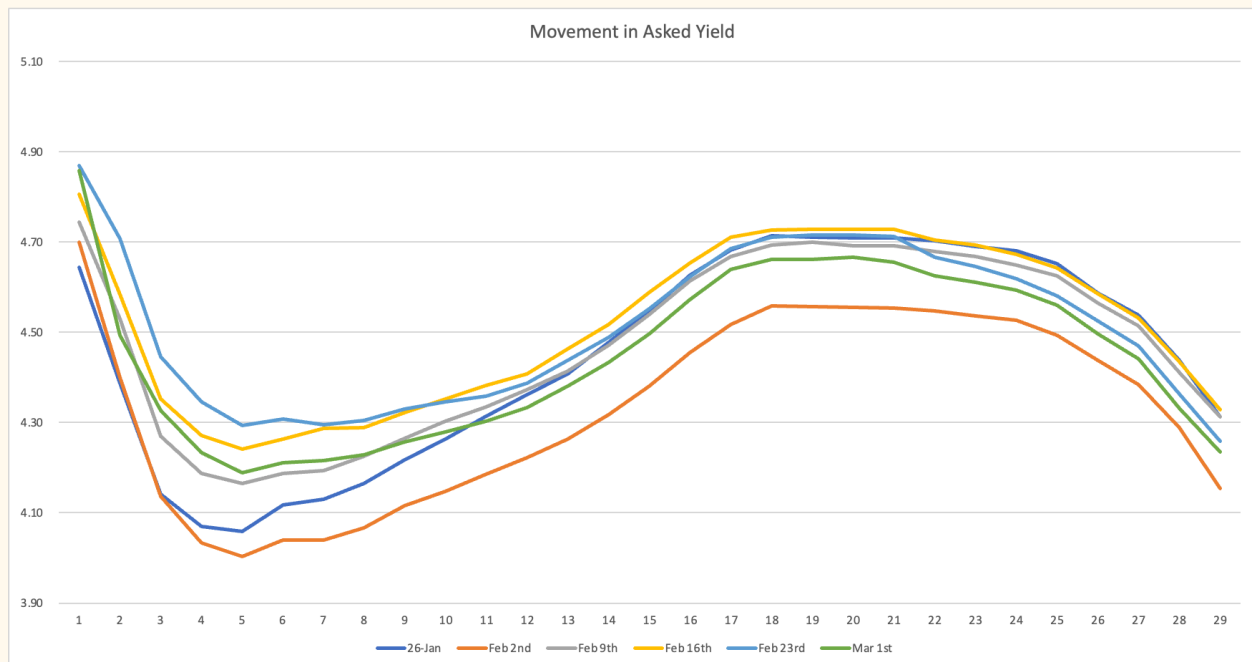


BONDS

PORTFOLIO MANAGEMENT

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Introduction

The goal of this project is to construct a zero-coupon bond portfolio using a \$100,000 fictitious budget, aiming to maximize short-term return over the 35-day holding period from January 26, 2024, to March 1, 2024. Given the restriction to long-only positions and integer bond quantities and at least 3 bond maturities, our strategy is tailored to extract the most value through carry, while managing interest rate risk exposure.

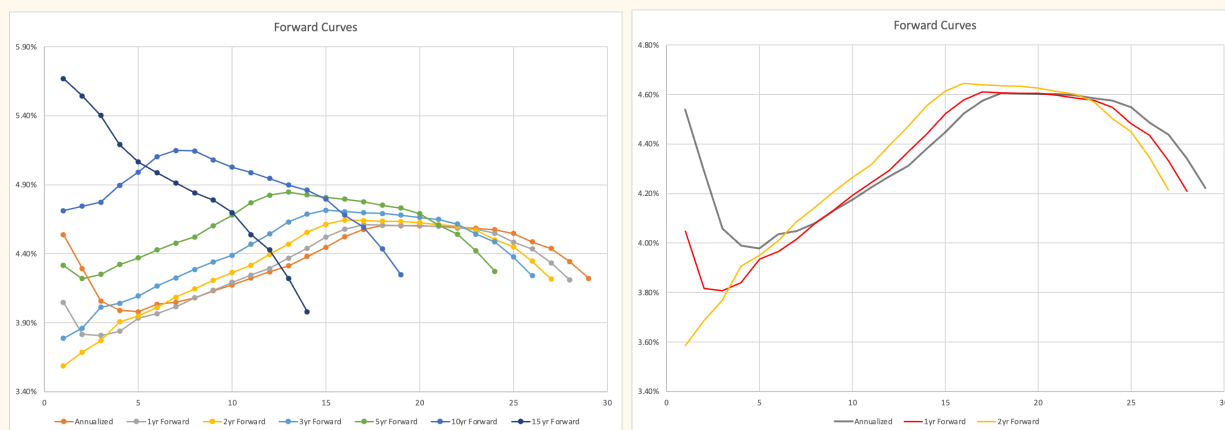
Investment Thesis

Since we have a very short investment horizon of 35 days, the optimal strategy focuses on maximizing carry — specifically, selecting bonds with a high theta-to-price ratio. This approach assumes a static yield curve.

Concerns

However, in practice, we remain exposed to delta and gamma risk in the event of yield shifts — a material concern given the current market environment characterized by curve inversion, inflation uncertainty, and evolving Fed policy expectations.

Forward Curve Analysis

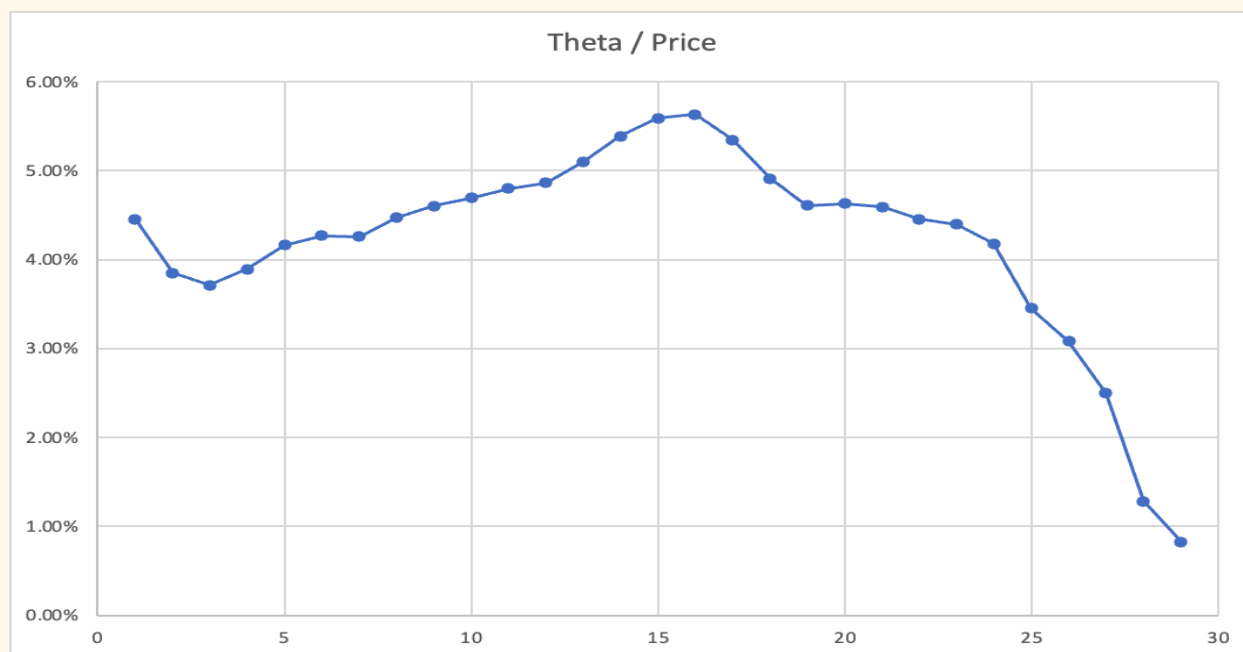


Forward curve analysis offers helpful context:

- Yields for maturities under 7 years are expected to decline over the next year.
- Yields under 3 years may continue falling for up to two years.
- Yields for 10–20 year maturities are projected to rise modestly.
- Yields beyond 20 years are expected to decline over the next two years.

While these insights suggest bonds under 13 years could benefit from rolling return over time, such effects play out over longer horizons and are unlikely to be realized in our 35-day window. Hence, forward curve data informs our understanding of broader rate dynamics but does not directly drive bond selection.

A theoretically appealing approach would involve going long high-theta bonds and short low-theta bonds to delta-neutralize the position. However, given our mandate is long-only, we instead optimize bond selection accordingly.



Portfolio Composition

Hence, we select bonds with maturities 14, 15, and 16 years, which exhibit the highest theta-to-price ratios, aligning with our short-term carry objective.

Additionally, we include a 1-year bond based on its strong relative score across short-term options (maturities 1, 2, 3).

Finally, we add a 23-year bond, which provides us exposure to longer term yield rates and has a sufficient score.

Adding the short and long legs help us hedge against changes in yield curve shape.

Performance

Over the 35-day holding period from January 26 to March 1, our strategy generated a total profit of **\$249.74**, resulting in a holding period return (**HPR**) of **0.25%** and an annualized yield (BEY) of 2.61%.

We invested \$99,831.02 of the \$100,000 fictitious capital, maintaining full allocation within integer constraints. Compared to benchmark strategies such as buying the full universe, purely short-term or long-term bonds, or selecting based only on theta/price rankings, our approach outperformed most reasonable strategies while remaining consistent with our initial thesis.

Inv. Maturities	26-Jan	2-Feb	9-Feb	16-Feb	23-Feb	1-Mar
1	19,920.00	19,910.18	19,918.33	19,903.07	19,911.43	19,953.02
14	19,970.45	20,291.48	19,830.95	19,716.00	19,819.04	19,987.19
15	19,980.12	20,344.04	19,888.55	19,700.70	19,829.99	20,007.63
16	19,967.58	20,373.60	19,891.46	19,710.91	19,830.30	20,007.94
23	19,992.86	20,535.29	19,904.98	19,714.67	19,953.87	20,124.98
Portfolio Value	99,831.02	101,454.59	99,434.26	98,745.35	99,344.64	100,080.75

Conclusion

Through this project, we gained hands-on experience in applying key fixed income concepts such as annuity pricing, yield curve dynamics, and forward rate interpretation. We also developed a deeper understanding of how to measure and manage interest rate risk and the effects of time passage (theta) on bond prices. Using these tools, we constructed a zero-coupon bond portfolio that performed well over the 35-day holding period, with a positive HPR that reinforced the practical value of our analytical approach. This exercise helped bridge theoretical learning with real-world fixed income portfolio construction.