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## MSR VALUATION AND HEDGING STRATEGIES VIA MSR KINETICS

By Richard Cooperstein and Vivian Li

### Summary

Andrew Davidson & Co., Inc. (AD&Co) was a bronze sponsor of IMN’s 9<sup>th</sup> Annual Residential Mortgage Servicing Rights Forum held on November 9 – 10 at the New York Marriott at the Brooklyn Bridge. Richard Cooperstein, Director of Alliances & Policies at AD&Co, spoke on a panel titled “Valuation, Modeling & Risk Inputs: Volatility, Liquidity, Credit, Market, Duration & Correction.” The panel discussion continued the conference theme of managing interest rate risk in a higher rate environment. Using AD&Co’s Mortgage Servicing Rights Kinetics (MSRK) product, Richard presented the rate risk dynamics of various MSR note rates and a simple example of hedging rate risk and stabilizing returns across various future interest rate scenarios.

### Mortgage Servicing Rights Dynamics

A key theme of the MSR Forum was the implications of dealing with the highest mortgage rates in twenty years. MSRs are exposed to meaningful interest rate risk and components like escrow and float rise in value.

Using MSRK, Figure 1 decomposes servicing rights into their component revenues and expenses. It shows the impact on a 2018 FNMA 4.9% MSR from 10-year Treasury rates rising from 1% to 4.5%. The present value (PV) of the base fee rises 50% in value by 2023. Escrow and float rise from almost nothing to 34 bps. Other components of MSR depend heavily on prepayments. As rates rise and prepayments slow, delinquencies rise which drives up costs because delinquent loans are very expensive to service. Lastly, low prepayments lead to lower recapture rates.

Figure 1. MSR Decomposition in 2020 and 2023

MSR Decomposition ▾  Summary  Loan-Level [Export Results](#) [Choose Fields](#) Records 1 - 1 of 1 « ‹ 1 › »

Loan ID		Current Balance	Price	Base Fee	Escrow	Float	Ancillary Income	Cost	Recapture
2018 FN 4.9	2020	\$290,761.20	1.0588	0.7706	0.0105	0.0255	0.1566	-0.2453	0.3410
2018 FN 4.9	2023	\$275,093.12	1.5228	1.2147	0.1066	0.2375	0.2746	-0.4122	0.1017

## Comparative Valuation of MSR

We illustrate two points in this comparative analysis. First, showing how MSR values and prepayment risk metrics vary as coupon rates vary in a given market. Second, Figures 2 and 3 show that single scenario analyses using the current curve are not the same as the expected value. Risk and performance vary widely across scenarios, and the results are not symmetric. A Monte Carlo simulation expected value is a more reliable measure of risk and return.

The first step is to quantify the dynamics of MSR values in today's higher rate environment for recent note rates, ranging from 4% to 7.9%, the recent market peak. Discount MSR values don't vary much, but par and premium note rate prices drop. However, embedded interest rate risk is vastly different when measured by standard metrics and by the impact of simple rate shocks. Figures 2 and 3 show that the rate risk metrics dramatically increase when note rates rise.

Figure 2 uses constant 550 OAS and Figure 3 uses constant 13% Current Curve Yield, which are roughly consistent on an aggregate basis. However, the results show that single scenario analysis can lead to overpaying for MSRs with the most optionality (at the money) and underpaying for discounts and premiums.

**Figure 2. Valuing MSR Note Rates in Today's Market Using Constant OAS**

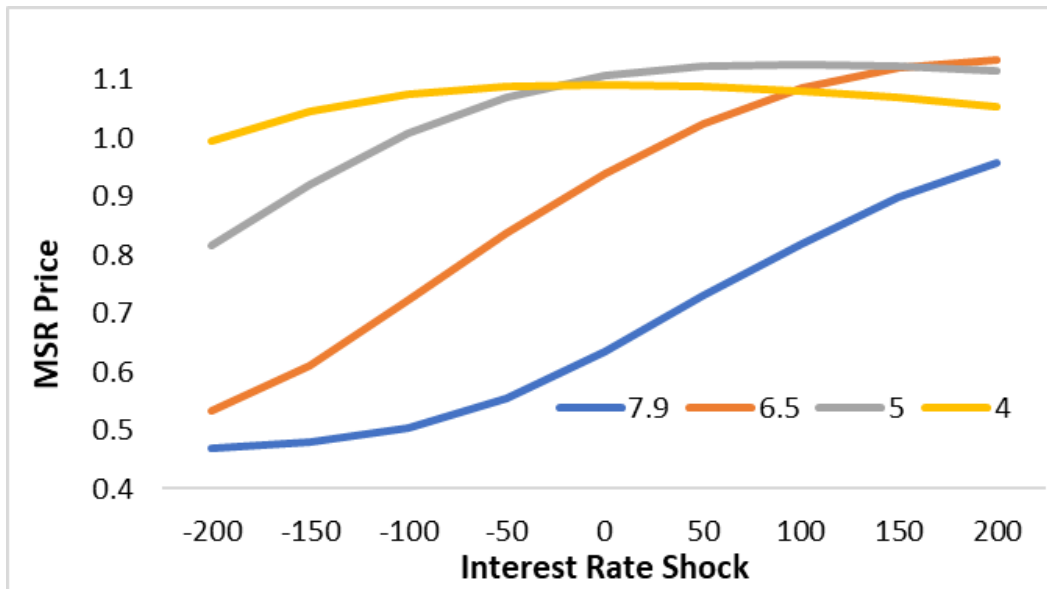
Loan ID	Current Balance	Price	Multiple	OAS	OAS Duration	Yield (CC)	Expected Yield	WAL (CC)	Expected WAL	Option Cost	Effective Duration	Effective Convexity	Prepay Sensitivity
GSE 7.9 80 750	\$299,584	0.63	2.54	547	3.21	7.34	10.00	3.33	3.58	-619	-28.32	8.71	-5.01
GSE 6.5 80 750	\$298,629	0.94	3.76	549	3.76	17.15	10.00	8.71	7.35	528	-20.12	-5.68	-3.90
GSE 5.0 80 750	\$294,815	1.11	4.42	549	4.30	12.47	10.00	9.09	9.04	191	-4.22	-7.6	-3.41
GSE 4.0 80 750	\$291,076	1.09	4.36	548	4.42	11.40	10.00	8.74	8.71	81	-0.10	-2.78	-3.29
<b>Total</b>	<b>\$1,184,104</b>	<b>0.94</b>	<b>3.76</b>	<b>548</b>	<b>4.01</b>	<b>12.96</b>	<b>10.00</b>	<b>7.45</b>	<b>7.15</b>	<b>168</b>	<b>-11.18</b>	<b>-2.95</b>	<b>-3.77</b>

**Figure 3. Valuing MSR Note Rates in Today's Market Using Constant Current Curve Yield**

Loan ID	Current Balance	Price	Multiple	OAS	OAS Duration	Yield (CC)	Expected Yield	WAL (CC)	Expected WAL	Option Cost	Effective Duration	Effective Convexity	Prepay Sensitivity
GSE 7.9 80 750	\$299,584	0.54	2.17	1,079	2.61	13.14	15.29	3.33	3.58	-641	-26.7	7.5	-4.4
GSE 6.5 80 750	\$298,629	1.09	4.36	186	4.40	13.14	6.36	8.71	7.35	501	-21.4	-5.2	-4.5
GSE 5.0 80 750	\$294,815	1.08	4.30	614	4.18	13.14	10.64	9.09	9.04	191	-4.1	-7.5	-3.3
GSE 4.0 80 750	\$291,076	1.01	4.06	718	4.13	13.14	11.68	8.74	8.71	81	-0.2	-2.7	-3.1
<b>Total</b>	<b>\$1,184,104</b>	<b>0.93</b>	<b>3.72</b>	<b>548</b>	<b>4.00</b>	<b>13.14</b>	<b>10.00</b>	<b>7.45</b>	<b>7.15</b>	<b>183</b>	<b>-11.5</b>	<b>-3.3</b>	<b>-3.8</b>

Another way to visualize prepayment risk is to analyze the impact of various rate scenarios on MSR asset values. Figure 4 shows that the value of deep discount MSRs is stable in the face of future rate changes, and so does not actually require rate risk hedging. Market rate servicing assets have the greatest optionality (variability in price); this is a classic example of the need to hedge rate risk.

**Figure 4. Impact of Interest Rate Shocks on Different MSR Note Rate Prices**



### MSR Hedging

Now that we’ve identified which servicing right needs to be hedged, we use a simple TBA Swap within MSRK to reduce interest rate risk. More complete hedges could include options and swaptions, but a TBA Swap is the simplest to illustrate the important dynamics. Par GSE mortgage rates have recently fallen below 7%, demonstrating the potential for mortgage rates to decline. Figure 5 shows the hedge position of the TBA Swap. We use three guiding principles to construct the hedge.

- Cash neutral TBA purchase and sale
- Sell the TBA that the MSR is long, buy the lower coupon TBA
- Size the swap so that MSR values are roughly equal for the up and down 200 bps rate shocks; this is subjective to the portfolio manager

**Figure 5. TBA Swap Position**

Hedge Positions						
Loan ID	Rate Fixed	Quote Type	Quote	Orig Rate	Position Balan...	
TBA 5.5	<input checked="" type="checkbox"/>	0	99.12	6.461	124645	
-TBA 6	<input checked="" type="checkbox"/>	0	100.71	6.912	-122677	

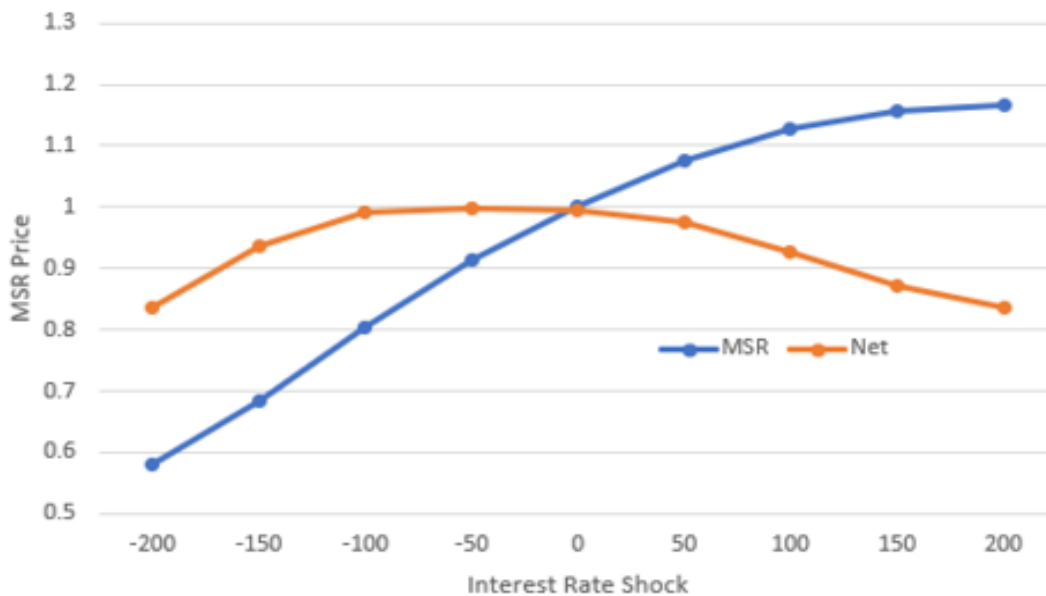
Figure 6 shows how the TBA Swap lowers interest rate risk, as reflected in several common metrics. The TBA Swap is calibrated to cash neutral and sized to balance the value of the MSR for the extreme rate shocks. We interpret that, out of 549 bps OAS, 465 bps OAS reduction is projected to be earned by the servicer merely for bearing prepayment-model risk. The remaining 84 bps OAS are decomposed into TBA prOAS of 23<sup>1</sup> and illiquidity of 61 bps OAS. The results are generally consistent with TBA and IO/PO valuation.

**Figure 6. MSR Interest Rate Risk Metrics Net of the TBA Swap Hedge**

Loan ID	Position Type	Current Balance	Price	Multiple	OAS	Yield (FC)	Effective Duration	Turnover Sensitivity	Ref Sensitivity
GSE 6.5 80 750	MSR	\$298,070.44	1.0022	4.01	549	15.66	-16.15	-2.84	-1.08
<b>MSR Total</b>	<b>MSR</b>	<b>\$298,070.44</b>	<b>1.0022</b>	<b>4.01</b>	<b>549</b>	<b>15.66</b>	<b>-16.15</b>	<b>-2.84</b>	<b>-1.08</b>
TBA 5.5	Hedge	\$124,645.17	99.1200		49	5.65	3.72	0.11	-0.10
-TBA 6	Hedge	-\$122,677.28	100.7100		56	5.85	3.31	0.05	-0.13
<b>Grand Total</b>	<b>Total</b>	<b>\$300,038.33</b>	<b>0.9956</b>		<b>84</b>	<b>14.77</b>	<b>0.86</b>	<b>-0.40</b>	<b>-0.01</b>

Another way to illustrate risk reduction of the swap is to measure MSR price stability to interest rate shocks. Figure 7 shows how the swap flattens the return profile. The size of the swap position is calibrated so that MSR price variation between the -200 IR shock to the 200 IR shock is reduced from 59 bps (price of 1.17 vs 0.58) to zero (price of 0.84 vs 0.84) using a TBA Swap that is MSR price neutral in the base case.

**Figure 7. GSE 6.7% MSR: Interest Rate Shocks with TBA Swap**



<sup>1</sup> “Market Analysis Reports,” Andrew Davidson & Co., Inc., last modified December 8, 2023, <https://www.ad-co.com/market-analysis-report/2023-12-08/hull-white>.

## Conclusion

For the first time in 20 years, mortgage assets have two-way interest rate risk, and new MSRs are especially exposed to interest rate declines. In this article, we illustrate the comparative dynamics of interest rate risk on servicing rights with different coupons, and identify which rights need to be hedged to protect their value. We then use a TBA Swap to demonstrate how a simple hedge can effectively reduce servicer exposure to the risk of rate movements. Finally, we show how pricing based on single scenario analysis can understate prepayment risk for note rates near market value. This can lead systemically overpaying for new issue MSRs.

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