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Rolling down the yield curve in up and down markets

Through active management, institutional investors in municipal bonds can employ professional strategies that seek to overcome market complexities and take advantage of profitable opportunities. One such strategy, which may be difficult for individual investors to implement due to transaction costs, is called "rolling down the yield curve."

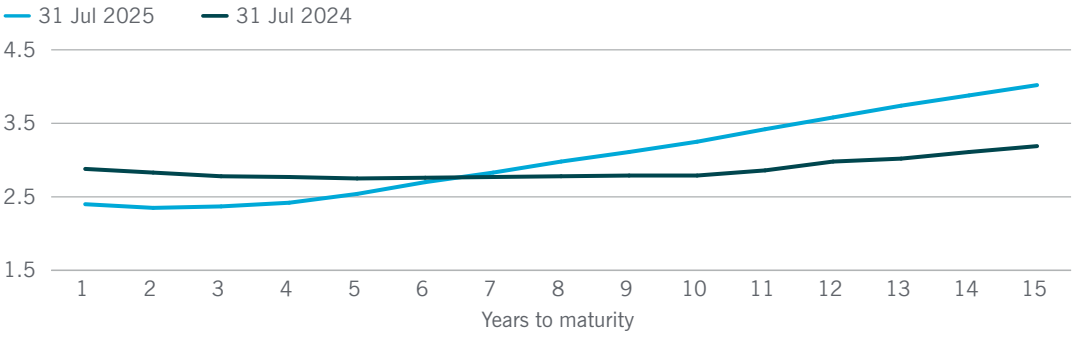
Returns may be enhanced by selling a bond at its peak price and rolling into a longer maturity bond. Two principles make this strategy viable:

1. Bonds with longer maturities typically have higher yields to compensate investors for a longer period of uncertainty.
2. Bonds with lower yields have higher prices, assuming coupon rates and maturity remain the same.

THE YIELD CURVE

The first principle can be visualized by plotting a yield curve. If one charts yields on the Y-axis, and time to maturity on the X-axis, the resulting line will usually slope upward to the right. Municipal yields with maturities of 5 years or less are particularly sensitive to U.S. Federal Reserve policy. This sensitivity can lead to yield curve inversions during monetary tightening cycles, when short-term rates rise above yields in the 5- to 10-year range. However, maturities beyond 10 years have consistently maintained a positive slope, reflecting long-term risk premiums (Figure 1).

Figure 1: The yield curve, an example (%)



Data source: Securities Evaluations, Inc. (a subsidiary of Intercontinental Exchange, Inc.), ICE U.S. Municipal AAA Noncallable Yield Curve.

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THE PRICE OF A BOND

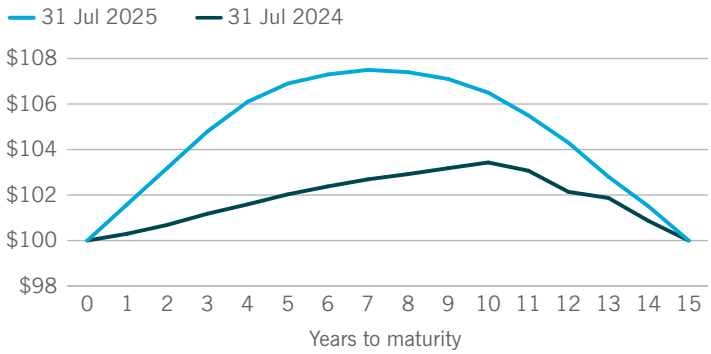
The second principle implies that the price of a bond will, for a time, rise as it approaches maturity because it will be priced to progressively lower yields. However, the price will start to decline at some point as the need to amortize the premium over a shorter and shorter maturity period outweighs the effect of pricing to lower yields.

If a bond with a 2.50% coupon is priced to yield 2.00% (as a result, for example, of a change in interest rates or because the bond is now being priced to a shorter maturity), the bond will be priced above par. The difference between the coupon rate and the yield (in this case 0.50%) will be roughly the amount by which the premium declines each year.

Thus, if the bond has four years until maturity, the dollar price will be about $102. But if the same bond has only two years to maturity, the dollar price will be about $101, since, at 0.50% per year, the one-point premium will be fully amortized in two years. For the price to stay at $102 with two years until maturity, the yield would have to fall to 1.50%, which would be 1.00% lower than the coupon rate so that about $1 of premium would be amortized each year.

Portfolio managers may derive increased value by selling bonds with just a few years to maturity while their prices are still high. The amount of benefit from this strategy depends on the slope of the yield curve and the timing of purchases and sales. For instance, a steepening of the curve may meaningfully increase premium levels that managers can harvest and reinvest into longer maturities. Figure 2 illustrates how a bond's price changes over time simply as a result of rolling down the yield curve, assuming the curve remains unchanged throughout the bond's life from settlement.

Figure 2: Price of a noncallable 15-year municipal bond over the course of its life



Data source: Securities Evaluations, Inc. (a subsidiary of Intercontinental Exchange, Inc.), ICE U.S. Municipal AAA Noncallable Yield Curve.

ILLUSTRATION: HOW IT WORKS

Suppose that on 31 Jul 2025, the AAA rated, noncallable yield curve was as follows:

Years	Yield (%)	Years	Yield (%)	Years	Yield (%)
1	2.40	6	2.70	11	3.42
2	2.35	7	2.83	12	3.58
3	2.37	8	2.98	13	3.74
4	2.42	9	3.11	14	3.88
5	2.54	10	3.25	15	4.02

Further suppose that someone invests $100,000 in a bond with the following characteristics:

Maturity	Yield (%)	Dollar price	Coupon (%)	Annual income
15 years	4.02	$100.00	4.02	$4,020

Ten years later, on 31 Jul 2035, if interest rates remain the same throughout the yield curve, the investor could sell that bond at a dollar price of $106.90 based on the fact that bonds with 5 years to maturity are priced to yield 2.54%. The proceeds of that sale could be used to purchase the new bond shown below (coupon rate rounded to nearest 0.01%).

Maturity	Yield (%)	Dollar price	Coupon (%)	Annual income
15 years	4.02	$106.60	4.61	$4,610

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By selling the original bond for more than par, the investor would be able to buy a premium bond with a higher coupon. Finally, in the year 2040 (15 years after the original investment and five years after the swap) the new bond has a dollar price of $111.54 (based on bonds with 10 years to maturity are priced to yield 3.25%). To summarize, below is the way the investor's cash flows look:



* 2040 does not include the final coupon payment.

Using these cash flows, we can compute the internal rate of return (IRR) on this investment, which is the interest rate that causes the present value of the amounts received to equal the amount invested. The IRR in this case is 4.72%. If the investor just held the original bond until it matured, the IRR would have been 4.02%, which is the yield at which the bond was purchased. Thus, by selling the bond with 5 years remaining to maturity and reinvesting in another 15-year bond, the investor increases the return by 0.70% over the same 15-year period.

Internal rate of return if interest RATES REMAIN CONSTANT	
Buy and hold (%)	4.02
Rolling down the yield curve (%)	4.72

WHAT HAPPENS IF INTEREST RATES FALL?

Suppose in our example that interest rates had fallen 0.50% sometime in the first 10 years after the bond was purchased and remained there for the rest of the 15-year period. (Since the coupon stream remains constant until the bond is sold in year 10, all that matters is what the yield curve looks like in the last 5 years to maturity. After 10 years, the original bond would be worth $109.36 (priced to a 5-year yield of 2.04%, 0.50% less than in the original scenario). The proceeds of that sale could be used to purchase the new bond shown below (coupon rate rounded to nearest 0.01%).

Maturity	Yield (%)	Dollar price	Coupon (%)	Annual income
15 years	3.52	$109.15	4.31	$4,310

By selling the bond with 5 years remaining to maturity and reinvesting in another 15-year bond, assuming a parallel shift in the curve of -0.50%, the new bond would be worth $113.57 if priced to a 10-year yield of 2.75%. Under this scenario, the investor would increase the return by 0.72% as the lower coupon payments are offset by a higher premium level.



* 2040 does not include the final coupon payment.

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Internal rate of return if interest RATES FALL 0.50%	
Buy and hold (%)	4.02
Rolling down the yield curve (%)	4.74

Internal rate of return if interest RATES RISE 0.50%	
Buy and hold (%)	4.02
Rolling down the yield curve (%)	4.71

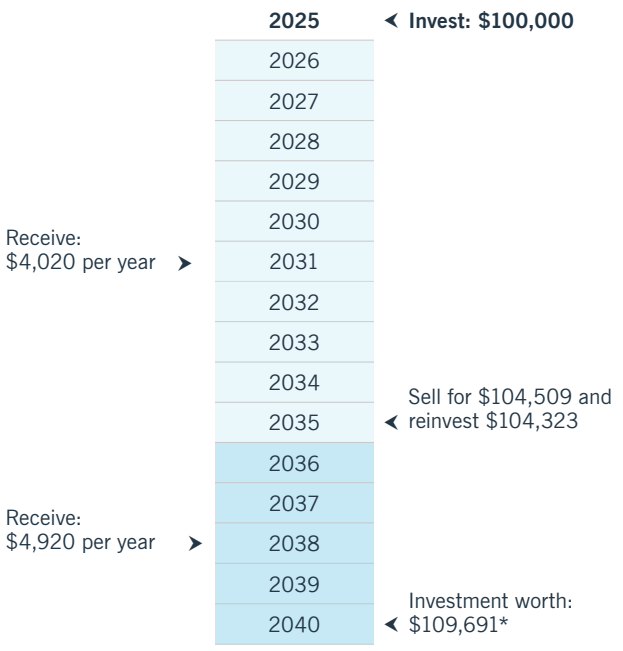
WHAT HAPPENS IF INTEREST RATES RISE?

We obtain similar results if we assume that yields had risen by 0.50%. In that case, the original bond would be priced $104.51 after 10 years (priced to a 5-year yield of 3.04%). The 0.50% increase in interest rates means that a new 15-year bond would yield 4.52%. The proceeds of that sale could be used to purchase the new bond shown below (coupon rate rounded to nearest 0.01%).

Maturity	Yield (%)	Dollar price	Coupon (%)	Annual income
15 years	4.52	$104.32	4.92	$4,920

By selling the bond with 5 years remaining to maturity and reinvesting in another 15-year bond, assuming a parallel shift in the curve of +0.50%, the new bond would be worth $109.69 if priced to a 10-year yield of 3.75%. Under this scenario, the investor would increase the return by 0.69% as the higher coupon offset the lower premium level.

Here are the cash flows:



* 2040 does not include the final coupon payment.

EXPLANATION: WHY IT WORKS

At first glance, this strategy sounds like the proverbial "free lunch," but it has a logical explanation. If the investor were to hold the bond to maturity, the investor would have a security whose yield decreases over time. This lower yield reflects the fact that the price volatility of the bond, in other words, its market risk, would also be decreasing.

The principle in operation here is that the maturity of a bond affects how much the price changes in response to changing interest rates: the shorter the maturity, the less the change. By swapping into a longer bond in the tenth year, the investor replaces a lower yielding security with a higher yielding security. This higher yield compensates for the fact that the new bond has greater price volatility.

This trade, however, merely restores the volatility to the level of risk originally chosen by the investor. The investor can meaningfully improve the return by taking advantage of the market's preference for low volatility and by making judicious use of the shape of the yield curve in selecting maturities for sale and purchase.

> *A bond's maturity affects how much the price changes in response to changing interest rates:* ***the shorter the maturity, the less the change.***

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CONCLUSION

By monitoring the shape of the yield curve and capturing the value produced when bonds ride the yield curve, portfolio managers can enhance the returns that investors receive from their portfolios in up and down markets. A steep yield curve creates a particularly opportune time for portfolio managers to sell bonds with maturities in the lowest parts of the yield curve and reinvest at higher yields out longer on the curve.

	Internal rate of return (%)	IRR with 20% capital gains tax (%)
Hold bond to maturity	4.02	4.02
Swap after 10 years, rates unchanged	4.72	4.60
Swap after 10 years, rates fall 0.50%	4.74	4.59
Swap after 10 years, rates rise 0.50%	4.71	4.61

ASSUMPTIONS**

The preceding analysis is based on two assumptions. The first is that the yield curve retains its current slope. If the yield curve were steeper, the benefits of selling, in 10 years, a bond due in 15 years and replacing it with a bond due 25 years from today would be enhanced. On the other hand, a flatter yield curve would reduce the benefit of this strategy. (Figure 2)

The second assumption is that interest rates do not increase between 10 and 15 years. In year 15, the investor in the example would be holding a bond with 10 years remaining to maturity after the swap. Meanwhile, an investor who continued to hold the original bond would then be receiving the principal balance in cash. If rates on 10-year bonds increased between year 10 and year 15, the investor would, in many cases, be better off holding cash at the end of the period than holding a 10-year bond (depending on how high 10-year yields became).

On the other hand, if rates fell, the investor with a 10-year bond would enjoy appreciation not available to the investor who receives a return of principal in year 15. Since these risks are symmetrical, and their impact varies with the interest rate cycle, we believe the effect of changes in rates should average out if the strategy of rolling down the yield curve is consistently followed over time.

** Source: Securities Evaluations, Inc. (a subsidiary of Intercontinental Exchange, Inc.)

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