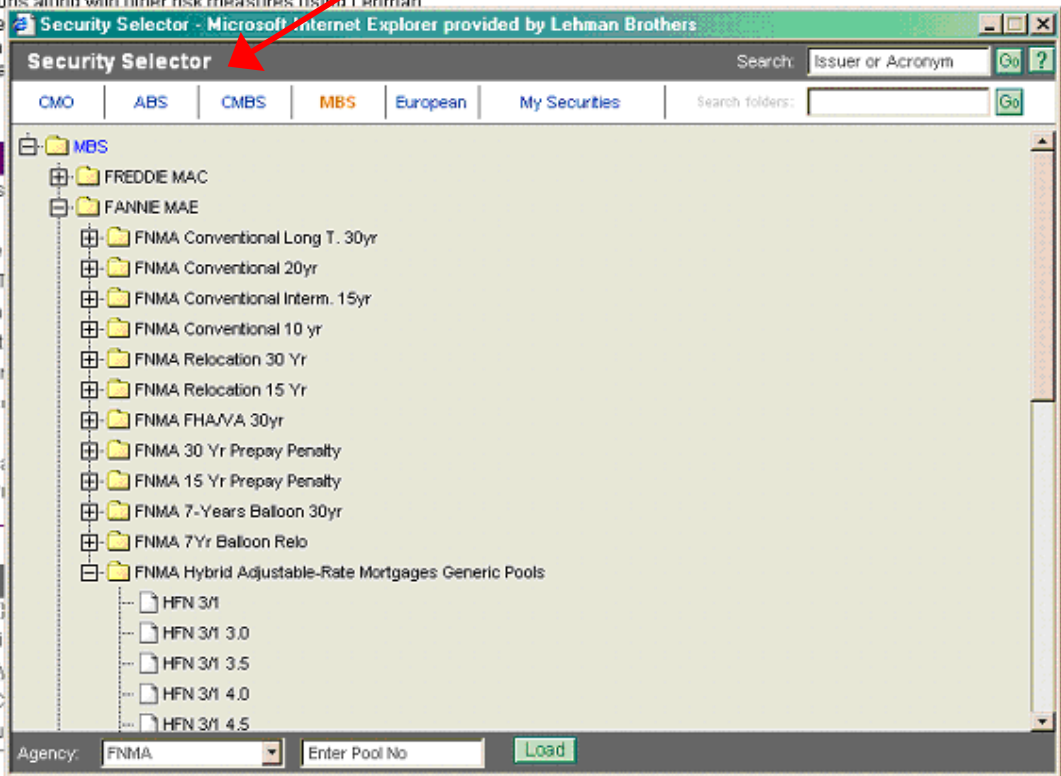
The Single Security Analysis allows you to analyze Mortgage, ABS and CMBS securities. The website collects all pertinent and material information needed to evaluate and calculate the risk measures of the security. The interactive calculators give you real-time option-adjusted spreads and durations along with other risk measures using Lehman Brother's industry-leading Prepayment calculator also returns yield tables and a prepayment analysis. In addition, state security's eligibility.

- New FNMA & FHLMC pool disclosures
- Support for 3 Yr Treasury
- Ability to define and save non-age
- Support for forward-settle Hybrid T
- New agency prepayment model a
- Support for CPY/CPP prepayment
- Ability to use real-time rates to pri
- Lehman Live keyword search acc
- New Hybrid Prepayment Model
- Non-Agency Prepayment Model h
- Users can now specify multiple P
- (eg 99-12 / 99-10 / 99-14+)

How To Specify a Security

Structured Products : {Issuer}
 Generic MBS : {Generi
 Pool : {Pool Ty
 Cusip : {Valid C
 Please click the above "Search" bu

Version No : 4.5.550



Modifying the characteristics of a Generic

- Click the Modify button at the top right

D2. Input Screen for Agency Hybrids

US Mortgages

Market Monitor | Reports | **Analytic Tools** | Offerings | Term Sheets | **Beta Reports**

Single Security Analysis [Back to Analytic Tools](#)

Security Name: **HFN 5/1 4.5 (4.5% 5 to 1 Yr CMT Generic Hybrid)** Cusip: **31389XX7**

Detail | **Calculator**

[Price/Yield/OAS](#) | [Yield Table](#) | [Cash Flow](#) | [Market Rates](#) | [Vector Manager](#) | [Preferences](#)

Price/Yield/OAS		Base Security FN 638902 Modify	
Security Information			
Index	CMT 1 Yr	Original Balance(\$)	15,031,533
Index Rate(%)	1.259	Current Balance(\$)	8,445,147
Discount Rate(%)	-	Factor	0.56182873
Current Coupon(%)	4.500	Factor Date	10/31/2003
Original Coupon(%)	4.500	WAM(mos)	360
WAC	5.000	WALA(mos)	0
Net Margin(bps)	225.0	First Reset Date	11/01/2008
Gross Margin(bps)	275.0	Next Rate Reset	11/01/2008
SATO	0.301	Rate Reset Frequency(mos)	12
First Reset Cap	200.0	Next Payment Reset	12/01/2008
Periodic Cap(bps)	200.0	Payment Reset Frequency(mos)	12
Payment Cap(%)	-	Original Term(mos)	360
Life Cap(%)	9.500	Issue Date	11/01/2003
Life Floor(%)	0.000	Maturity Date	11/01/2033
Rate Lookback (days)	45	Convertible	No
Payment Lookback (days)	0	Convertible Start	-
Delay (days)	24	Convertible End	-
Rounding	None	Rate Change Threshold(%)	-
		Recast Period(mos)	-
		Next Recast Date	-
Price/Yield/OAS Inputs			
Rate Environment	<input type="text" value="NY 3PM Close"/>	Settlement Date	<input type="text" value="11/24/2003"/>
Pricing Type	<input type="text" value="Price"/>	Pricing Value	<input type="text"/>
Prepayment Type	<input type="text" value="Model"/>	Model(%)	<input type="text" value="100"/>
Prepay Penalty Loans(%)	<input type="text"/>	Prepay Penalty Term(mos)	<input type="text"/>
Analysis	<input type="text" value="OAD"/>		
Preferences	<input type="text"/>		<input type="button" value="Go"/>

Modifying the characteristics of A generic (continued)

- Now you can change the coupon, WAC, cap structure and reset dates.
- You can then 'save' the hybrid as a user-defined security if you wish to re-use the security.

D3. Modifying the Input for Hybrid ARMs

US Mortgages

Market Monitor | Reports | **Analytic Tools** | Offerings | Term Sheets | Beta Reports

Single Security Analysis | HFN 5/1 4.5 | [Back to Analytic Tools](#)

Security Name: **HFN 5/1 4.5 (4.5% 5 to 1 Yr CMT Generic Hybrid - MODIFIED)** | Cusip: **31389XX7**

Detail | **Calculator**

[Price/Yield/OAS](#) | [Yield Table](#) | [Cash Flow](#) | [Market Rates](#) | [Vector Manager](#) | [Preferences](#)

Price/Yield/OAS

Security Information | Base Security FN 638902 |

Index	CMT 1 Yr	Original Balance(\$)	15,031,533
Index Rate(%)	1.259	Current Balance(\$)	8,445,147
Discount Rate(%)		Factor	0.56182873
		Factor Date	10/31/2003
Current Coupon(%)	4.500	WAM(mos)	360
Original Coupon(%)	4.500	WALA(mos)	0
WAC	5.000		
Net Margin(bps)	225.0	First Reset Date	11/01/2008
Gross Margin(bps)	275.0	Next Rate Reset	11/01/2008
Collateral Type		Rate Reset Frequency(mos)	12
SATO	0.301	Next Payment Reset	12/01/2008
		Payment Reset Frequency(mos)	12
First Reset Cap(bps)	200.0		
Periodic Cap(bps)	200.0	Original Term(mos)	360
Payment Cap(%)		Issue Date	11/01/2003
Life Cap(%)	9.500	Maturity Date	11/01/2033
Life Floor(%)	0.000	Convertible	No
		Convertible Start	
Rate Lookback (days)	45	Convertible End	
Payment Lookback (days)	0	Pool Reset Stratification	
Delay (days)	24	Reset Date	% of Total
Rate Change Threshold(%)			Coupon(%)
Recast Period(mos)			
Next Recast Date			
Rounding	None		

Price/Yield/OAS Inputs

Rate Environment	NY 3PM Close	Settlement Date	11/24/2003
Pricing Type	Price	Pricing Value	
Prepayment Type	Model	Model(%)	100
Prepay Penalty Loans(%)		Prepay Penalty Term(mos)	
Analysis	OAD		

Loading a Non-Agency Hybrid CMO

- Use the Search Function to load a Non-agency Security
- The drop down box at the top left allows the users to choose either the 'Jumbo' or the 'Alt-A' model
- If the pool has penalties, enter the 'Prepay Penalty Loans (%)' and 'Prepayment penalty Term (mos)'.

D4. Loading Non-Agency CMOs in the Hybrid Calculator

US Mortgages

Market Monitor | Reports | Analytic Tools | Offerings | Term Sheets | Beta Reports

Single Security Analysis SAS03-31A 1A [Back to Analytic Tools](#)

Security Name: SAS03-31A 1A (Floater) Cusip: 86359A2X0

Deal Summary | **Calculator**

Price/Yield/OAS | Yield Table | Cash Flow | FFIEC | Scenario Analysis | Market Rates | Vector Manager | Preferences

Price/Yield/OAS

Collateral Information (Group 1) View				Bond Summary			
Jumbo	4.75 %	Historical PSAs	CPRs	Class: 1A (Floater)	Cusip: 86359A2X0		
ARM		1 Month	8.4	Coupon(%)	4.751		
WAC(%)	5.008	3 Month		Orig. Bal(\$)	65,524,000	Delay(days)	24
WAM(mos)	358	6 Month		Factor	0.99174022	Next Payment	12/25/2003
WALA(mos)	2	Life		Factor Date	10/01/2003	Cap(%)	999.000
				Margin(%)	0.000	Floor(%)	0.000
				Formula	(#NETRATE1)		

Price/Yield/OAS Inputs

Rate Environment	NY 3PM Close	Settlement Date	11/21/2003
Pricing Type	Price	Pricing Value	<input type="text"/>
Prepayment Type	Model	Model(%)	100.0
Prepay Penalty Loans(%)	<input type="text"/>	Prepay Penalty Term(mos)	<input type="text"/>
Default Type	None	Default Rate(%)	<input type="text"/>
Recovery Type	%Default	Recovery Rate(%)	<input type="text"/>
Recovery Lag(mos)	<input type="text"/>	Delinquency Rate(%)	<input type="text"/>
Analysis	OAS		

Warning: This deal may contain approx. collateral or simplifying assumptions!

Annotations:

- Input CMO name or cusip here
- Specify collateral type here; choose between jumbo and jumbo alt-A.
- Specify Prepay Penalty % & Term (in mo)

Changing Prepayment Assumptions

- On the 'Preferences' tab, one can alter the prepayment assumptions on hybrids.
- One can choose to run the hybrid as a balloon by setting 'Balloon ARM at Next Reset Date' ON.

D5. Changing Prepayment Assumptions in the Hybrid Model

US Mortgages

Market Monitor | Reports | **Analytic Tools** | Offerings | Term Sheets | Beta Reports

Single Security Analysis SAS03-31A 1A

Security Name: **SAS03-31A 1A (Floater)** Cusip: **86359A2X0**

Deal Summary | **Calculator** | Price/Yield/OAS | Yield Table | Cash Flow | FFIEC | Scenario Analysis | Market Rates | Vector Manager | **Preferences**

Click here to knob the model

Prepayment/Default Model			OAS		
Compression Type	<input checked="" type="radio"/> Standard	<input type="radio"/> Single Line	Number of Paths	200	
Prepay Model Projections	<input checked="" type="radio"/> On	<input type="radio"/> Off	% of Cal Volatility	100	
Prepayment Model Knobs			Break Even Pricing	Off	
Knob Name	Standard Value	Override Value	ABS/CMBS		
(HYB) Turnover Multiplier	1.0	<input type="text"/>	Hot Past M.E.(mos)	0	
(HYB) Lock In Multiplier	1.0	<input type="text"/>	Past Mat Ext(mos)	0	
(HYB) Aging Shift	0.0	<input type="text"/>	Prepay Lockout	Off	
(HYB) Refinance Shift	0.0	<input type="text"/>	Yield Maintenance	Off	
(HYB) Refinance Multiplier	1.0	<input type="text"/>	Yield Maint Add On	0	
(HYB) PSA Shift	0.0	<input type="text"/>	Delay CPR/CDR	Off	
(HYB) Burnout Multiplier	1.0	<input type="text"/>	Misc		
(HYB) Refinance Shift (Flt)	0.0	<input type="text"/>	Floater Index Override	None	
(HYB) Refinance Multiplier (Flt)	1.0	<input type="text"/>	Use PoolTalk Scenario	No	
(HYB) Sato Multiplier	1.0	<input type="text"/>	Use Static Cashflow for ZV	No	
			Show Preferences	No	
			Calls		
			CleanUp Call/Opt Red	Off	
			Balloon ARM At Next Reset Date	Off	
			External Triggers		
			Name	Value	Description
			DELINQUEHC	<input type="text"/>	
			CUMLOSS1	<input type="text"/>	
			SHIFTTRIGG	<input type="text"/>	A Shifting I

Turn this knob 'on' to run bond to roll date

Output From The Model

D6. Changing Prepayment Assumptions in the Hybrid Model

Price/Yield/OAS		HFN 5/1 4.5								
Security Information		Base Security : FN 638902								
Index	CMT 1 Yr	Original Balance(\$)	15,031,533							
Index Rate(%)	1.259	Current Balance(\$)	8,445,147							
Discount Rate(%)	-	Factor	0.56182873							
		Factor Date	10/31/2003							
Current Coupon(%)	4.500	WAM(mos)	360							
Original Coupon(%)	4.500	WALA(mos)	0							
WAC	5.000									
Net Margin(bps)	225.0	First Reset Date	11/01/2008							
Gross Margin(bps)	275.0	Next Rate Reset	11/01/2008							
SATO	0.301	Rate Reset Frequency(mos)	12							
		Next Payment Reset	12/01/2008							
First Reset Cap	200.0	Payment Reset Freq(mos)	12							
Periodic Cap(bps)	200.0									
Payment Cap(%)	-	Original Term(mos)	360							
Life Cap(%)	9.500	Issue Date	11/01/2003							
Life Floor(%)	0.000	Maturity Date	11/01/2033							
		Convertible	No							
Rate Lookback(days)	45	Convertible Start	-							
Payment Lookback(days)	0	Convertible End	-							
Delay(days)	24	Rate Change Threshold(%)	-							
Rounding	None	Recast Period(mos)	-							
		Next Recast Date	-							
Input Assumptions										
Rate Environment	NY 3PM Close	Settlement Date	11/24/2003							
Pricing Type	Price	Pricing Value	101-21+							
Prepayment Type	Model	Model(%)	100.000							
Prepay Penalty Loans(%)		Prepay Penalty Term(mos)								
Analysis	OAD									
Analysis Results										
	Price	Accrued	Yield	Avg Life	Dur	NEM	DM			
	101-21+	0.288	3.591	2.706	0.98	233.3	230.6			
	OAS	Eff Dur	Eff Conv	Sprd Dur	Opt Cost	ZV Sprd	ZV A/L			
Treasury	66	2.60	-1.5	3.34	56	121.7	4.271			
Libor	29	2.71	-1.5	3.34	56	85.1	4.271			
Lehman Brothers Prepayment Model Projections										
	-200	-150	-100	-50	0 bps	+50	+100	+150	+200	
1 Year	62.5	58.6	49.5	37.6	25.5	11.5	8.0	7.0	6.5	
5 Year	61.0	58.3	51.7	42.7	32.1	17.4	13.8	12.3	11.6	
Avg. Life	59.7	56.9	50.3	40.9	30.0	17.7	15.3	14.4	14.0	
Market Rates (Close of 11/17/2003)										
	3 Month	6 Month	1 Year	2 Year	3 Year	5 Year	10 Year	30 Year	Mortgage Rate	5.628
Treasury	0.953	1.032	1.259	1.776	2.310	3.143	4.184	5.037	5 Yr Hybrid Rate	4.435
Libor	1.170	1.220	1.451	2.109	2.702	3.536	4.577	5.342		

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