

Analytics Insights

How long is the Fed?

Fed's MBS portfolio and implications for banks – one year later

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AUTHOR

Albert R. Durso

Senior RMBS and
CMBS Strategist
albert.durso2@lseg.com

CONTRIBUTOR

Subray Shetty

Research Manager
subray.shetty@lseg.com

Overview

Since January 2009, the Federal Reserve (Fed) has been buying mortgage-backed securities (MBS) to stabilize housing markets and homeowner lending rates. This has resulted in the Fed owning 30% of all outstanding Agency MBS and as much as 40% of dominant 30yr coupon 2% and 2.5%.

Their duration exposure and prepayment runoff, now paramount since new purchase and reinvestments have lapsed, offers a fascinating look at the inflows and outflows of fixed rate positions. In many ways this mirrors bank holdings which have been headline news the past year, with repercussions presently felt throughout the MBS market via FDIC auctions.

How each will paydown and or run off goes a long way to determining exposure to come and what the economic backdrop means to each entity. Also, what is the value of those holdings when set against the yield curve, static and dynamic, as resales are ongoing for banks while Fed sales are still not on the immediate horizon.

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Executive summary

The Fed's MBS holdings peaked at \$2.7 trillion through a combination of new purchases and paydown reinvestments. At last year's Federal Open Market Committee (FOMC) meeting in May, it was announced that balance sheet reduction would take place beginning in June 2022.

This portfolio reduction would be accomplished by letting the portfolio run off if, and as, the monthly reinvestment cap exceeded the paydowns (\$17.5 billion first 3 months, \$35 billion thereafter). With prepayments lurching at historically low levels, this was not an obstacle after the initial quarter.

In our study that follows, we look at the state of the Fed portfolio one year later (using a balance sheet and line-item cutoff of April 12, 2023), the prepayments that have run off monthly, and the remaining composition of the Agency MBS bonds with respect to their durations and average lives in the face of market gyrations.

Segmenting the portfolio by maturity and coupon, we were able to get a reading as to the exposure in slices as well as prepayment runoff by those same coupons and sections. From there, leveraging the largest pools (up to \$30 billion) we ran them against benchmark OAS levels and prices and were able to extract inherent value and duration profiles. Effectively we zoomed in and zoomed out for specific and macro looks at MBS holdings overall.

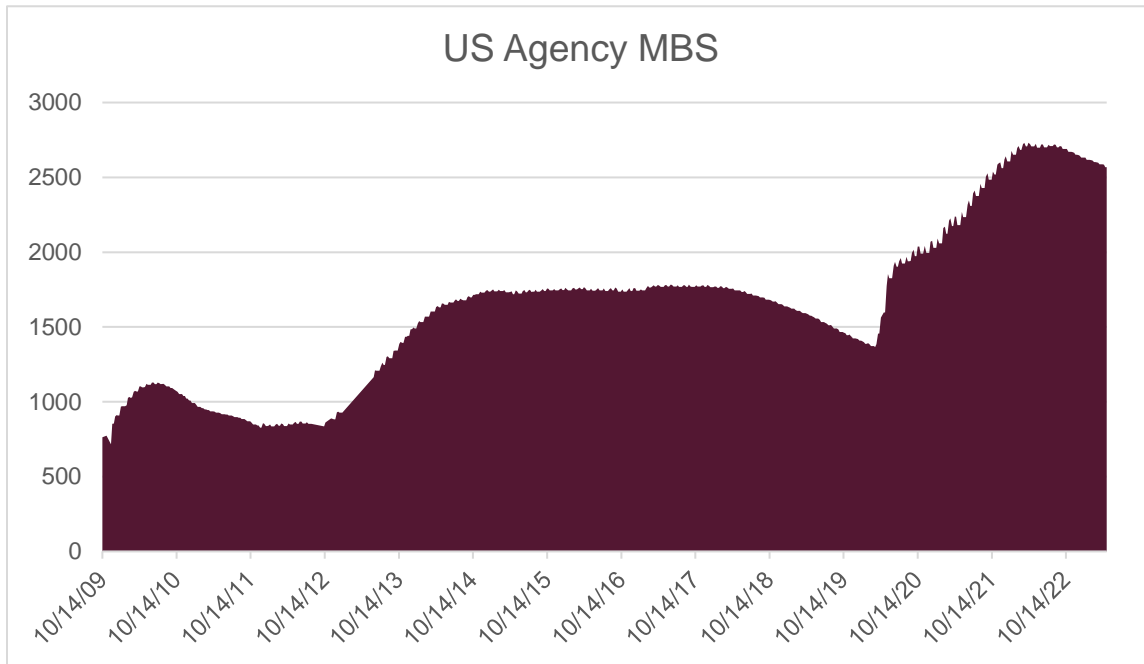
The output showed more of an intermediate profile on 30yr holdings while logically swaying to shorter durations on 10yr and 15yr paper.

Overall Fed Holdings

Looking back at the Fed's efforts to support interest rates and housing, purchases in MBS were focused on consuming that month's current production hedges, TBA, to help the market absorb new issuance without a tremendous stress on spreads and ultimately mortgage rates back to the consumer.

This is very much reflected in a timeline of events, where the aftereffects of the Great Financial Crisis (GFC) and more recently Covid-19 incited similar increases to the Fed balance sheets with an eye toward re-booting a malfunctioning free market. In all, the actions of the Fed were successful in knocking down interest rates 400 basis points over a three-year span from 2009-12.

2009-23



Maturity/coupon breakdown – agency MBS

The Federal Reserve owns nearly 29,000 line items on its Agency MBS inventory, 60% are 30yr pass through collateral and 35.5% in 15yrs, with the remainder of CUSIPS (count) in 10yr and 20yr maturities.

By dollar amount (current face value), the skew changes a bit, but again in favor of 30yr and 15yr bonds with 30yr paper approaching 90% while 15yrs make up the rest.

By maturity

| Row Labels | Sum of CURRENTFACEVALUE | Sum of Count | C/F % | Count% |
|--------------------|-----------------------------|------------------|------------|------------|
| 10 | 4,316,384,224.28 | 852.00 | 0.2 | 3 |
| 15 | 297,198,566,410.56 | 10,192.00 | 11.5 | 35.5 |
| 20 | 3,432,080,195.42 | 369.00 | 0.1 | 1.3 |
| 30 | 2,280,936,265,941.77 | 17,331.00 | 88.2 | 60.3 |
| Grand Total | 2,585,883,296,772.03 | 28,744.00 | 100 | 100 |

Of the 28,975 items, 14,478 have current faces (or remaining balances) of less than \$1 million (totaling \$3.73 billion), with 260 of those under \$1,000. The presence of 10yr and 20yr maturities (1,335-line items) are in keeping with how a bank assembles its held to maturity (HTM) portfolio, maintaining flexible maturities in light of fluctuating depositor needs.

By coupon

| Row Labels | Sum of CURRENTFACEVALUE |
|--------------------|-----------------------------|
| 1.5 | 164,645,584,749.75 |
| 2 | 1,001,784,065,173.14 |
| 2.5 | 716,348,477,056.63 |
| 3 | 306,349,607,209.32 |
| 3.5 | 201,451,804,049.17 |
| 4 | 124,865,629,053.23 |
| 4.5 | 52,590,055,002.05 |
| 5 | 15,567,798,386.59 |
| 5.5 | 1,947,686,256.76 |
| 6 | 286,417,579.98 |
| 6.5 | 38,889,501.27 |
| (blank) | 7,282,754.15 |
| Grand Total | 2,585,883,296,772.05 |

Monthly prepayments and position runoff

With little to no new purchases or prepayment reinvestments at play the past year, the MBS portfolio has gradually started to shrink.

The initial three-month period where the cap was at \$17.5 billion, saw purchases of \$27 billion and the month over month MBS Agency holdings jump from July to August by \$18 billion.

From that point on however, position reductions have been to the tune of \$17.685 billion per month from October 2022 to April 2023. Overall holdings have been reduced by upwards of \$132 billion (not including small operation May settlement purchases of \$26 million).

| Fed 2022-23 | Month | Position | Reduction | Paydown | Cap excess | Purche-Settle Month |
|-------------|------------------|----------------------|-----------------------------|--------------------|---------------------|---------------------|
| | June | 2,718,696,704,700.00 | | | | |
| | July | 2,700,572,594,100.00 | 18,124,110,600.00 | 10,514,807,065.19 | (6,985,192,934.81) | 1,686,000,000.00 |
| | August | 2,718,754,180,600.00 | (18,181,586,500.00) | 24,444,197,041.28 | 6,944,197,041.28 | 13,441,000,000.00 |
| | September | 2,709,847,164,800.00 | 8,907,015,800.00 | 24,841,745,939.13 | 7,341,745,939.13 | 13,601,000,000.00 |
| | October | 2,689,556,643,800.00 | 20,290,521,000.00 | 22,226,553,672.62 | (12,773,446,327.38) | 3,161,000,000.00 |
| | November | 2,668,338,128,700.00 | 21,218,515,100.00 | 18,742,944,393.78 | (16,257,055,606.22) | (122,630,000.00) |
| | December | 2,650,114,172,500.00 | 18,223,956,200.00 | 18,487,483,088.69 | (16,512,516,911.31) | - |
| | January | 2,632,908,241,700.00 | 17,205,930,800.00 | 15,820,185,661.81 | (19,179,814,338.19) | - |
| | February | 2,616,273,473,100.00 | 16,634,768,600.00 | 3,887,488,067.75 | (31,112,511,932.25) | 75,000,000.00 |
| | March | 2,601,598,207,100.00 | 14,675,266,000.00 | 14,122,355,427.17 | (20,877,644,572.83) | 75,000,000.00 |
| | April | 2,586,045,583,400.00 | 15,552,623,700.00 | 15,000,000,000.00 | (20,000,000,000.00) | 65,000,000.00 |
| | May | | | | | 26,000,000.00 |
| | Oct to April Avg | | 17,685,940,200.00 | | | |
| | Total | 132,651,121,300.00 | 132,651,121,300.00 | 168,087,760,357.42 | | 31,981,370,000.00 |
| | | | Net (Purch-paydowns) | 136,106,390,357.42 | | |

Current duration

30-year

From the Fed's catalog of holdings, we took the largest pools in the 30yr space.

The 30yr holdings comprise \$2.28 trillion of the overall \$2.586 trillion in MBS holdings (88.2%). We selected the 22 largest pools totaling \$466.657 billion of that \$2.28 trillion total (20% of the 30yr holdings).

Using Yield Book's model, current market levels for that corresponding TBA, and excel add-in calculator, we get the following results below:

Average Effective Duration of 7.22yrs, Weighted Average Life of 9.92yrs, 52 OAS and a 4.47% yield (current mark to market).

| Column1 | Identifier | Par Amt | Price | Column4 | Yield | OAS | EffectiveDuration | WAL | SpreadtoBenchmark | EffectiveConvexity | DV01 | Zspread |
|---------------------------|------------|--------------------|-------|---------|-------|-------|-------------------|-------|-------------------|--------------------|------|---------|
| UMBS MORTPASS 2% 01/51 | 3132DWA3 | 29,642,869,792.94 | 82-00 | | 4.50 | 56.57 | 7.24 | 9.76 | 76.72 | -0.26 | 0.06 | 73.05 |
| UMBS MORTPASS 2% 01/51 | 31418DV74 | 27,653,177,847.36 | 82-00 | | 4.48 | 55.39 | 7.27 | 9.82 | 75.44 | -0.26 | 0.06 | 71.89 |
| UMBS MORTPASS 2% 09/51 | 3132DWC7 | 27,505,367,495.32 | 82-00 | | 4.33 | 39.94 | 7.54 | 10.50 | 59.71 | -0.26 | 0.07 | 57.77 |
| UMBS MORTPASS 2% 05/51 | 3132DWP7 | 25,401,287,840.85 | 82-00 | | 4.41 | 48.20 | 7.42 | 10.15 | 67.70 | -0.23 | 0.06 | 64.96 |
| UMBS MORTPASS 2% 10/51 | 3132DWC4 | 25,082,585,850.34 | 82-00 | | 4.32 | 39.52 | 7.57 | 10.54 | 59.02 | -0.25 | 0.07 | 57.15 |
| UMBS MORTPASS 2% 12/50 | 3132DWA3 | 24,242,571,182.77 | 82-00 | | 4.48 | 54.75 | 7.25 | 9.83 | 75.17 | -0.27 | 0.06 | 71.66 |
| UMBS MORTPASS 2% 05/51 | 31418DVX4 | 23,746,815,165.24 | 82-00 | | 4.40 | 47.23 | 7.45 | 10.20 | 66.57 | -0.22 | 0.06 | 63.94 |
| UMBS MORTPASS 2% 02/51 | 31418DWR9 | 23,129,588,999.84 | 82-00 | | 4.45 | 52.17 | 7.33 | 9.97 | 71.84 | -0.24 | 0.06 | 68.65 |
| UMBS MORTPASS 2% 03/51 | 3132DWB8 | 21,818,748,892.49 | 82-00 | | 4.43 | 50.34 | 7.37 | 10.05 | 69.88 | -0.23 | 0.06 | 66.89 |
| UMBS MORTPASS 2% 08/51 | 3132DWB51 | 21,591,360,005.46 | 82-00 | | 4.35 | 42.09 | 7.49 | 10.39 | 62.08 | -0.25 | 0.06 | 59.92 |
| UMBS MORTPASS 2% 02/51 | 3132DWA52 | 21,548,811,298.28 | 82-00 | | 4.46 | 52.83 | 7.31 | 9.94 | 72.59 | -0.25 | 0.06 | 69.34 |
| UMBS MORTPASS 3% 07/47 | 3140J8GV9 | 19,536,987,521.85 | 88-16 | | 4.91 | 90.05 | 5.56 | 7.99 | 118.39 | -0.11 | 0.05 | 109.41 |
| UMBS MORTPASS 2% 11/50 | 3132DWA0 | 18,486,538,373.47 | 82-00 | | 4.50 | 56.72 | 7.19 | 9.74 | 77.45 | -0.27 | 0.06 | 73.71 |
| UMBS MORTPASS 2% 04/51 | 3132DWB5 | 18,178,913,780.82 | 82-00 | | 4.41 | 49.00 | 7.40 | 10.11 | 68.43 | -0.23 | 0.06 | 65.59 |
| UMBS MORTPASS 2% 06/51 | 31418DZV7 | 18,051,759,469.64 | 82-00 | | 4.36 | 42.97 | 7.46 | 10.36 | 62.82 | -0.25 | 0.06 | 60.53 |
| GNMA II MORTPASS 2% 03/51 | 36179WBX5 | 17,822,275,747.70 | 82-00 | | 4.70 | 77.63 | 7.04 | 9.04 | 96.66 | -0.05 | 0.06 | 91.83 |
| UMBS MORTPASS 2% 12/50 | 31418DVA7 | 17,802,886,769.27 | 82-00 | | 4.51 | 57.08 | 7.20 | 9.73 | 77.61 | -0.27 | 0.06 | 73.86 |
| UMBS MORTPASS 2% 10/50 | 3132DV7K5 | 17,450,688,199.64 | 82-00 | | 4.52 | 57.54 | 7.15 | 9.69 | 78.57 | -0.26 | 0.06 | 74.70 |
| UMBS MORTPASS 2% 11/51 | 31418D6B3 | 17,424,959,629.35 | 82-00 | | 4.29 | 36.49 | 7.61 | 10.69 | 56.00 | -0.26 | 0.07 | 54.43 |
| UMBS MORTPASS 2.5% 06/51 | 31418DZW5 | 17,132,753,848.20 | 85-12 | | 4.50 | 50.38 | 6.90 | 9.99 | 76.70 | -0.35 | 0.06 | 73.37 |
| UMBS MORTPASS 2.5% 09/51 | 3132DWCC5 | 16,727,907,009.72 | 85-12 | | 4.47 | 48.85 | 6.98 | 10.12 | 74.30 | -0.34 | 0.06 | 71.29 |
| UMBS MORTPASS 2% 10/50 | 31418DTQ5 | 16,678,525,703.70 | 82-00 | | 4.52 | 57.57 | 7.15 | 9.69 | 78.54 | -0.26 | 0.06 | 74.68 |
| | Sum | 466,657,380,424.25 | | Avg | 4.47 | 52.88 | 7.22 | 9.92 | 73.74 | -0.24 | 0.06 | 70.39 |

Current Duration (20yr/15yrs/10yrs)

Turning our attention to the shallower end of the pool, the duration of 20yrs/15yrs/10yrs represents the remaining 11.8% (\$306 billion) in U.S. MBS Agency holdings.

20-year

Our representative sample included 15 pools of 20yr maturities, tallying \$2.632 billion (76.7% of \$3.432 billion 20yrs).

The results showed the following overall averages- Effective Duration of 4.83yrs, WAL 6.08 years and 5.11% yield (current market to market).

| Column1 | Identifier | Par Amt | Price | Column4 | Yield | OAS | EffectiveDuration | WAL | SpreadtoBenchmark | EffectiveConvexity | DV01 | Zspread |
|--------------------------|------------|------------------|-------|---------|-------|--------|-------------------|------|-------------------|--------------------|------|---------|
| UMBS MORTPASS 2.5% 05/40 | 31418DPA4 | 622,699,640.32 | 87-04 | | 4.96 | 97.51 | 5.23 | 6.56 | 106.65 | -0.15 | 0.05 | 111.02 |
| UMBS MORTPASS 3.5% 03/36 | 3138ERQH6 | 444,536,838.04 | 92-12 | | 6.13 | 196.50 | 2.91 | 3.33 | 188.95 | 0.08 | 0.03 | 203.16 |
| UMBS MORTPASS 2.5% 06/40 | 31418DQG0 | 338,877,528.79 | 87-04 | | 4.94 | 96.02 | 5.26 | 6.61 | 104.96 | -0.15 | 0.05 | 109.52 |
| UMBS MORTPASS 2.5% 07/40 | 31418DQZ1 | 154,231,317.89 | 87-04 | | 4.93 | 95.01 | 5.27 | 6.64 | 104.02 | -0.16 | 0.05 | 108.65 |
| UMBS MORTPASS 2.5% 08/40 | 31418DRQ7 | 146,424,356.73 | 87-04 | | 4.91 | 93.41 | 5.31 | 6.70 | 102.21 | -0.16 | 0.05 | 107.04 |
| UMBS MORTPASS 2.5% 03/40 | 31418DMP4 | 140,482,598.75 | 87-04 | | 5.01 | 102.40 | 5.14 | 6.41 | 112.00 | -0.15 | 0.05 | 115.81 |
| UMBS MORTPASS 2.5% 04/40 | 31418DND0 | 136,574,723.98 | 87-04 | | 4.98 | 98.90 | 5.19 | 6.51 | 108.47 | -0.18 | 0.05 | 112.65 |
| UMBS MORTPASS 2.5% 05/40 | 3140QDJ88 | 93,247,517.28 | 87-04 | | 4.96 | 98.14 | 5.23 | 6.55 | 107.12 | -0.13 | 0.05 | 111.44 |
| UMBS MORTPASS 2.5% 09/40 | 31418DST0 | 89,730,615.47 | 87-04 | | 4.90 | 92.25 | 5.34 | 6.74 | 100.65 | -0.16 | 0.05 | 105.66 |
| FHLMCGLD 3.5% 02/36 | 3132J4JF7 | 82,339,534.11 | 92-12 | | 6.12 | 196.55 | 2.95 | 3.39 | 188.07 | 0.07 | 0.03 | 203.57 |
| UMBS MORTPASS 3% 12/39 | 31418DJN3 | 79,786,576.55 | 90-00 | | 4.97 | 94.39 | 4.83 | 6.30 | 108.39 | -0.24 | 0.05 | 111.57 |
| UMBS MORTPASS 3% 02/40 | 31418DLQ3 | 78,402,450.92 | 90-00 | | 4.98 | 94.03 | 4.83 | 6.30 | 108.48 | -0.25 | 0.05 | 111.62 |
| UMBS MORTPASS 3% 01/40 | 31418DKC5 | 77,879,898.10 | 90-00 | | 4.97 | 93.99 | 4.83 | 6.31 | 108.33 | -0.25 | 0.05 | 111.49 |
| UMBS MORTPASS 2.5% 10/40 | 31418DTK8 | 75,989,776.48 | 87-04 | | 4.88 | 90.78 | 5.38 | 6.81 | 98.56 | -0.13 | 0.05 | 103.82 |
| UMBS MORTPASS 3% 09/39 | 31418DFM9 | 71,293,362.08 | 90-00 | | 5.04 | 100.05 | 4.72 | 6.09 | 114.46 | -0.21 | 0.04 | 116.79 |
| | Sum | 2,632,496,735.49 | | Avg | 5.11 | 109.33 | 4.83 | 6.08 | 117.42 | -0.15 | 0.04 | 122.92 |

15-year

Our representative sample included 22 pools of 15yrs maturities, tallying \$70.192 billion (23.6% of \$297.2 billion 15yrs).

The results showed the following overall averages- Effective Duration of 4.40yrs, WAL 5.02 years and 4.44% yield (current market to market).

| Column1 | Identifier | Par Amt | Price | Column4 | Yield | OAS | EffectiveDuration | WAL | SpreadtoBenchmark | EffectiveConvexity | DV01 | Zspread |
|--------------------------|------------|-------------------|-------|---------|-------|--------|-------------------|------|-------------------|--------------------|------|---------|
| UMBS MORTPASS 2% 09/35 | 31418DSM5 | 4,177,703,456.92 | 89-16 | | 4.55 | 54.88 | 4.20 | 4.80 | 65.43 | -0.02 | 0.04 | 62.85 |
| UMBS MORTPASS 1.5% 10/36 | 31418D5B4 | 3,805,318,936.93 | 87-08 | | 4.21 | 28.47 | 4.81 | 5.51 | 32.03 | 0.05 | 0.04 | 34.26 |
| UMBS MORTPASS 1.5% 01/36 | 3132D56U1 | 3,766,650,489.61 | 87-08 | | 4.47 | 51.31 | 4.48 | 5.02 | 57.84 | 0.03 | 0.04 | 57.06 |
| UMBS MORTPASS 1.5% 12/36 | 31418D7J5 | 3,625,633,525.80 | 87-08 | | 4.17 | 24.85 | 4.88 | 5.60 | 27.92 | 0.05 | 0.04 | 30.62 |
| UMBS MORTPASS 1.5% 11/36 | 31418D6F4 | 3,603,689,837.33 | 87-08 | | 4.19 | 26.26 | 4.85 | 5.57 | 29.52 | 0.04 | 0.04 | 32.05 |
| UMBS MORTPASS 1.5% 05/36 | 3132D6AB6 | 3,537,119,804.67 | 87-08 | | 4.35 | 40.74 | 4.65 | 5.24 | 45.88 | 0.04 | 0.04 | 46.48 |
| UMBS MORTPASS 1.5% 12/35 | 3132D56P2 | 3,443,303,494.80 | 87-08 | | 4.47 | 50.83 | 4.48 | 5.03 | 57.43 | 0.03 | 0.04 | 56.69 |
| UMBS MORTPASS 2% 10/35 | 31418DTM4 | 3,441,597,993.30 | 89-16 | | 4.51 | 52.31 | 4.24 | 4.86 | 62.38 | -0.02 | 0.04 | 60.26 |
| UMBS MORTPASS 2.5% 02/32 | 3140J8BW2 | 3,431,170,580.56 | 92-12 | | 5.18 | 103.09 | 2.87 | 3.18 | 94.63 | 0.06 | 0.03 | 107.83 |
| UMBS MORTPASS 2% 06/36 | 31418DZ21 | 3,340,305,708.40 | 89-16 | | 4.34 | 37.17 | 4.51 | 5.25 | 44.94 | -0.02 | 0.04 | 45.34 |
| UMBS MORTPASS 2% 09/35 | 3132D55W8 | 3,281,589,812.51 | 89-16 | | 4.55 | 54.84 | 4.20 | 4.80 | 65.49 | -0.02 | 0.04 | 62.91 |
| UMBS MORTPASS 2% 11/35 | 31418DUD2 | 3,186,717,564.15 | 89-16 | | 4.50 | 51.56 | 4.26 | 4.88 | 61.37 | -0.01 | 0.04 | 59.39 |
| UMBS MORTPASS 1.5% 05/36 | 31418DY22 | 3,056,270,497.40 | 87-08 | | 4.33 | 39.44 | 4.65 | 5.27 | 44.31 | 0.04 | 0.04 | 45.10 |
| UMBS MORTPASS 2% 06/35 | 31418DP48 | 2,919,154,221.73 | 89-16 | | 4.60 | 59.46 | 4.12 | 4.70 | 70.72 | -0.01 | 0.04 | 67.31 |
| UMBS MORTPASS 2% 10/35 | 3132D56E7 | 2,912,352,361.97 | 89-16 | | 4.53 | 53.19 | 4.23 | 4.84 | 63.45 | -0.02 | 0.04 | 61.16 |
| UMBS MORTPASS 2% 05/36 | 31418DY30 | 2,894,466,714.17 | 89-16 | | 4.36 | 39.37 | 4.48 | 5.19 | 47.18 | -0.02 | 0.04 | 47.26 |
| UMBS MORTPASS 2% 04/36 | 31418DX98 | 2,808,610,342.15 | 89-16 | | 4.38 | 40.97 | 4.46 | 5.16 | 48.76 | -0.01 | 0.04 | 48.62 |
| UMBS MORTPASS 1.5% 12/35 | 31418DU75 | 2,631,059,025.46 | 87-08 | | 4.48 | 52.29 | 4.46 | 5.00 | 58.98 | 0.04 | 0.04 | 58.05 |
| UMBS MORTPASS 1.5% 11/36 | 3132D6A42 | 2,630,381,350.64 | 87-08 | | 4.19 | 26.69 | 4.86 | 5.56 | 29.94 | 0.04 | 0.04 | 32.42 |
| UMBS MORTPASS 1.5% 11/35 | 3132D56J6 | 2,608,408,794.54 | 87-08 | | 4.51 | 54.68 | 4.42 | 4.95 | 61.84 | 0.03 | 0.04 | 60.55 |
| UMBS MORTPASS 2% 08/35 | 31418DRR5 | 2,547,524,063.78 | 89-16 | | 4.56 | 56.16 | 4.18 | 4.77 | 66.90 | -0.02 | 0.04 | 64.11 |
| UMBS MORTPASS 2% 05/36 | 3132D6AC4 | 2,543,012,690.20 | 89-16 | | 4.36 | 38.65 | 4.48 | 5.21 | 46.66 | -0.03 | 0.04 | 46.82 |
| | Sum | 70,192,041,267.02 | | Avg | 4.44 | 47.15 | 4.40 | 5.02 | 53.80 | 0.01 | 0.04 | 53.96 |

10-year

Our representative sample included 9 pools of 10yr maturities, tallying \$510.8 million (11.8% of \$4.316 billion 10yrs).

The results showed the following overall averages: effective duration of 2.62 years, WAL 2.80 years and 5.58% yield (current market-to-market).

| Column1 | Identifier | Par Amt | Price | Yield | OAS | EffectiveDuration | WAL | SpreadtoBenchmark | EffectiveConvexity | DV01 | Zspread |
|--------------------------|------------|----------------|-------|-------|--------|-------------------|------|-------------------|--------------------|------|---------|
| UMBS MORTPASS 2% 09/30 | 31418DSQ6 | 173,748,160.47 | 90-14 | 5.92 | 143.10 | 2.57 | 2.74 | 136.48 | 0.00 | 0.02 | 147.53 |
| UMBS MORTPASS 2% 05/31 | 31418DY63 | 62,291,847.89 | 90-14 | 5.55 | 114.01 | 2.85 | 3.03 | 99.94 | -0.01 | 0.02 | 118.52 |
| UMBS MORTPASS 2% 10/30 | 3140XAK35 | 61,262,749.38 | 90-14 | 5.94 | 145.03 | 2.56 | 2.73 | 138.88 | 0.00 | 0.02 | 149.52 |
| UMBS MORTPASS 2% 10/30 | 31418DTE2 | 48,798,772.93 | 90-14 | 5.88 | 140.46 | 2.60 | 2.77 | 133.05 | 0.00 | 0.02 | 144.82 |
| UMBS MORTPASS 2.5% 12/26 | 3138ESAH1 | 42,929,865.30 | 97-02 | 5.59 | 20.80 | 0.91 | 0.95 | -0.63 | 0.01 | 0.01 | 22.53 |
| UMBS MORTPASS 2% 01/32 | 3133LPUB1 | 36,400,100.22 | 90-14 | 5.14 | 81.81 | 3.21 | 3.45 | 58.44 | -0.01 | 0.03 | 85.84 |
| UMBS MORTPASS 2% 09/31 | 31418D4K5 | 33,334,446.25 | 90-14 | 5.35 | 98.13 | 3.01 | 3.22 | 79.61 | -0.01 | 0.03 | 102.43 |
| UMBS MORTPASS 2% 08/31 | 31418D3U4 | 27,090,907.08 | 90-14 | 5.37 | 100.34 | 2.99 | 3.20 | 82.29 | -0.01 | 0.03 | 104.58 |
| UMBS MORTPASS 2% 06/31 | 3133LPTR8 | 25,002,826.49 | 90-14 | 5.46 | 106.90 | 2.92 | 3.12 | 90.75 | -0.01 | 0.03 | 111.34 |
| | Sum | 510,859,676.01 | Avg | 5.58 | 105.62 | 2.62 | 2.80 | 90.98 | -0.01 | 0.02 | 109.68 |

Entire duration analysis and summary

Ultimately, we uploaded the entire Fed MBS Agency portfolio into the Yield Book model to view their composition, duration, weighted average life, spread and convexity.

In its totality, the \$2.58 trillion Fed MBS Agency book has a Weighted Effective Duration of 6.27 years, a “weighted” Weighted Average life of 8.77 years, Weighted Effective Convexity of -.028, with a Weighted Average Price of \$86.95, Weighted Average Yield 4.48%, and Weighted OAS of 44.77 at current mark to market.

Drilling down into two specific groups, Current Face (C/F) greater than \$1 million and C/F <\$1 million, we ran separate measures on duration, average life and spread, etc. Again, to smooth out the effects of the smallest bonds, we weighted the findings to skew for material holdings in each class.

The smaller block totaled \$3.729 trillion with Average Effective Duration was 4.09 years and had a Weighted Average life of 5.59 years.

The larger block totaled \$2.582 trillion in C/F, the Average Effective Duration was 6.27 years, and Weighted Average Life of 8.77 years.

Yield Book portfolio duration

Fed MBS AGENCY HOLDINGS April 12, 2023

| Security | Identifier | Par Amt | WGT | PRICE | YIELD | OAS | EFF DUR | WAL | SPR to BM | EFF CONV | DV01 | ZSPREAD |
|----------|-------------|----------------------|-----|-------|-------|-------|---------|------|-----------|----------|------|---------|
| FED HLD | MBS Total | 2,585,883,296,772.00 | 1 | 89.96 | 4.48 | 44.79 | 6.27 | 8.77 | 73.56 | -0.26 | 0.06 | 65.73 |
| | C/F < \$1mm | 3,729,137,948.00 | 1 | 94.29 | 4.77 | 56.37 | 4.09 | 5.59 | 75.41 | -0.11 | 0.04 | 72.86 |
| | C/F >\$1mm | 2,582,154,158,823.00 | 1 | 86.95 | 4.48 | 44.77 | 6.27 | 8.77 | 73.55 | -0.28 | 0.06 | 65.72 |

Yield curve shift

Relative to Fed holdings of Agency MBS

In our examination of the MBS Agency portfolio, we identified the largest cohorts held by the Fed and subjected them to a yield curve shock (+/- 200bps).

The results are seen below in the Yield Book Excel add-in table alongside representative constituents.

| | | | | | | |
|-------------------------------|---------|--------|-------|-------|-------|-------|
| UMBS 2 '21 prod | 84-04* | 95.45 | 90.43 | 84.72 | 78.65 | 72.64 |
| | Yield | 2.63 | 3.32 | 4.08 | 4.90 | 5.78 |
| | Eff Dur | 5.02 | 6.02 | 7.03 | 7.75 | 8.12 |
| | WAL | 8.47 | 8.99 | 9.66 | 10.28 | 10.78 |
| UMBS 2.5 '21 prod | 87-17* | 98.29 | 93.54 | 87.99 | 81.98 | 75.90 |
| | Yield | 2.74 | 3.42 | 4.18 | 4.98 | 5.84 |
| | Eff Dur | 4.56 | 5.56 | 6.65 | 7.46 | 7.91 |
| | WAL | 8.25 | 8.75 | 9.47 | 10.22 | 10.81 |
| UMBS 3.0 '17 prod | 92-00* | 101.14 | 96.98 | 92.25 | 87.17 | 81.99 |
| | Yield | 2.81 | 3.47 | 4.25 | 5.12 | 6.03 |
| | Eff Dur | 3.85 | 4.65 | 5.37 | 5.93 | 6.29 |
| | WAL | 7.59 | 7.77 | 7.93 | 8.14 | 8.43 |
| UMBS 15yr 1.5 '20 prod | 89-02* | 96.93 | 93.49 | 89.91 | 86.29 | 81.99 |
| | Yield | 2.26 | 3.14 | 4.06 | 5.00 | 6.03 |
| | Eff Dur | 3.49 | 3.77 | 4.03 | 4.18 | 6.29 |
| | WAL | 4.24 | 4.35 | 4.48 | 4.61 | 8.43 |
| UMBS 15yr 2.0 '21 prod | 88-16* | 96.63 | 93.06 | 89.33 | 85.56 | 81.84 |
| | Yield | 2.81 | 3.70 | 4.62 | 5.54 | 6.49 |
| | Eff Dur | 3.65 | 3.94 | 4.21 | 4.39 | 4.47 |
| | WAL | 4.45 | 4.59 | 4.75 | 4.92 | 5.05 |
| UMBS 20yr 2.5 '20 prod | 91-12 | 96.63 | 96.11 | 91.91 | 87.38 | 81.84 |
| | Yield | 2.81 | 3.24 | 4.06 | 4.93 | 6.49 |
| | Eff Dur | 3.65 | 4.18 | 4.80 | 5.28 | 4.47 |
| | WAL | 4.45 | 5.92 | 6.15 | 6.45 | 5.05 |
| UMBS 10yr 2 '22 prod | 90-16 | 96.93 | 96.11 | 91.91 | 87.38 | 81.99 |
| | Yield | 2.26 | 3.24 | 4.06 | 4.93 | 6.03 |
| | Eff Dur | 3.49 | 4.18 | 4.80 | 5.28 | 6.29 |
| | WAL | 4.24 | 5.92 | 6.15 | 6.45 | 8.43 |
| *even OAS to TBA | | | | | | |

As expected, longer and lower coupons gained and lost the most in price movements, while 15-year 1.5% extended more as rates shifted higher. Into lower rates/rally, 30-year 2.55% shortened the most while 10-year 2% saw WALs nearly two years shorter.

The bulk of 30-year paper in the Fed's arsenal is fully extended at these current price levels and therefore not overly affected into a rate backup.

TBA comparison against comparable Fed holdings

As another benchmark evaluation, we ran a comparison of MBS TBA to Fed MBS pools (again using Yield Book excel add-in) to see what the duration overhang may be.

Tagging the largest blocks in the Fed's arsenal, with current face values ranging from \$19 billion to \$29 billion, we ran a side by side at even OAS to TBA to compare durations.

Below those results, we charted the outright differences or in the case of more than one bond, average differences in profile.

Green areas denote a gain to the TBA line, while red areas are the case where the pool fails in its side by side to TBA.

All the side by sides, being seasoned paper to TBA, gained in price, showed shorter duration of half to over one year in the case of 2018 30yr 3%^s, with WALs shorter by one to over two years to generics.

This follows form on seasoned paper versus new issue and lends optimism to portfolio runoff in general sense, despite slower prepaids into a rising interest rate backdrop as we are experiencing currently.

| Par Amt | Price | Prod Yr | Desc/Pool | Price6 | Yield | EffectiveDuration | WAL | Eff Convexity | SpreadToBenchm |
|-------------------|-------|---------|-------------------|--------|-------|-------------------|-------|---------------|----------------|
| 54,000,000,000.00 | 30o | 2023 | fnma2-gen | 82.03 | 4.21 | 7.64 | 11.02 | -0.21 | 46.55 |
| 29,642,869,792.00 | 30o | 2020 | fisd8121 | 83.7 | 4.25 | 6.98 | 9.65 | -0.3 | 49.99 |
| 25,082,585,850.34 | 30o | 2021 | fisd8172 | 82.8 | 4.22 | 7.35 | 10.42 | -0.28 | 47.6 |
| 17,000,000,000.00 | 35o | 2023 | fnma2.5-gen | 85.35 | 4.32 | 7.22 | 11 | -0.24 | 57.53 |
| 17,132,753,848.20 | 35o | 2021 | FNMA4356 | 86.41 | 4.36 | 6.68 | 9.86 | -0.33 | 61.28 |
| 19,000,000,000.00 | 40o | 2023 | FNMA3.0-gen | 88.67 | 4.46 | 6.64 | 10.7 | -0.48 | 70.91 |
| 19,536,987,521.85 | 40o | 2016 | FNBM3811 | 91.01 | 4.46 | 5.38 | 7.98 | -0.22 | 71.18 |
| | | | | | | | | | |
| | | | AVG POOLS | | | | | | |
| | | | 2% ^s | 83.25 | 4.24 | 7.16 | 10.03 | -0.29 | 48.79 |
| | | | diff | 1.22 | 0.02 | -0.47 | -0.99 | -0.08 | 2.25 |
| | | | 2.5% ^s | 86.41 | 4.36 | 6.68 | 9.86 | -0.33 | 61.28 |
| | | | diff | 1.06 | 0.04 | -0.54 | -1.14 | -0.09 | 3.75 |
| | | | 3% ^s | 91.01 | 4.46 | 5.38 | 7.98 | -0.22 | 71.18 |
| | | | diff | 2.35 | 0.00 | -1.26 | -2.72 | 0.26 | 0.26 |

Conclusions

1. The Fed's portfolio is shrinking, seasoned, and running off as anticipated.
2. Duration and Average Life is shorter than generic TBA for comparable constituents.
3. Fed Portfolio WAL is 8.77yrs, and 6.27yrs Effective duration, weighted by C/F
4. Shifting the Yield Curve +/- 200 basis points shows minimal extension risk as lower coupons at current prices and speeds are fully extended.
5. Largest pools (\$19 billion or more) are shorter and have greater price value when set against benchmark generic TBAs.

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Americas

+1 646 989 2200

EMEA

+44 20 7334 8963

Asia-Pacific

Tokyo +81 3 6441 1015

APAC +866 2 8979 4966

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