Rolldown and Carry - A Closer Look at Sovereign Bond Returns

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1. Introduction

Sovereign bond returns are influenced by a variety of factors. The returns on bonds are attributed to two components- the appreciation/depreciation in the bond's price due to change in yield over the holding period and the periodic coupon payments in the form of interest earned. In order to get an indicative estimate of the potential bond return over the investment horizon, assuming that the term structure holds good for the horizon, the investors use the Roll-Down and Carry (RDC) measure usually adjusted for the transaction costs. This concept note aims to provide a guide with an illustration on computing roll down and carry and discuss its use in fixed income investing.

To illustrate the computation of the rolldown and carry of a bond, let us consider the 7.59% Government Security (G.S.) 2026 security, with a face value of ₹100. The bond has semi-annual coupon payments on January 11 and July 11, 2021. It is assumed that the bond is purchased on December 01, 2021 (Settlement Date is December 02, 2021). The residual maturity of the bond is 4.11 years and the bond makes semi-annual coupon payments of ₹3.795 twice a year. The RDC measure over various holding periods are demonstrated. We have considered investment horizons of 1 month, 3 months, 6 months and 12 months. The time lines across horizons are illustrated in figure 1 in Annexure.

2. Bond Roll-Down

Roll-down refers to the potential return generated by a bond, as it "rolls down" the yield curve during the investment period. Rolldown is the change in the bond's price attributed to the bond rolling down the yield curve with the passage of time. It is important to understand that the shape of the yield curve affects rolldown of a bond. While an upward sloping yield curve produces a positive rolldown for a bond, a flat/inverted curve would result in a zero/negative roll respectively. For example, if the yield curve is an upward sloping curve and remains unchanged over the investment horizon, the cash flows of the bond will be discounted by points on the curve that correspond to shorter maturities at lower yields. As yields drop, the bond's price increases, resulting in a capital gain to the bond investor. This gain is termed as a positive rolldown gain. Likewise, in an inverted yield curve scenario, the bond would move from a higher maturity (at a lower yield and higher price) to a lower maturity (at a higher yield and lower price), resulting in a capital loss (i.e. a negative roll).

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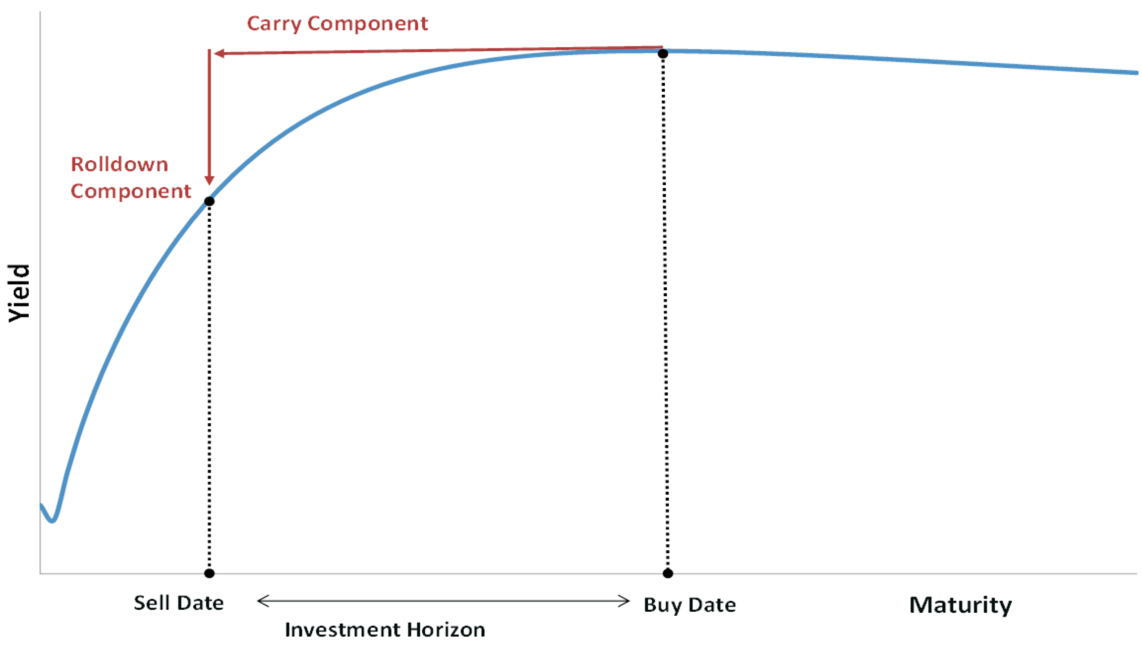
Figure 1: Carry and Rolldown on an Unchanged Yield



One important assumption for positive rolldown is that the market possesses sufficient liquidity to buy and sell the bond at favourable prices. While computing rolldown, the bond's position on the yield curve matters. For instance, bonds having a residual maturity located at the steeper portions of the yield curve would have a more pronounced rolldown return, than those located at the flatter parts of the curve. In addition, the residual tenor of the bond would also impact the rolldown return. For bonds very close to maturity, the rolldown effect would likely be minimal as the price would converge to its par value (viz. pull to par effect). For bonds at the long end of the maturity spectrum e.g. 40 year bonds, the immediate rolldown effect over shorter investment horizons would be less noticeable. Bonds that are neither too close or too far from its maturity, often experience a noticeable rolldown effect.

As observed in the Table 1, by focusing solely on the bond's buying and selling prices, excluding the coupon payment, one can recognize that an investor obtains a positive rolldown return. For instance, within a six-month investment horizon, the buying price is 104.5667 computed using the spot curve as on December 01, 2021. Given the assumption that the yield curve remains unchanged over the investment horizon, the selling price is 104.6320, which is computed using the spot curve as observed at the start of the investment horizon. This results in a positive rolldown return of ₹0.0653.

Table 1: Computing the Rolldown Return for Each Investment Horizon					
Cash Flow Dates	**02-12-21**	**04-01-2022**	**02-03-2022**	**02-06-2022**	**02-12-2022**
11-01-2022	3.7815	3.7925			
11-07-2022	3.7051	3.7206	3.75	3.7815	
11-01-2023	3.609	3.627	3.66	3.7051	3.7815
11-07-2023	3.5025	3.522	3.56	3.609	3.7051
11-01-2024	3.3898	3.4101	3.45	3.5025	3.609
11-07-2024	3.2739	3.2946	3.33	3.3898	3.5025
11-01-2025	3.1572	3.178	3.22	3.2739	3.3898
11-07-2025	3.0415	3.0619	3.1	3.1572	3.2739
11-01-2026	80.079	80.6258	81.62	83.1858	86.3518
Dirty Price	107.5394	108.2324	105.68	107.6048	107.6135
Accrued Interest	2.9728	3.6474	1.08	2.9728	2.9728
Clean Price	104.5667	104.585	104.6	104.632	104.6407
Rolldown Return	**-**	**0.00183**	**0.0333**	**0.0653**	**0.074**

3. Bond Carry

Carry refers to the expected return that can be earned by way of coupon income from holding a bond over a specific period, adjusted for a financing cost. It is the difference between coupon income and the cost of financing a bond investment. It is important to note that the return from the carry of a bond is based on the assumption that the yield curve remains unchanged over the investment horizon. The carry of a bond has direct relationship with (a) the coupon rate of a bond, (b) the rate at which the coupon proceeds are re-invested and (c) the holding period of the investment. This means that the bonds issued at higher coupon rates would have a greater carry than low coupon bonds. When such coupon is received, the proceeds are reinvested in the bond for the remainder of the investment horizon. Hence, for a higher reinvestment rate and longer investment horizon, the carry return would be higher.

Box 1: How would one determine the reinvestment rate at the start of the investment horizon?

The following steps are followed to determine the coupon reinvestment rate: First, the period between the bond's purchase date and the upcoming scheduled coupon payment date is determined. Second, the overall holding period of the bond, which encompasses the entire investment horizon, is ascertained. Finally, the time between the scheduled coupon payment and when the bond is sold, representing the coupon-compounding period, is computed. The equation highlights the computation of forward rates used for coupon compounding. *

$$Fwd\ Rate = \left(\frac{(1+S_2)^{h2}}{(1+S_1)^{h1}}\right)^{\frac{1}{h3}} - 1$$

Here,

$Fwd\ Rate$ = Forward Rate used for coupon reinvestment

S_2= Spot Rate of holding period of the bond

S_1 = Spot Rate of holding period till subsequent coupon

h_1 = Holding period till first coupon

h_2 = Entire holding period of the bond

There is an inverse relationship between the carry of a bond and the cost of financing. The impact from the cost of financing on the bond's carry is based on whether the investment is leveraged or unleveraged. In case of a leveraged position, the bond is financed by borrowed funds, in which the financing cost is the interest on the borrowed amount. In case of an unleveraged position, an investor would use one's own capital to make the purchase, thus having no explicit financing cost. However, there is always an implicit cost, which is the opportunity cost that the investor forgoes while having taken the decision to make the investment in the bond. A risk free rate such as a collateralised overnight rate, compounded over the investment period, is often considered as an implicit opportunity cost.

The Carry can be either positive or negative. If the coupon is higher than the cost of financing, then one will derive a positive carry and if the cost of financing is lower than the coupon, the carry is negative.

Focusing on the carry return across all investment horizons (Figure 1 in annexure), one can observe that the Carry component is zero for the 1-month investment horizon because there are no coupon payments received within this period. Table 2 provides an overview of the cash carry for all four-investment horizons.

Taking the case of six-month investment horizons, the carry return is estimated as:

$$Carry = \frac{Coupon}{2}(1 + Fwd\ Rate)^{n} = \frac{7.9500}{2}(1 + 3.4433)^{0.3917} = Rs.3.8457$$

Where, Coupon is the annual coupon of the bond, Fwd Rate is the forward rate implied for the reinvestment period n. Thus in this illustration, the forward rate is 3.4433%[†].

Table 2: Cash Carry breakdown for Each Investment Horizon					
		1 Month	**3 Month**	**6 Month**	**12 Month**
Coupon Return	(a)	-	3.795	3.795	7.59
Re-investment Return	(b)	-	0.0174	0.0507	0.194
Cash Carry	(a+b)	-	3.8124	3.8457	7.784

4. Total Roll Down and Carry

As highlighted in table 3, the expected return as given by the RDC increases with the time horizon for a positive (increasing) yield curve. This is because the carry component is more significant for longer-term horizon. In case of 6-month investment horizon, the carry return is ₹3.8457 with rolldown return of Rs 0.0653. This results in an expected return of ₹3.9110 (i.e. 3.8457+0.0653). In percentage terms, this culminates to 3.74% return.

Table 3: Expected Return Profile from Carry and Rolldown				
Time Horizon	**1 Month**	**3 Month**	**6 Month**	**12 Month**
Sell Date	04-01-2022	02-03-2022	02-06-2022	02-12-2022
Cash Carry	0	3.8124	3.8457	7.784
Rolldown	0.0184	0.0371	0.0653	0.0741
P&L (in ₹ terms)	0.0184	3.8495	3.911	7.858
P&L (in % terms)	0.02%	3.68%	3.74%	7.51%

5. Application of the Roll Down and Carry

The term structure or yield curve in the bond market provides the spot rate curve and also helps derive the forward rate curve. This provides an indication on the expected rates given the latest information in the economy. Assuming that there is no change in expectations of interest rates over the forward horizon, the total RDC is an indicative measure of possible returns on the bond over the given horizon.

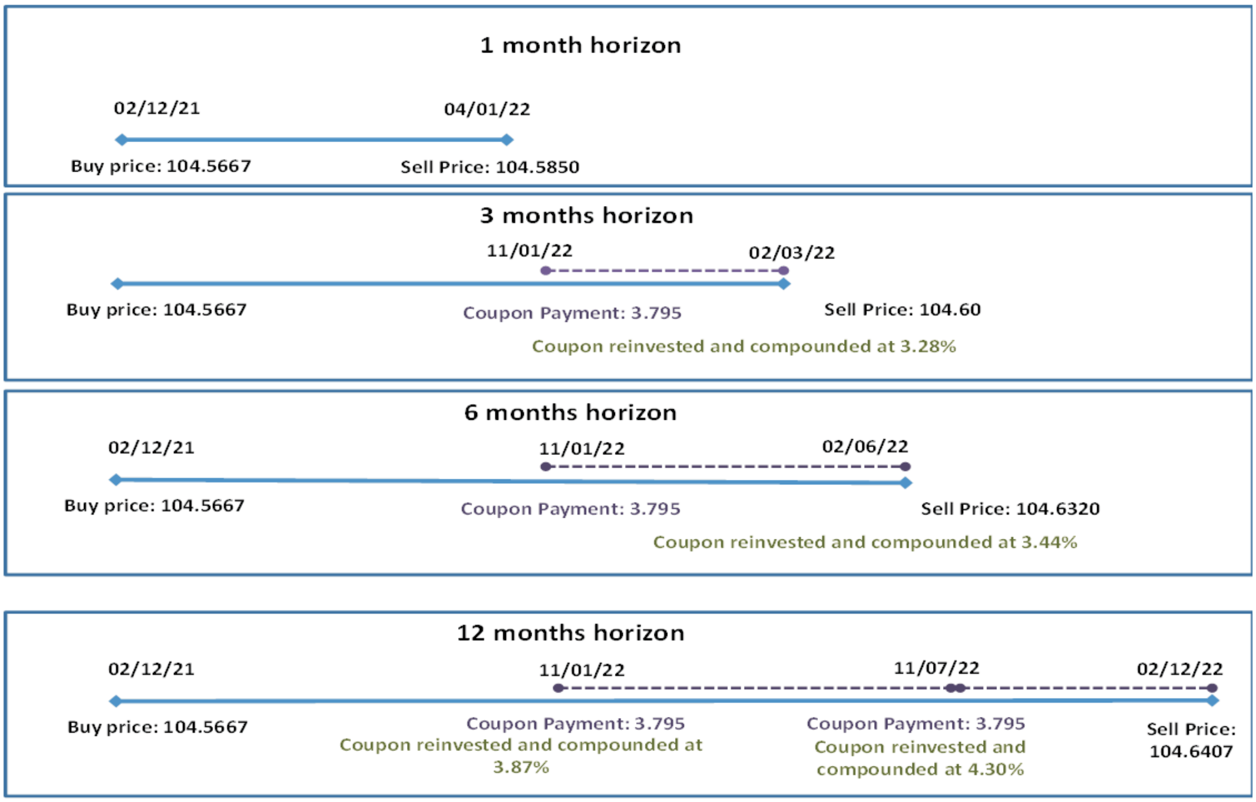
The measure of RDC is also used in portfolio construction analysis for identifying securities that could offer higher potential return, subject to the constraints of that portfolio. As part of their security selection process, portfolio managers specifically focus on those maturity segments of the curve that maximize roll down and carry.

[†] *The forward rate implied from the 1 month and 9 days spot rate of 3.3810% and 6-month spot rate of 3.4300%.*

RDC also serves as a tool for portfolio managers to fine-tune their portfolio allocations by assessing the relative value of securities based on their carry and rolldown characteristics. This evaluation helps them identify potential profitable positions along the yield curve or within various maturity segments that may arise from market mispricing.

Annexure

Figure 1: Buying and Selling prices of bond at multiple investment horizons



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