BOND EXCHANGE OF SOUTH AFRICA

PRICING BUY/SELL-BACKS IN SOUTH AFRICA

This document provides the pricing specification for Buy/Sell-Backs on the Bond Exchange of South Africa (BESA).

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1 INTRODUCTION

This document provides the specification of how the Bond Exchange trade capture system (BTB) calculates the All-in price values of Buy/Sell-backs on the Exchange. It is important to note that many market participants use the words “Repo”, “Buy/Sell-back” and “Carry” interchangeably; however there are some distinct differences between them.

Although this document is focussed on providing the pricing specification for Buy/Sell-back’s, we will briefly introduce and explain the concept of Repos.

1.1 Overview

A Repo (short for “sale and repurchase agreement”) is simply a collateralised loan where one party is borrowing cash and promises to return it at a pre-specified date with interest, and puts up bonds as collateral.

The word collateral is used very loosely in the financial markets and is used in certain contexts to mean that something is temporarily given as a guarantee without the change in ownership. This is not the case with a Repo transaction. In a Repo transaction, the ownership of the securities does pass from one party to the other. The effect of this is that if the seller defaults on the cash repayment, the buyer does not need to establish his or her right to the collateral.

The Repo is essentially a transaction whereby the two parties agree to do two deals as a package. The first is a purchase or sale of a security – often a government bond – for delivery straight away (usually T+2). The second deal is a reversal of the first deal, for settlement on some future date. Because it is understood from the outset that the first deal will be reversed, it is clear that both parties intend the transfer of securities (in one direction) and the transfer of cash (in the other direction) to be temporary rather than permanent.

The terms “securities” and “collateral” are generally interchangeable. To further confuse things it is customary to say that the party looking to borrow money is transacting a Repo, whereas the party looking to obtain securities is executing a Reverse Repo; i.e. for every transaction, one party’s Repo is another party’s Reverse Repo (both are the same transaction viewed from two different perspectives).

The Repo is structured so that the economic benefit of owning the securities – income and capital gains/loss – remains with the original owner. The price on the first leg of a Repo is the market value of the collateral \ security at the time of trade. The price on the second leg is the first price plus the Repo interest. The interest rate negotiated is often called the “carry” rate or Repo rate. The prices for both the original sale and the subsequent repurchase are agreed at

the outset. The difference between these two prices is calculated to be equivalent to the cost of borrowing "secured" money.

Repos are driven by either the need to lend or borrow cash, collateralised by securities, or the need to borrow specific securities (this is expanded upon later).

1.2 Documentation

The words REPO, classical REPO, ISMA REPO (now ICMA REPO), carry and Buy/Sell-back are often used interchangeably in the financial markets; however they mean different things legally**.** A classical REPO and an ICMA REPO are the same thing; the Buy/sell-back is different to the above and the term carry is a general term referring to either of the terms above (its roots come from the forward market e.g. the cost of carrying gold – storage cost, transport etc.)

The majority of the Repo's or even Buy\Sell-back transactions are now conducted under a legal agreement called the TBMA \ ISMA Global Master Repurchase Agreement (GMRA) (TBMA stands for "The Bond Market Association", ISMA stands for "International Securities Market Association - they merged with the International Primary Market Association to become the International Capital Markets Association.) The agreement used to be called the PSA \ ISMA GMRA (PSA stands for Public Securities Association, which became TBMA). This agreement is a global norm and caters for both Repo's and Buy/Sell-back's. If counterparties have not signed any legal documentation (such as the TBMA \ ISMA agreement) the transaction will fall under common law and be treated as a Buy/Sell-back whereby the two legs of the deal (although dealt simultaneously), are treated as two separate transactions rather than one from a legal perspective. The economics of the deal are the same, except when a coupon payment is involved.

It is becoming the norm to sign the TBMA \ ISMA agreement to govern both Repos and Buy/Sell-back's globally for numerous reasons, the most important ones being offset in the case of default and the treatment of capital adequacy.

1.3 Coupon Payments

Since ownership of the collateral passes to the counterparty for the period of the Repo, the counterparty will receive the coupons or partial redemptions due. However, this counterparty is holding the security only as collateral; the financial reward from the transaction comes from interest on the cash loan, which the counterparty will receive through the difference in prices between the first and second legs of the Repo. In a classical Repo or TBMA \ ISMA Repo, the coupon is passed back to the original owner of the collateral i.e. the counterparty will make a payment (equivalent to the coupon amount) back to the original collateral owner on coupon payment date. This is not the case with a Buy/Sell-back. The consequences of a

coupon payment are included as part of the price of the second leg of the transaction and agreed up-front rather than passed on separately to the counterparty when the issuer pays the coupon. In other words the counterparty would return the bonds on the second buy/sell-back date in return for their cash plus interest due minus any coupons and interest that could have been earned on the coupons.

1.4 Securities Lending

Where a Repo is driven by the buyer's need to invest cash, the exact nature of the collateral is not important. Clearly it needs to be of adequate quality and government securities are by far the most widely used. It is not, however, important to the buyer exactly which government bond is received as collateral. In some cases, however, a Repo is driven on the buyer's side by the need to borrow a particular bond as a result of being short of that bond. In this case, the collateral delivered must be that particular bond rather than any other and is called 'special', as opposed to 'general collateral' (abbreviated as "GC"). The extent to which any particular security becomes special depends on the supply and demand for that security. A seller who is aware that the security being requested by the buyer is in particularly short supply is able to negotiate a lower interest rate for the cash he or she is taking through the Repo. The more special the security, the lower the Repo interest rate. Thus, if a particular security is 'expensive' for the buyer to borrow, this implies a lower rather than a higher Repo rate.

It may be that the lender of the security does not wish to borrow cash as they may be already cash-rich. Therefore to borrow more cash than is needed to place on deposit would probably cost him or her the bid-offer spread. Nevertheless, the lender wishes to take advantage of the fact of owning a security in short supply. Such a lender simply lends the securities for a fee. However, because the lender wishes to be secured against default by the borrower, he or she also takes collateral from the borrower, also in the form of securities. The exchange, therefore, becomes a loan of special against a loan of general collateral, with the lender of the special earning a fee, and is known as "securities lending" or "stock lending". If a coupon, or other payment such as a partial redemption, is payable on the security lent during the transaction, the treatment is the same as in a Classic Repo or Buy/Sell-back as the case may be.

1.5 Benefits of Repos

For lenders of cash, a Repo has the advantage of double security - if a counterparty defaults, they can rely on the collateral. They can therefore look to the creditworthiness of both the counterparty and the issuer of the collateral. For borrowers of cash, the advantage is that they can make use of an investment in their portfolio to borrow funds either more cheaply, or which they might not otherwise be able to borrow at all. In addition, Portfolio managers can enhance return on their portfolios via Repos. The way they do this is to conduct a Repo

transaction whereby they give out the securities they have in their portfolio in return for cash. They then either lend the same cash out at a higher rate to their clients or undertake investments which yield higher returns.

Repos are also used to facilitate short selling or for taking a forward position in bonds. For example, if you expect interest rates to decrease, over a period of a week, you would buy bonds now for settlement (T+3). You could then also undertake a one week Repo whereby the first leg coincides with the spot settlement. Therefore, on the first settlement date you are required to deliver cash in return for bonds in the spot transaction and are required to receive cash in return for bonds in the first leg of the Repo transaction, therefore your net position for the spot settlement date is zero and you have an obligation to deliver cash plus interest in one week's time in return for bonds for the second leg of the Repo. This is the same as undertaking a forward settlement bond transaction.

The above sections were adapted from "Mastering Repo Markets", by Robert Steiner, FT Market Editions, 1996. For a more detailed overview of Repos, Buy/Sell-backs and securities lending please refer to the above reference.

2 METHODOLOGY TO CALCULATE THE ALL-IN PRICE OF BUY/SELL BACKS

The fundamental difference between the existing South African convention and that of TBMA\ISMA Buy Sell-backs is that in SA we inherited the historical method whereby "brokers" used to "carry" their position on a weekly basis (Thursday to Thursday) for more or less than half a basis point per week. Trades were therefore captured onto the system on a yield basis. As a result, the practice today is to calculate the first leg of the Buy/Sellback based on the market YTM; the second leg is calculated by adding the Buy/Sellback interest to the value of the first leg to generate the value for the second leg (for *TBMA\ISMA agreement Buy/Sellbacks this is where the process ends*); we then iterate back the closest yield to the value of the second leg and use this yield to re-calculate the value of the second leg, which could result in a difference (due to the iteration and rounding) compared to the value before the iteration took place.

2.1 Pricing Buy/Sell-Backs

The calculation of the first leg of the Buy/Sell-back is simply the All-in price of the bond as calculated in "Bond Pricing Formula Specifications", dated 24 August 2005. A copy of this document can be downloaded from BESA's website - htttp://www.bondexchange.co.za. Calculation of the second leg of the Inflation Linked Buy/Sell-back is divided into four steps namely:

1. Adding the Repo interest to the All-in price calculated on the first settlement leg
2. Adjusting for the impact of any future coupons.
3. Iterate back the closest yield corresponding to the calculated second leg All-in price.
4. Use this yield to recalculate the second leg of the Buy/Sell-back.

2.1.1 Steps 1 & 2

$$AIP_2 = AIP_1 \times \left(1 + \frac{r}{100} \times \frac{d_2 - d_1}{365}\right) - \frac{CPN}{2} \times \sum_i EV_{cd_i, d_2}$$

Where:

$$EV_{cd_i, d_2} = \frac{1}{1 + \frac{r}{100} \times \frac{cd_i - d_2}{365}} \quad \text{if } d_2 < cd_i \quad \text{and } d_2 \text{ is in the ex period.}$$

$$EV_{cd_i,d_2} = 1 + \frac{r}{100} \times \frac{d_2 - cd_i}{365} \quad \text{if } d_2 \geq cd_i$$

d_1 = First settlement date

d_2 = Second Settlement date

Note that $d_2 > d_1$ as per market convention.

r = Buy/Sell-back rate (Repo rate) expressed as simple rate and for example 8% would be represented as 8.

cd_i = This is the set of coupon dates which affect the Buy/Sell-back. In other words the person who hands over the bonds as collateral in return for putting cash on deposit at the "Repo" rate is still entitled to receive the coupons from the collateral (our bonds); we therefore account for these coupon payments in the second leg of the Buy/Sell-back. If there are no coupon consequences then cd_i will be zero and we would ignore the second term in the equation. i=1 refers to the next coupon date and i=2 would refer to the following coupon date etc;

EV = Equivalent value. If the second leg of the Buy/Sell-back falls in the bonds ex period, then we discount the coupon back to d_2 and subtract it from the proceeds to be paid to the counterparty as they will receive the next coupon. If on the other hand, the second leg of the Buy/Sell-back follows a coupon date and the counterparty receives the coupon, we subtract not only the value of the coupon but also the interest we could have earned on the coupon (using the "Repo" rate for the interest calculation). If the Buy/Sell-back spans many coupon dates, we would subtract each respective coupon and the interest we could earn on each respective coupon up to the second leg of the Buy/Sell-back.

CPN = Annual Coupon.

The above formula's were taken from "BUY/SELL BACK (carries) AND FORWARD PRICING GUIDELINES", produced by Quant Financial Research, 10 November 1997.

2.1.2 Step 3 & 4

To iterate back the yield corresponding to AIP_2 we can use any of a number of numerical methods. For more information on the process of iteration, please refer to the "Bond Pricing Specification." We use this yield iteration to calculate the final value of the All-in price of the second leg.

3 EXAMPLES OF BUY/SELL BACKS

What are the All-in prices of a R186 Buy/Sell-back for settlement 08 June 2006 to 29 June 2006 with a "Repo" rate of 6.5% and the spot level of the R186 (for value 08 June 2006) is a yield to maturity of 7.15% ? The R186 details are as follows:

R189 Details	
Coupon Rate	10.5
Maturity	21 December 2026
Interest Payable1	21-June
Interest Payable2	21-December
Books Closed1	11-June
Books Closed2	11-December

We first have to determine the All-in price as per the bond pricing specification on 8 June. A R186 bond trading at a ytm of 7.15% for value 08 June 2005 produces and All-in price of R140.65075

We can now calculate the All-in price for the second leg of the Buy/Sell-back:

$$AIP_2 = \underbrace{R140.65075}_{AIP_1} \times \underbrace{\left(1+\frac{0.065\times 21}{365}\right)}_{\text{Repo interest}} - \underbrace{5.25}_{\text{Semi -annual coupon}} \times \underbrace{\left(1+\frac{0.065\times 8}{365}\right)}_{\text{Interest on the coupon}} = R135.919265818...$$

We now need to iterate back a second yield.

The iteration then produces the closest yield of:

7.15322	135.91935
7.15323	135.91922
7.15324	135.91904

Therefore the AIP_2 of R135.91922 is used to calculate the consideration of the second leg of the Buy/Sell-back as it is the closest iteration.

Example 2

What are the All-in prices of a R186 Buy/Sell-back for settlement 08 June 2006 to 15 June 2006 with a "Repo" rate of 6.5% and the spot level of the R186 (for value 08 June 2006) is a yield to maturity of 7.15%? Using the data from the table and the calculations from the previous examples a R186 bond trading at a ytm of 7.15% for value 08 June 2005 produces and All-in price of R140.65075

Therefore, we can now calculate the All-in price for the second leg of the Buy/Sell-back:

$$AIP_2 = \underbrace{R140.65075}_{AIP_1} \times \underbrace{\left(1 + \frac{0.065 \times 7}{365}\right)}_{\text{Repo Interest}} - \underbrace{5.25}_{\text{Semi-annual coupon}} \times \underbrace{\left(\frac{1}{1 + \frac{0.065 \times 6}{365}}\right)}_{\text{Discounted coupon}} = R135.581685\ 358...$$

We now need to iterate back a second yield.

The iteration then produces the closest yield of:

7.15112	135.58188
7.15113	135.58175
7.15114	135.58161

Therefore the AIP_2 of R135.58175 is used to calculate the consideration of the second leg of the Buy/Sell-back as it is the closest iteration (only just!).

Example 3

What are the All-in prices of a R186 Buy/Sell-back for settlement 01 June 2006 to 08 June 2006 with a "Repo" rate of 6.5% and the spot level of the R186 (for value 01 June 2006) is a yield to maturity of 7.15%? Using the data from the table and the calculations from the previous examples a R186 bond trading at a ytm of 7.15% for value 01 June 2005 produces and All-in price of R140.46086

$$AIP_2 = \underbrace{R140.46086}_{AIP_1} \times \underbrace{\left(1 + \frac{0.065 \times 7}{365}\right)}_{\text{Repo Interest}} = R140.635955\ 0446...$$

Since there are no coupons involved, as the seller receives the coupon, the formula is considerably simpler.

The iteration then produces the closest yield of:

7.15109	140.63605
7.15110	140.63591
7.15111	140.63578

Therefore the AIP_2 of R140.63591 is used to calculate the consideration of the second leg of the Buy/Sell-back as it is the closest iteration.

Example 4

What are the All-in prices of a R186 Buy/Sell-back for settlement 12 June 2006 to 19 June 2006 with a "Repo" rate of 6.5% and the spot level of the R186 (for value 12 June 2006) is a yield to maturity of 7.15%? Using the data from the table and the calculations from the previous examples a R186 bond trading at a ytm of 7.15% for value 12 June 2006 produces and All-in price of R135.51849

$$AIP_2 = R135.51849 \times \left(1 + \frac{0.065 \times 7}{365}\right) = R135.687424\ \ 00808..$$

Again, the calculation of the second leg All-in-price is considerably simplified as no coupons are involved in the transaction.

The iteration then produces the closest yield of:

7.15105	135.68755
7.15106	135.68742
7.15107	135.68728

Therefore the AIP_2 of R135.68742 is used to calculate the consideration of the second leg of the Buy/Sell-back as it is the closest iteration.

4 BIBLIOGRAPHY

"Mastering Repo Markets", Robert Steiner, FT Market Editions, 1996.

"BUY/SELL BACK (carries) AND FORWARD PRICING GUIDELINES", Quant Financial Research, 10 November 1997