**Bond Analysis**

**Research Question**

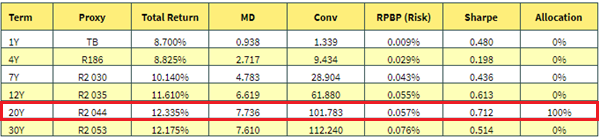
Considering current bond metrics (risk vs. return parameters) which would be the optimal bucket to go long when adding duration?

**Findings**

Utilizing prevailing bond yields and price sensitivities, we determined the Sharpe Ratio of specific bonds across the SA Govi curve. The bonds selected ranged from 1 year (Treasury-Bills) to 30 years (R2053 bond) and were used as proxies for various maturity buckets along the curve.

In addition, the calculated Sharpe Ratio measured the excess return of each bond over the current SA Repo Rate (8.25%) relative to its risk or Rand Per Basis Point (RPBP[[1]](#footnote-1)).

Our analysis shows that given current bond yields and risk numbers, the 20-year bucket (represented by the R2044 bond) produced the highest Sharpe Ratio and consequently the optimal risk adjusted return from the Govi bonds considered.

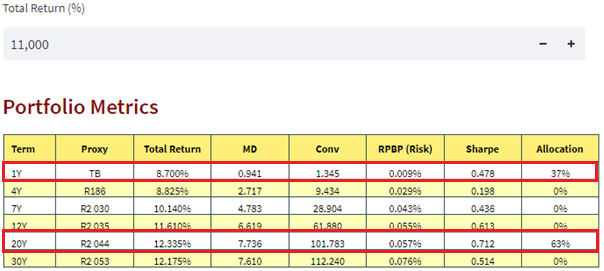


**Analysis**

In addition to determining the optimal maturity bucket, we also looked at the optimal bucket allocation that matched the portfolio yield to that of the ALL BOND INDEX (ALBI). Using the Sep-23 index weights (and BESA closing prices from 30-Aug-23), we calculated the yield on the ALBI to be roughly 11.04% with an MD of roughly 5.77 and a RPBP of R470.04 (~5bps or 0.05%) – please see Appendix for calculation breakdown.

Following this we then ran our optimization model that worked out the optimal bond allocation (from the bonds considered in our analysis) that would both match the 11% ALBI yield and maximize the portfolio’s Sharpe Ratio.

Not surprisingly, our optimization model produced a 63% allocation to the 20-year bucket (R2044 bond) with the remaining 37% assigned to 1-year Treasury Bills. This resulted in a RPBP of R393 (~4bps or 0.04%) and was a marginal improvement on a risk adjusted level when compared to the ALBI.



**Bond Sensitivity Considerations**

Generally speaking, a bonds Modified Duration is only a good approximation (of a bond’s price change) for small movements in yields. For large yield changes, one would need to make a convexity adjustment given that the relationship between price vs. yield for vanilla bonds is convex.

Additionally, when looking at the convexity adjustment, it is useful to compare the fixed coupon rate to the bonds current Yield-To-Maturity (YTM). In most cases the bigger the difference between these rates the bigger the convexity adjustment for the bond.

With this in mind, we have also shown the bonds Capital Returns and corresponding Total Returns for various yield changes in the appendix. Interestingly, we note that the convexity adjustment appears to be more prominent for the longer dated bonds considered. Another factor contributing to the higher convexity is the higher bond yields relative to the coupons.

Lastly, for completeness, we’ve also shown graphs for the various bond’s statistics.

**BOND OPTIMIZER APP**

**T**he link below takes you to the software built for this analysis. Please feel free to open and play-around with the application.

* [*https://bond-optimizer-dcsrftlqdwcdlgftqd6mgp.streamlit.app/*](https://bond-optimizer-dcsrftlqdwcdlgftqd6mgp.streamlit.app/)

**REFERENCES:**

* [*https://thismatter.com/money/bonds/duration-convexity.htm*](https://thismatter.com/money/bonds/duration-convexity.htm)
* [*https://www.cfainstitute.org/en/membership/professional-development/refresher-readings/understanding-fixed-income-risk-return*](https://www.cfainstitute.org/en/membership/professional-development/refresher-readings/understanding-fixed-income-risk-return)
* *https://www.investopedia.com/articles/bonds/08/duration-convexity.asp#:~:text=In%20technical%20terms%2C%20this%20means,to%20higher%20degrees%20of%20convexity.*

**APPENDIX**

The R209, R213 and R214 bonds were highlighted as it has the closed RPP to the ALBI. Also worth noting is that these bonds pay the lowest coupons and with the high bond yields, the convexity measure for these are also notable.

**CAPITAL BOND RETURNS**

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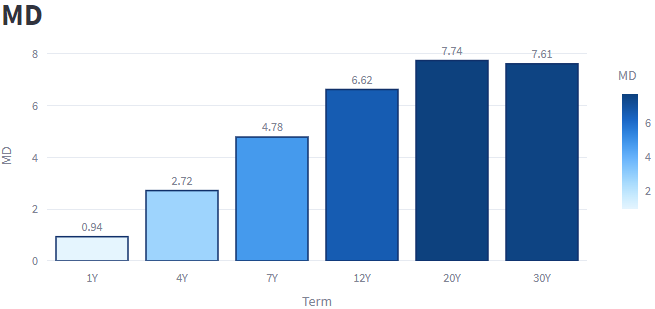
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**TOTAL BOND RETURNS**

A table with numbers and percentages

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**BOND BUCKET METRICS**



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1. The RPBP gauges the change in bond price for a one basis point change in yield (∆y). The price difference is approximated using the bonds Modified Duration (MDur) and Convexity (Conv) measures as shown below:

   **= (-MDur) x ∆y + x (Conv) x (∆y)2** [↑](#footnote-ref-1)