Implementing an arbitrage trade using GOI Bond-Interest Rate Swaps

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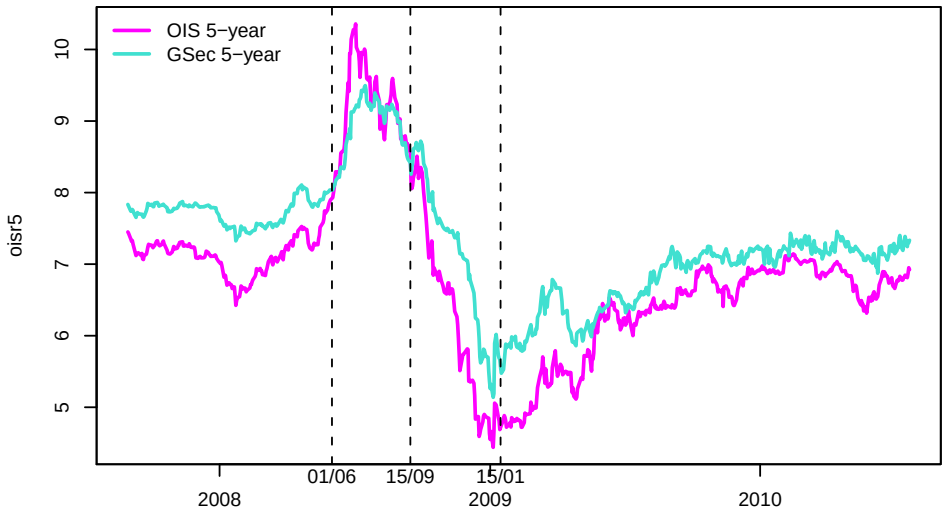
1 A market anomaly: OIS vs. GSec rates

A reasonably liquid interest rate derivative markets in India is the Overnight Indexed Swaps market (OIS) where contracts are traded swapping fixed rates on a floating interest rate (set by the MIBOR[1]). However, a curious feature of this market is that the OIS/GSEC spreads have consistently stayed negative i.e the OIS rates have generally been lower than the GSEC yields (as can be seen in Figure 1).

Figure 1 Spread between the 5-year OIS and GOI bond rates



This anomaly offers a case to earn arbitrage gains by implementing a possible arbitrage portfolio using GOI bond(s) and OIS contracts. We present a simple arbitrage strategy and then back-test its performance using market rates to see how the strategy would have performed in terms of profits/losses over the period for which the arbitrage portfolio was held.

[1]Mumbai InterBank Offer Rate, which is a polled rate calculated by the National Stock Exchange, and available at different maturities of overnight, three-month, six-month.

2 An arbitrage strategy on the OIS-GSec anomaly

We can structure the following portfolio as an arbitrage strategy to exploit this apparent anomaly:

1. Invest in 1-5Y GOI securities,
2. Fund them through daily CBLO[2] platform. The borrowing in CBLO market, however, entails interest rate risk exposure.
3. To hedge against this risk, pay a fixed rate and receive daily compounded floating MIBOR by buying a similar tenor OIS.

There can be a direct arbitrage gain on the fixed end (receive higher GSEC yield against lower OIS fixed rate) if the daily CBLO rates stay near the overnight MIBOR. However, the difference between the (lower) CBLO floating rate and higher MIBOR rate can prove to yield additional profits.

2.1 Example of an "arbitrage portfolio"

A sample portfolio using above strategy is created by taking a long position ('+') in the spot, CBLO and the OIS markets.

We test the performance of this position using real time market rates prevailing over the period from Feb 1, 2008 to Apr 5, 2009.

The specific transactions we examined are:

1. **Spot bond transaction** The spot position in the arbitrage strategy is taken by buying 6:65 CG2009 on Feb 1, 2008 at the prevailing market yield of 7.47%.
2. **Spot funding transaction** The GOI bond is purchased with the funds borrowed from CCIL's overnight CBLO market. In this example, funds are assumed to be borrowed for the entire period i.e Feb 1, 2008 - Apr 5, 2009 at a floating interest rate in the overnight CBLO market. The position is assumed to be rolled over each day until maturity.
3. **OIS transaction** To offset the interest rate risk exposure in CBLO market, we go long a 1Y OIS; where we pay fixed rates in exchange for the floating (CBLO overnight) rates. The interest settlement of the swap contract is assumed to occur at maturity on a net basis.

The effective amount of investment made in the above strategy is the sum of the margin money (to take a position in both the CBLO and the OIS markets) along with the accrued interest paid on initial buying of bond. The total investment works out to be as Rs 15,558,373 for this set of positions. A detailed description of the positions involved are in Box 2.1.

[2]Collateralized Borrowing and Lending Obligation

Arbitrage portfolio
Trade strategy start date: 1 Feb 2008
GOI SECURITY:

- **Long** GSEC: CG2009 6.65%
- Maturity: 5 Apr 2009
- Last interest payment date: Oct 5, 2007
- Face value of the bond: Rs 25 cr
- Principal = Rs 247,701,428
- Accrued interest = Rs 5,356,944
- Reference Price: 99.08
- Yield: 7.47%
- Total value = Rs 253,058,373

CBLO FUNDING:

- **Long** CBLO market (borrowing against CG2009 6.65%)
- Haircut = 5%
- Margin = 5% $\times$ Rs 25 cr = Rs 1.25 cr
- Interest on borrowed funds = Daily compounded CBLO rate

OIS POSITION:

- **Long** fixed 6.71% OIS
- Notional: Rs 25 cr
- End date: Feb 1, 2009

TOTAL INVESTMENT = RS 15,558,373

3 Returns from Arbitrage

We use market data and calculate the daily compounded CBLO and the MIBOR rate prevailing over the given tenor. A summary of rates is given in following Table 1:

Table 1 Rates in the spot and the OIS markets (annualised)

	(%)
CG2009: Yield on purchase	7.47
Daily compounded CBLO rate	6.34
OIS (Fixed)	6.71
OIS (Floating)	8.06

We compare the performance of our arbitrage strategy vis-a-vis two other strategies an investment position, and a speculative position objective) as follows:

- **Investment:** Long GSec using own funds
- **Speculation:** Long GSec + Funds borrowed in overnight CBLO market
- **Arbitrage:** Long GSec + Funds borrowed in CBLO + OIS Hedge

In all the three cases, the GSec bonds are held till maturity. The time horizon of investment is fourteen months. Table 2 shows the returns in the three positions.

Table 2 Performance of different strategies

Strategy	Investment size (Rs. crores)	Returns (%)	
		Total	Annualized
Investment	25.30	8.65	7.36
Speculation	1.55	26.88	22.87
Arbitrage	1.55	48.56	41.31

Table 2 shows that that the rate of return is far higher in the case of the arbitrage portfolio than that realised in either of the investment or the speculative portfolios. both the other cases, i.e in case 1, where one simply invests using own funds or in case 2 which is funding through CBLO[3].The difference is substantial. Net of transactions costs, the arbitrage strategy yields almost six times the returns made in a simple investment strategy in interest rates.

[3]The above strategy, however, does not account for liquidity premiums which might be an additional cost while implementing the strategy.

4 Conclusion

We find that the strategy would have made higher profits for the arbitrageur (with a profit margin of the tune of 41% p.a) at an investment of Rs 1.79 cr vis-a-vis the case when one simply borrows from the market (when the profit margin drops to 22.87%). The "arbitrage" strategy also has the advantage of being protected against interest rate volatility.

The difference in returns is statistically significant and substantial, which raises the question of why participants in the market who already have the underlying bonds, and can readily access both the securities and the funds market do not take advantage of these possibilities.

One scenario could be that the position we chanced upon is unique, and other bonds and positions would not yield such returns. We consider this unlikely since we chose the portfolios purely based on the sole criteria of liquidity of the bond in the market at the time of initiating the position. The 6.65% CG2009 was a liquid security during the period of our analysis.

Another scenario under which the arbitrage returns is not accessible is that there are entry barriers to these interest rate markets. For instance, the CBLO market is not open to all market participants but only the large financial institutions such as the banks and primary dealers. Data from the Clearing Corporation of India, Ltd. (CCIL) website show that 85% of the OIS market participation is by non-public-sector banks. This is indicative of some barriers to entry, either in terms of contract design [4] or in terms of knowledge and awareness of these contracts.

The outcome is that, in the absence of firms implementing such arbitrage strategies, the anomaly of having OIS market rates being consistently lower than the GSec rates is likely to continue.

[4] As a hypothetical example, perhaps the typical transaction size in the OIS market may be too large for the public sector bank to take a position in vis-a-vis position limits that their internal risk management processes might permit them to take on the interest rate derivative markets.

Appendix

A Floating interest rate calculation in OIS market

The floating rate on OIS has been computed by taking the overnight MIBOR rate over the 1Y period from Feb 1, 2008- Feb 1, 2009 using the following formula:

$$\text{OIS floating rate} \quad = \quad [\Pi_{i=1}^{d_o}(1 + \frac{R_i \times n_i}{365}) - 1] \times \frac{365}{d}$$

where:

- d_o, is the number of business days in the relevant calculation period
- n_i is the number of calendar days in the calculation period on which the rate is R_i;
- d is the number of calendar days in the relevant calculation period; and
- R_i, for any business day 'i' in the relevant calculation period is the daily MIBOR rate.