The Convexity Maven

A Commentary by Harley Bassman

September 14, 2021

"The REIT Money Machine"

A Mortgage REIT (mREIT) is different from the more common Equity REIT. mREITs do not own real estate assets (offices, hotels, shopping centers, apartments, etc.), but rather mortgages supported by residential property.

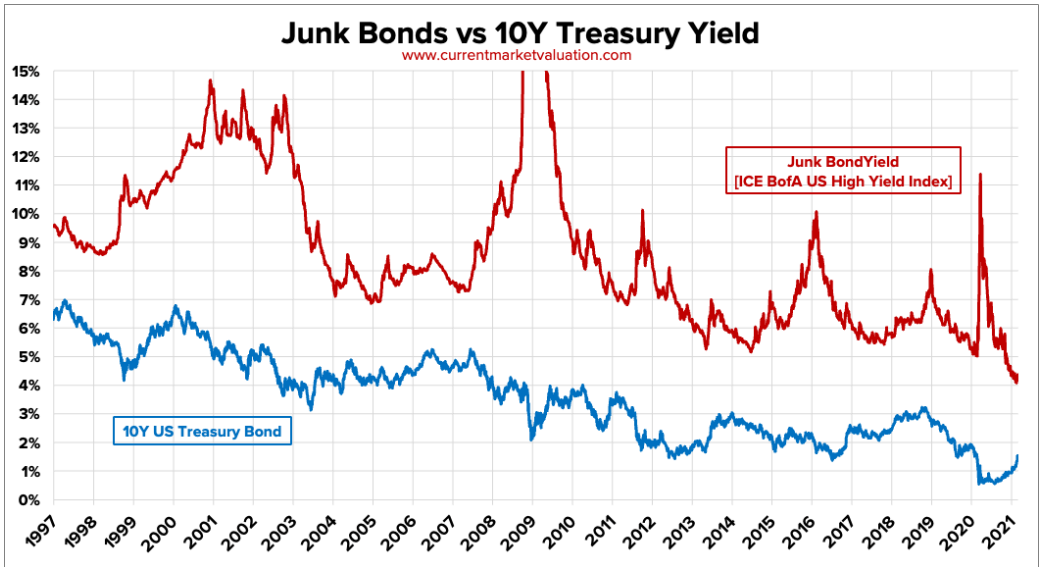
Since they usually own safer assets at the top of capital structure, they enhance their yield by using leverage (borrowed money), instead of taking credit risk.

As such, the main risks they face are: 1) The ability and the cost to borrow (short-term rates); and 2) asset market (long-term rates) Volatility.

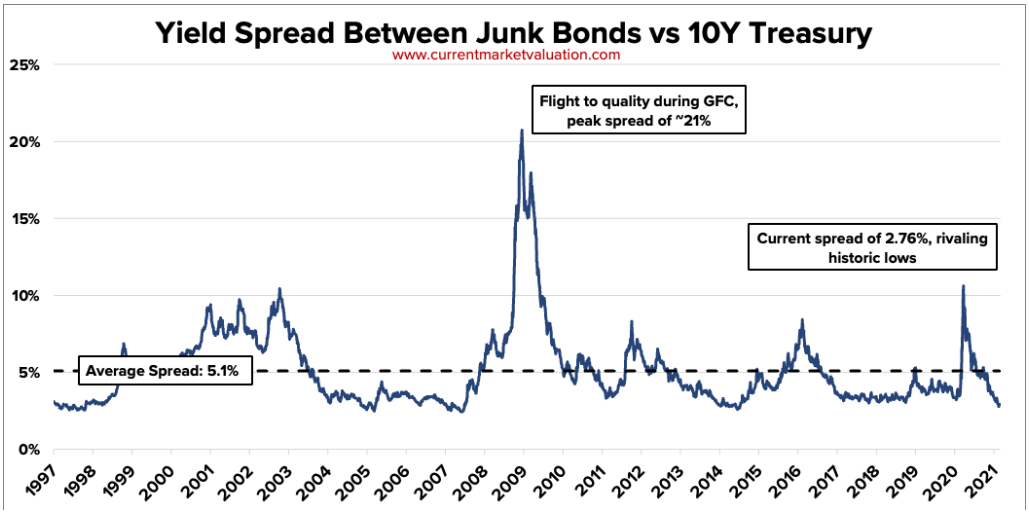
More important than knowing what you know, is to know what you do not know. Valuing the growth potential of a hotel/office is not in my skill set; but Volatility and Liquidity risk is in my wheelhouse, so presently I will take a double portion.

Both risks exploded in March 2020 as fears of an uncontrollable pandemic caused lenders to reduce their available credit lines and increase the cost to borrow. The coup de grace was vicious Volatility that forced margin call liquidations.

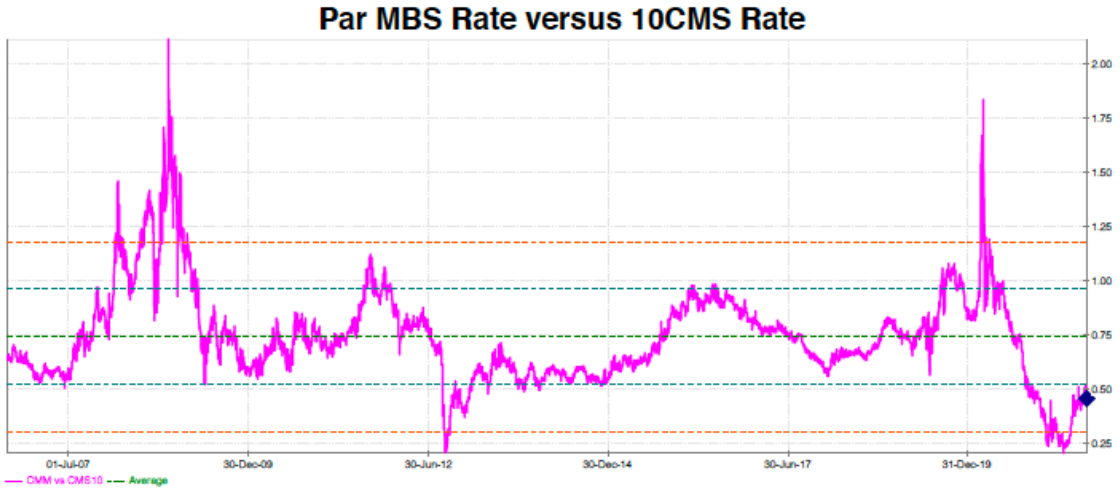
Could this occur again, of course; but with a cashflow yield of nearly 9% and a somnambulant FED, I prefer leveraging highly-rated assets instead of owning bottom of the capital structure -persimmon line- Junk bonds at less than 4.0%.



Moreover, there is almost no cushion for an increase in defaults with the spread to Treasuries -munsell line- near a record tight.



To be fair, Mortgage-backed Securities (MBS) too are not a value proposition. I often refer to the -cerise line- spread between the Constant Maturity Mortgage rate (CMM) and the Constant Maturity Swap rate (CMS) as the benchmark for MBS valuation. Near a 50bps spread, it is still one standard deviation rich to its "forever" average of 74bps.



The contrast is that a widening of the MBS spread will create a mark-to-market loss in Book Value that can be earned back over time, whereas defaults on Junk bonds create a permanent loss of principal.

The Generic Profile of a Mortgage REIT

Let's build a simple Mortgage REIT to understand the math, and then slowly add in the real-world complications.

Starting Capital = $10,000,000

Borrow $70mm to purchase a total of $80mm FN 2.0% MBS bonds at 101.38 to yield about 1.80%. (I say "about" because the stated yield of a MBS bond depends upon a few assumptions I will not detail here.)

Again, for reasons I will not detail, one can currently borrow funds to buy FN 2% MBS bonds at an annual interest rate of -0.32%. Yes, that's a negative annual interest rate.

After accounting for the coupon interest, the borrowing costs, and principal cashflows from an amortizing mortgage, one nets $1875 per month per million. That's $150,000 per month for the $80mm MBS bonds.

To hedge the interest rate risk of MBS bonds, one can sell (short) some number of US Treasury bonds (UST). Thus, if rates rise and the price of the MBS bonds declines, there will be an offsetting gain from the short UST position.

As I will detail soon, at this rate level one needs to sell (short) a ratio of 60% of 10yr USTs; in this case 60% of $80mm is $48mm at 99.47 to yield 1.31%.

The "Repo" market (short for Repurchase) is the overnight lending and borrowing market for USTs. Repo is perhaps the largest market on the planet, and is shockingly unheralded despite it being the core plumbing of our financial system. Clogs in this plumbing caused the FED to panic in September 2019 and March 2020 and offer unlimited funds to liquify the entire system.

[For more on Repo, I would direct you to Zoltan Pozsar, the undisputed expert at Credit Suisse, as well as Jeffrey Snider's classroom at Alhambra Investments.]

Presently, one can "borrow" 10yr USTs via Repo at about 5bps (0.05%); when all the cash flows are accounted, it costs $1,015 per million, or $48,720 to carry a short position of $48mm for one month.

Netting the above, a duration (interest rate) hedged position of Government guaranteed MBS leveraged 8 to 1 will produce $101,280 per month, or $1,215,360 per year. On the $10mm of invested capital, that is a 12.15% annual return. If this sounds too good to be true in a near zero percent interest rate environment, it is. Let's see why…

One unaccounted cost is the "roll down" of the 10yr UST. The security we sold (shorted) is presently a full ten-year bond, but in one year's time it will be a nine-year bond. With the Yield Curve positively sloped, a nine-year bond now yields 6bp less than a ten-year bond (1.25% vs 1.31%).

This will create about a half point mark to market loss on the UST, or $5,000 per million. Applied to the total $48mm position, that will reduce the annual return by $240,000 and clip the total return to $975,360, or a 9.75% return on capital.

Since managers of such a venture will not do this for free, a second unaccounted cost is the Administration Fee, so we need to subtract another 1%.

It must be said that earning 8.75%, after fees with NO CREDIT RISK on the underlying assets, is rather incredible in a zero percent environment.

But of course you know there is no free lunch, the massive elephant in the corner is my old friend – negative Convexity. This is real risk that must be managed in a mortgage REIT; and is the source of the above market income.

MBS Convexity

Ginnie, Fannie and Freddie mortgage bonds are all (effectively) guaranteed by the US Government. The only reason they trade to a higher yield than a UST is that they are **negatively convex**. In a nutshell, this means they go down in price faster than they rise given equal changes in interest rates.

Using the bonds above, their prices change by the -pistachio digits- if rates decline by 50bps, and the -rufous digits- for a 50bp increase in rates. Notice the MBS price declines faster than it rises, for a – tangelo digits- convexity of -0.70. In contrast, the UST has the opposite profile with a positive convexity of +0.37.

The -capri digits- span a 100bps rate change that is known as Duration, and the relative relationship -sangria digits- is the hedge ratio. This is the source of the 60% ratio used for our REIT construction.

	FN 2s			UST 10yr		
	Price	Px change	Convexity	Price	Px change	Convexity
Rates 50bp lower	103.81			104.29		
		2.43			4.82	
Rates Unchanged	101.38		-0.7	99.47		0.37
		3.13			4.45	
Rates 50bp higher	98.25			95.02		
100bp Duration		5.56			9.27	
Local Hedge ratio			59.98%			

I will spare you the math, but if you apply the above prices to the portfolio constructed prior, a +/-50bp change in rates, unadjusted, will create a loss of about $370,000, which will reduce the total economic return to about 6.00%.

And because the negative convexity of the MBS is not stable (it will increase with a more substantial change in interest rates), a 100bp move might well wipe out all profits from the portfolio.

Despite pronouncement from the FED, the managers of these REITs do not trust that rates will be unchanged forever; so they control the risk by adjusting the hedge ratio, sometimes by model but more often by instinct (aka, tossing darts).

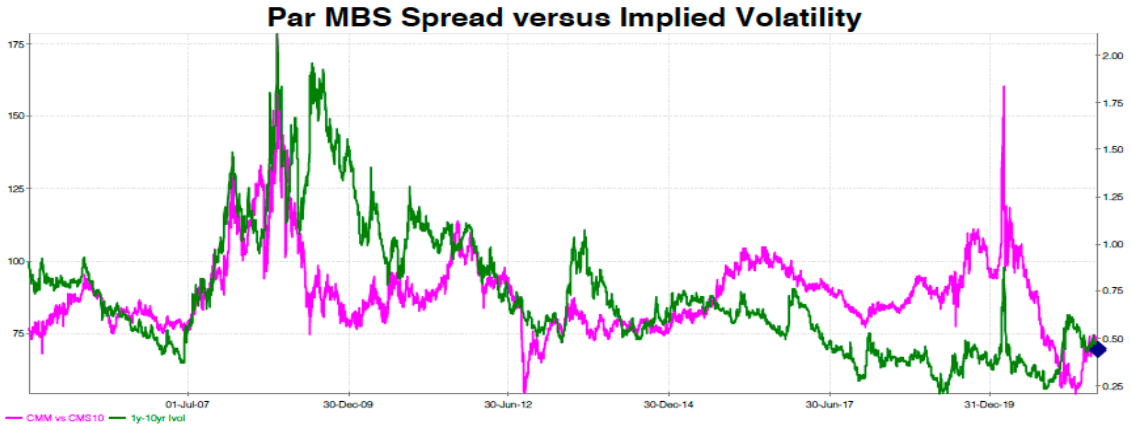
REIT risk managers will "hedge by hand" via selling as prices decline and buying as prices rise to contain this vibrating interest rate risk. But the cold reality is that no one can consistently predict the direction and velocity of longer-term interest rates, even the most experienced investors.

As such, the managers of these REITs often engage in option trading to "buy back" some of the negative Convexity of MBS bonds.

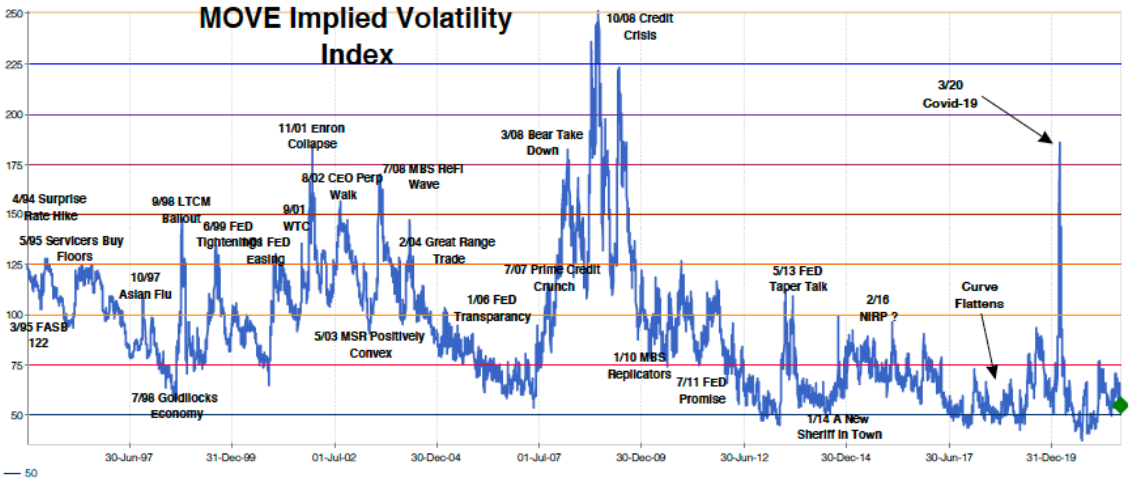
As a reminder, the Convexity in a MBS bond is sourced from the borrower's (homeowner's) ability to payoff (prepay) their mortgage at any time, with no costs or fees. Thus, the bondholder (buyer of the MBS) does not know if they own a one-month or a thirty-year security.

This creates two different types of negative optionality. From a modeling standpoint, MBS bonds are short the Volatility (vega) of a three-year expiry option. This is demonstrated by the coincidence between the -taffy line- CMM vs CMS spread versus the -neon line- level of Implied Volatility.

One might note the recent and anomalous "wiggle" where Volatility rose, yet MBS spreads tightened; this was a result of the FED's MBS buying program during last Spring's short-lived rate rise.



However, the greater risk is the pure Convexity (gamma) of an asymmetric return profile which is better hedged by short-dated (one- to three-month expiry) options. Their cost can be measured by the -denim line- MOVE Index, which is now relatively inexpensive but still carries a heavy time-decay (theta) cost.



The math required to analyze a "full option hedge" is beyond the scope of this Commentary, but trust me to say that buying back most of the negative Convexity would ballpark cost this portfolio $275,000 to $350,000 per year.

Where the rubber meets the road

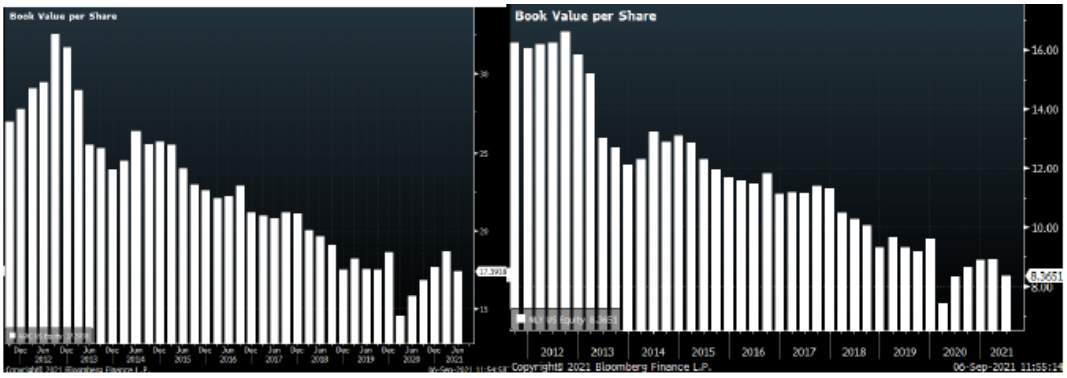
Depending upon their view, REIT managers will use a combination of hedging by hand and buying short- and long-dated options, but these risk mitigation tools can be expensed in ways that are not always transparent.

In theory, the purchase of an option is a direct offset to the yield enhancing negative Convexity embedded into an MBS. As such, the time decay (theta) should be counted as a reduction of income.

In contrast, hedging by hand via the buying and selling of various securities will create trading losses that will reduce the Book Value. This thought might ring a bell as to how to account for the "roll down" cost described a few pages prior.

As such, when looking at a Mortgage REIT, one needs to be mindful of both the stated cash flow payout (dividend) as well as the Book Value since, as noted, the hedging costs will show up as a reduction on the balance sheet.

Below is the (ever declining) Book Value for two classic Mortgage REITs, and by "classic" I mean they primarily invest only in US supported MBS and hedge primarily with standard rate products (USTs, Swaps, Futures, and Options).



To be clear, this should not be taken as a negative comment, but rather "full disclosure" to help you fully analyze the value proposition of a REIT.

For much of the past decade, some REITs have had a cashflow yield of 12%, so even an annual 5% Book Value reduction still leaves the investor with a net Economic Return near 7%, not too shabby for a no credit risk bond investment.

Closing Comments

The FED has purposefully emptied its quiver of policy arrows to reduce the Yield and Volatility of assets to encourage "animal spirits" to increase employment and lift wages to thus grow the economy and stoke the fires of inflation.

Looking down from 30,000 feet, I would say I agree with their goals; my quibbles have always been a bit more nuanced.

As detailed in my *"Open Letter to the FED"* – July 25, 2021, I think it would be good public policy to let the Yield Curve steepen by migrating their $120bn a month purchase program from MBS and TIPs to shorter-dated UST securities.

I do not think the FED will increase their benchmark rate, presently near zero, anytime soon; nor do I think they will "taper" their purchases cold turkey.

The primary risks to a Mortgage REIT are:

1) Higher short-term Rates;
2) Flatter Yield Curve;
3) Increasing interest rate Volatility.

I think the FED will mitigate all of three of these risks. The lurking danger is that the current elevated inflation rate is not a "transitory base effect", but rather the real deal that violently increases interest rates.

Thus, my personal account is chocked full of various Mortgage REITs (both classic and hybrid), BDCs, and CEFs that kick off a yield of roughly 8%, but is fully covered by an **Interest Rate Hedge Strategy**.

(See *"Helicopter Defense"* – May 11, 2021, and *"Fire Insurance"* – June 8, 2021, at ConvexityMaven.com)

Remember: For most investments, sizing is more important than entry level.

Harley S. Bassman
September 14, 2021

Follow me on Twitter: **@ConvexityMaven**
Your comments are always welcome at: harley@bassman.net

If you would like to be added to my distribution, just ping me.

For reference literature on the financial markets - particularly about options and derivatives - I will immodestly direct you to my educational archive at:

http://www.convexitymaven.com/themavensclassroom.html

If you still have kids in the house, please take a vacation that is more interesting than the Four Seasons, Costa Rica – life is not a dress rehearsal. Turn off the Crackberry (did I just date myself ?) and explore with the family. You don't need to break the bank, rent an RV and see the U.S. We traveled with our four kids on five incredible RV trips.

http://bassman.net