A Market-Neutral Strategy for Bonds
— Hedged Transactions of Government Bonds

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1. The Market-Neutral Approach

In recent years, with the growing diversification of asset management overseas, investment alternatives have attracted the attention of investors including pension funds.

Their aim is to improve returns by investing in new types of assets other than stocks, bonds, and foreign exchange instruments, and to diversify risk and stabilize portfolio returns by combining traditional assets with assets whose price movements are uncorrelated. Typical examples are private equity (which seeks high returns by owning stocks before the IPO) and hedge funds (which seek high returns from small investment amounts by using derivatives to profit from market distortions and price disparities).

The market-neutral strategy represents another alternative investment strategy which seeks stable returns without regard to the direction of the market. In other words, the strategy seeks to neutralize risk with respect to market price fluctuations.

As opposed to the conventional approach of seeking returns by buying and then selling certain assets, thereby betting on the direction of the market, this approach simultaneously uses both long and short positions, and aims to profit from relative price changes.

For instance, if a particular security is undervalued relative to its theoretical price (fair value), the market is expected to eventually correct the price to its appropriate theoretical level. Likewise, a security that is overvalued relative to its theoretical price is expected to eventually revert to the appropriate level. In both cases, the market is expected to correct prices in the appropriate direction, generating a profit corresponding to the change in price.

The success of the market-neutral approach rests on the expertise of analysts to value different assets and issues and make buy and sell calls, and of fund managers to swiftly manipulate positions without impacting the market.

2. Which Assets are Appropriate for the Strategy?

Hedge funds and other investors execute a market-neutral strategy by simultaneously establishing both long and short positions in stocks or other assets with high price volatility.

The market-neutral strategy targets assets with high volatility because such assets tend to have large mis-pricing components which produce gains after price corrections.

Another important consideration is liquidity: how easily an asset can be traded, and whether it can be traded in adequate volumes without impacting its price.

Since asset prices tend to rise when bought and to fall when sold, the practice of buying undervalued issues and selling overvalued issues itself poses the risk of erasing any gains from price corrections. Thus the most appropriate assets for this strategy are those with high liquidity and low market impact.

While bonds are relatively less volatile than stocks or foreign exchange instruments, Japanese Government Bonds (JGB) in particular are highly liquid, enabling their purchase in large quantities.

This paper examines the performance of a market-neutral strategy for 10-year JGBs and their futures.

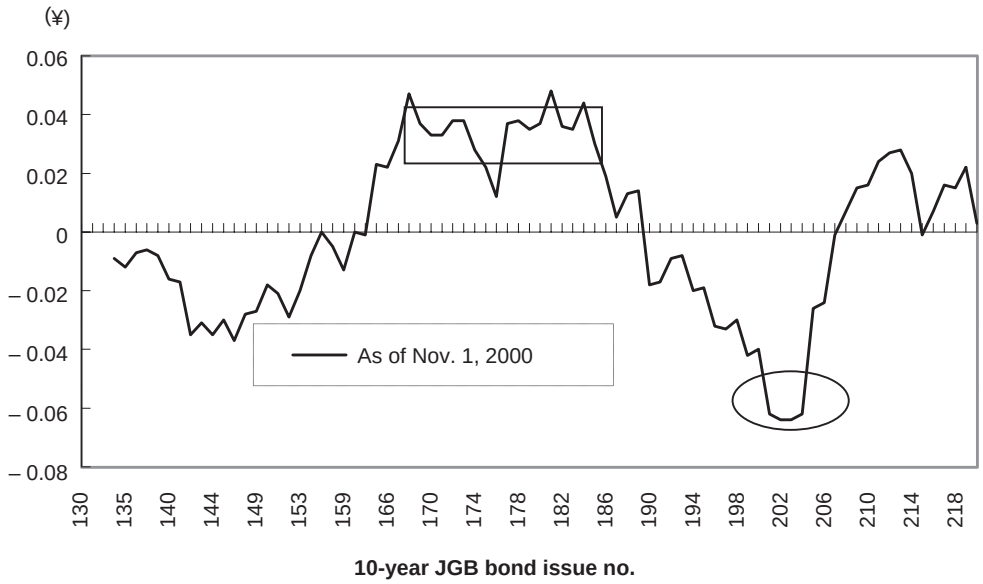
3. Market-Neutral Strategy for Bonds

(1) Selection of Bond Issue

The most critical factor in the market-neutral strategy is to purchase bonds that are undervalued.[1] The prices of these bonds tends to rise more than the market when the market rises, and to decline by less when the market falls.

In Figure 1, which shows bond market data for November 1, 2000, the vertical axis represents deviations of the market price from the fair value. Negative values indicate the amount by which the market price is undervalued below the theoretical price. On the horizontal axis are bond issues arranged by time to maturity. The bonds near bond issue no. 202 (7 years to maturity) show a sharp negative deviation, indicating an undervaluation. On the other hand, bonds near bond no. 170 (3.5 years to maturity) are overvalued.

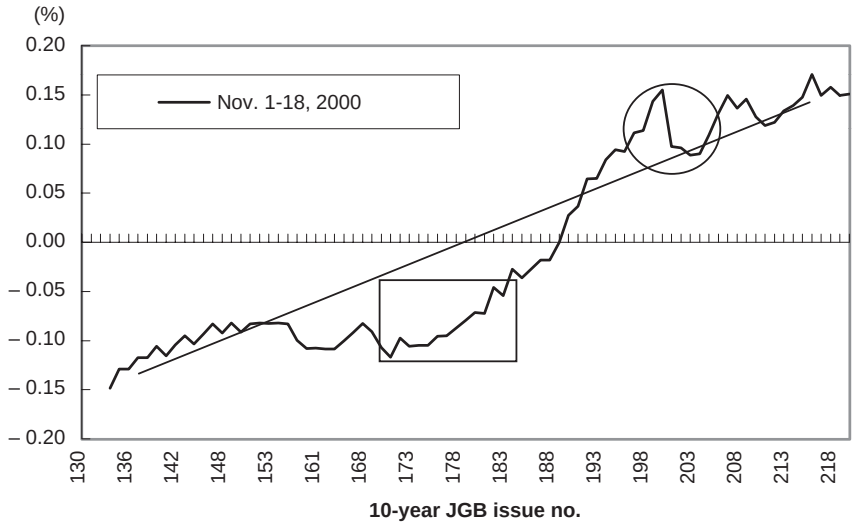
Figure 1 Deviation of Bond Prices From Their Fair Value



Source: NLI Research Institute

Figure 2 shows the change in bond prices one week later. The undervalued bonds have a higher rate of return.

Figure 2 Change in Bond Prices One Week Later



Note: Sloping line represents expected price change in the overall JGB market when there are no discrepancies between market price and fair value.
Source: NLI Research Institute

(2) Hedging with Futures

The next step is to hedge the bond purchase by selling futures. Hedging refers to the selling of assets

(such as futures) whose prices move in tandem with the purchased bonds, thereby reducing the price fluctuation risk of the bond position.

In general, while a short position can be established by short selling cash bonds, trading in bond futures offers higher liquidity and lower transaction costs.[2]

Although market-neutral trading may sound like a newfangled investment approach, the positions involved — going long on cash bonds and selling futures to offset price risks — are exactly the same as with the long basis strategy (which seeks the increasing overvaluation of bonds relative to future prices). The difference is largely semantic, as the long basis strategy seeks an increase in the basis (increasing overvaluation relative to futures), while the market-neutral strategy seeks undervaluations now; the economic effect is essentially identical. In either case, it is imperative to calculate selling positions accurately so that any losses from bonds can be offset by gains from futures. Otherwise, since the price corrections that produce gains from market-neutral trading are small relative to the overall market, significant hedging errors can cause losses immediately.

In the empirical analysis below, the ratio of futures to bonds (hedge ratio) is determined by considering the correlation in price movements between futures and bonds.[3]

For bond price data, we used small lot data from the TSE up through November 1998, and the Japan Securities Dealers Association OTC quotations data from December forward.

4. Empirical Analysis Results

(1) Strategy Outperforms Short-term Interest Rate

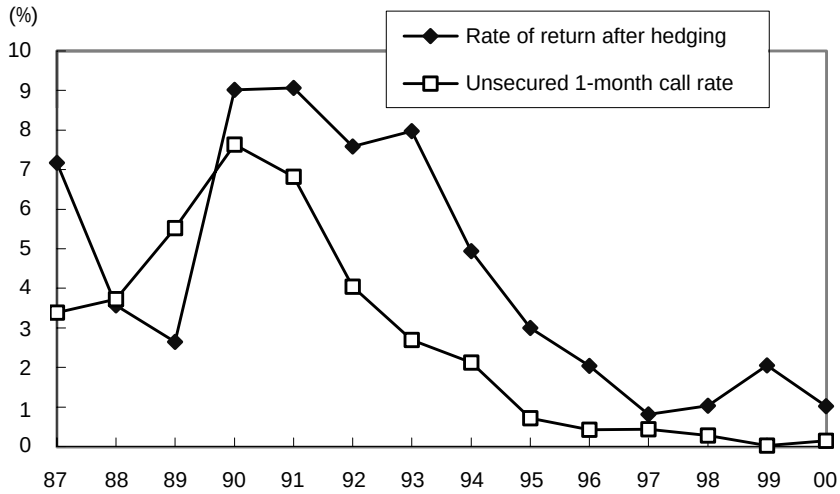
Based on past price movements, we composed a bond portfolio consisting of up to ten individual issues that were significantly undervalued. The positions were hedged using the method described above, and the portfolio was rebalanced monthly. The portfolio’s performance is shown in Figure 3.

We compared the return after hedging with the unsecured 1-month call rate. The choice of this interest rate is based on the following: Since the bond position is hedged by selling futures, and bonds are delivered on the contract settlement date, the resulting rate of return is free of market risk (the implied repo rate) because the futures seller has a right to sell the bonds at the futures contract price; there remains only oppportunity risk. Thus theoretically, the monthly portfolio rebalancing means that this risk-free rate is equivalent to the short-term interest rate of the same maturity; otherwise, arbitrage opportunities exisit.

As such, the short-term interest rate is an appropriate benchmark for judging the additional gains obtained by offsetting market-neutral positions with value-additive opportunities through skillful market timing.

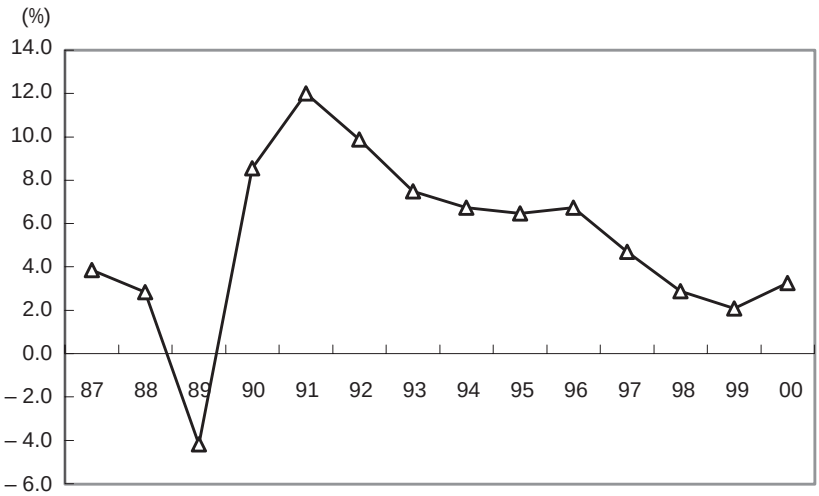
The return after hedging exceeds the short-term interest rate in almost all years. Moreover, although the portfolio underperformed in 1989 when rising interest rates pushed the bond performance index into negative territory, it is remarkable that the absolute return after hedging remained positive throughout the period (Figure 4).

Figure 3 Rate of Return After Hedging and the Short-term Interest Rate



Source: NLI Research Institute

Figure 4 The Bond Performance Index



Source: Composed with data from Nomura Research Institute.

(2) Estimating the Transaction Cost

We next consider bond transaction costs and to what extent they affect portfolio performance.

Most bond transactions are conducted in the overt-the-counter market, where the bulk of transaction costs consist of the spread between bid and offer prices. While government bonds are highly liquid overall, there are differences between different issues. The higher the liquidity of an issue, or the tighter the supply and demand balance, the smaller the price spread tends to be.

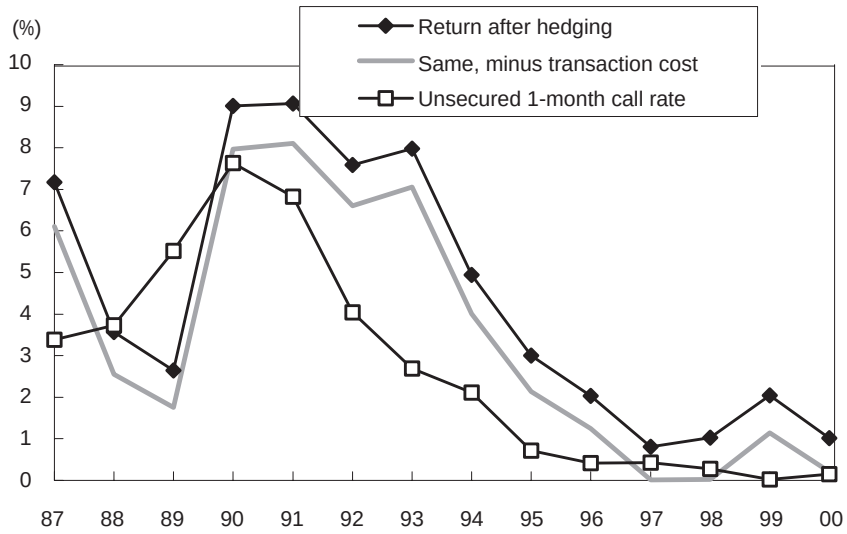
For example, both the OTC standard quotations and the Broker's Broker (BB) JGB prices are average prices calculated from prices reported by securities firms at 3 p.m. (after discarding maximum and minimum values). For issues with low liquidity, which may have only a bid or offer price, the reported price is often estimated by the securities firm. Assuming that this causes large price spreads and variations between the standard quotations and BB prices, we regarded these discrepancies as a reflection of one-sided transaction costs.

For the second half of 2000, the average price discrepancy between standard quotations and BB JGB prices (excluding cases of price equality) was approximately 3.8 basis points for one side of a transaction (less than 0.04 yen per face value of 100).

Although the inclusion of transaction cost reduces the portfolio's return, the Sharpe ratio was still 0.72 on an annual basis.[4] This ratio is an indicator for judging whether returns are appropriate for the risk level.

In general, a Sharpe ratio after transaction costs of 0.7 or better is considered outstanding for active portfolio management (assuming that the distribution of excess returns is normal, the probability of excess negative returns is approximately 24 percent). In this light, the market-neutral strategy described in this paper reveals the possibility for producing excess returns on a consistent basis.

Figure 5 Rate of Return After Transaction Cost



Source: NLI Research Institute.

Notes

1. The judgment of whether a bond price is undervalued is based on its deviation from the theoretical price obtained from a Time-Dependent Markov model. See Tsuda and Kariya, "The Prediction of Bond Prices Using a Time-Dependent Markov Model," *JAFEE Journal* (1995).

2. The transaction cost of futures, which consists almost entirely of commissions, is approximately 3 basis points per two-sided transactions having a face value of around 1 billion yen. As the transaction lot size increases, the cost can decline to 0.5 to 1 basis point.

3. We calculated how much the portfolio moves when the futures market price changes by 1 unit (assuming that it represents the overall price movement of the bond market). For example, if the relationship between the market (as represented by futures prices) and individual securities is given as:

$$R_i = \alpha_i + \beta R_{MKT} + \varepsilon$$

the hedge ratio is then

$$-\beta = -\mathrm{Cov}(R_i, R_{MKT}) / \mathrm{Var}(R_{MKT})$$

where Cov denotes the covariance between individual securities and futures, Var denotes the variance of futures, and R denotes the various returns.

4. The Sharpe ratio is the risk-adjusted excess return, and is calculated as follows.
   (Average excess return above unsecured call rate) / (Standard deviation of excess return)