

CEEMEA Fixed Income Strategy

Using asset swap spreads to identify government bond relative-value

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- We provide an introduction to government bond asset swaps, explaining their basic mechanics
 - The use of asset swap spreads in identifying and capturing relative value is discussed
 - The market drivers of asset swaps spreads are examined
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Yield spreads between government bonds and interest rate swaps are increasingly being used as measures of bond relative value in CEEMEA fixed income markets. Moreover, this value is now being captured through the trading of government bond asset swaps.

In its most basic form, a government bond asset swap is a package consisting of the fixed-rate cash flows of the bond, and an agreement to use an interest rate swap to exchange these cash flows for a series of floating-rate payments. These payments usually float with an index rate such as LIBOR. Effectively by using the swap curve to create a set of equal and opposite fixed-rate cash flows we create a synthetic floating rate note (FRN).

Asset swaps are ideal for expressing relative-value views. The matching of fixed-rate cash flows limits exposure to the overall level of interest rates and incorporates coupon effects. Furthermore, both positions will roll down the curve at the same rate, limiting exposure to curve shape. At any point the NPV of the asset swap package will be determined by cost of unwinding the swap and selling the bond - a value driven by the yield spread between bonds and swaps and termed the *asset swap spread* of the bond.

This note is broken into five sections. Section 1 reviews the mechanics of a government bond asset swap, interpreting the asset swap spread, and the types of asset swap available to investors. Section 2 provides an overview of the CEEMEA asset swap market.

Section 3 studies the use of asset swaps in identifying and capturing relative value. Section 4 analyzes factors that influence asset swap spreads, and Section 5 summarizes our conclusions. Appendix 1 covers the calculation of the asset swap spread.

1. Mechanics of a bond asset swap

The process of constructing a bond asset swap package is represented in Figure 1.1. The dealer buys the bond in the market for the dirty price of the bond, and puts together a swap for fixed flows against floating with a constant spread added to the floating payments, and sells the entire package to the client. It is possible that the client is the original owner of the bond.

After buying the package, the client owns the bond, and will receive the bond cash flows from the issuer of the bond. The fixed leg of the swap is set-up to exactly match the cash flows for the bond. Thus the fixed leg is assumed to contain a principal repayment equal to the bond's principal repayment. Hence from the client's perspective the fixed flows cancel out.

Whereas a plain vanilla interest rate swap has zero cost, apart from credit charges, the price of an asset swap package will be related to the price of the underlying asset. The cost of an asset swap will be driven by the difference in the present value of the bond's fixed cash flows and the present value of the swap's fixed cash flows that replicate them. In market terminology this payment is quoted in the form of a constant spread added to the reference floating index rate (typically LIBOR) over the life of the package - this is the asset swap spread. The client then receives a regular stream of floating cash flows, with the asset swap spread added. This emulates the payments one gets when buying a FRN issued by the same reference

entity, with the asset swap spread analogous to the discount margin of the FRN.

For example, in the case of a Polish Government Bond (POLGB) this will involve exchanging an annual fixed-rate coupon for a semi-annual floating cash flow indexed on 6-month WIBOR.

The notional amount will be exchanged at maturity (since the fixed leg also contains a principal payment at maturity). Thus if the index rate is i , asset swap spread s , accrual period t and the notional amount n , then each floating cash flow would be $(i+s)*t*n$.

The cornerstone of any interpretation of an asset swap spread, is that it represents a credit spread. In G7 markets, government bond yields represent the funding rate for the highest quality credit. Governments can monetize their debt (printing money to pay local currency obligations), legislate or tax to repay their debt. Swaps represent bank credit - the average funding rate for inter-bank deposits over the tenor of the swap. This stream of forward deposits will fluctuate over time - driven by expectations of future interest rates, but also including a risk premium driven by the volatility of future interest rates and the credit quality of the bank fixing panel. Unlike a funded bond position there is no principal risk, but nonetheless swap pricing still contains the inherent default risk from a stream of forward cash flows. As such a swap curve represents a generic term structure for the prevailing bank credit of the fixing panel. In G7 markets, bank credit in the fixing panel is typically rated AA, and it is no surprise that government-swap spreads are closely related to AA corporate bond spreads.

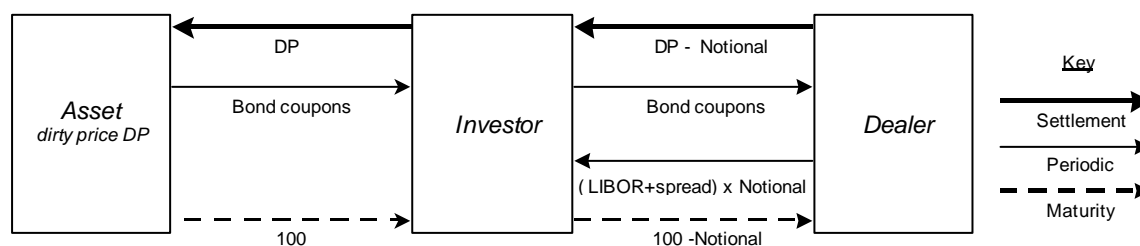
In theory therefore we can view the asset swap spread of a bond as quantifying the bond's credit risk relative to a generic bank credit (LIBOR). A generic AA rated asset will have a zero asset swap spread, while an asset with lower credit quality should have a positive asset swap spread to compensate for the additional credit risk. Conversely, an asset with greater credit quality should have a negative asset swap spread, as the investor should be prepared to give up yield given the lower credit risk. Figure 1.2 summarizes this.

As we previously explained an asset swap package is essentially a synthetic FRN. Like FRNs, the interest sensitivity of an asset swap is very small, and investors funding through LIBOR deposits can immunize themselves from residual interest-rate risk associated with the LIBOR re-fixings. Investors are then solely exposed to market variations in the value of the asset swap spread. In the corporate bond market the asset swap spread of the bond is very highly correlated with the spread on a credit default swap with equivalent tenor and reference entity. Note that the client is still liable for an open swap position if the bond issuer goes into default.

Figure 1.2: Theoretical asset swap spread versus asset credit quality

Asset credit quality	Asset swap spread
Greater than fixing panel	< 0 (LIBOR - x bp)
Comparable to fixing panel	= 0 (LIBOR flat)
Inferior to fixing panel	> 0 (LIBOR +x bp)

Figure 1.1: Mechanics of a bond asset swap



While credit risk is a component of government-swap spreads, it is difficult to ascribe the complete value, nor the large volatility in such spreads, to this. Other factors such as yield level, curve shape, supply-demand, and liquidity complicate this simple interpretation. We will examine some of these factors in Section 4.

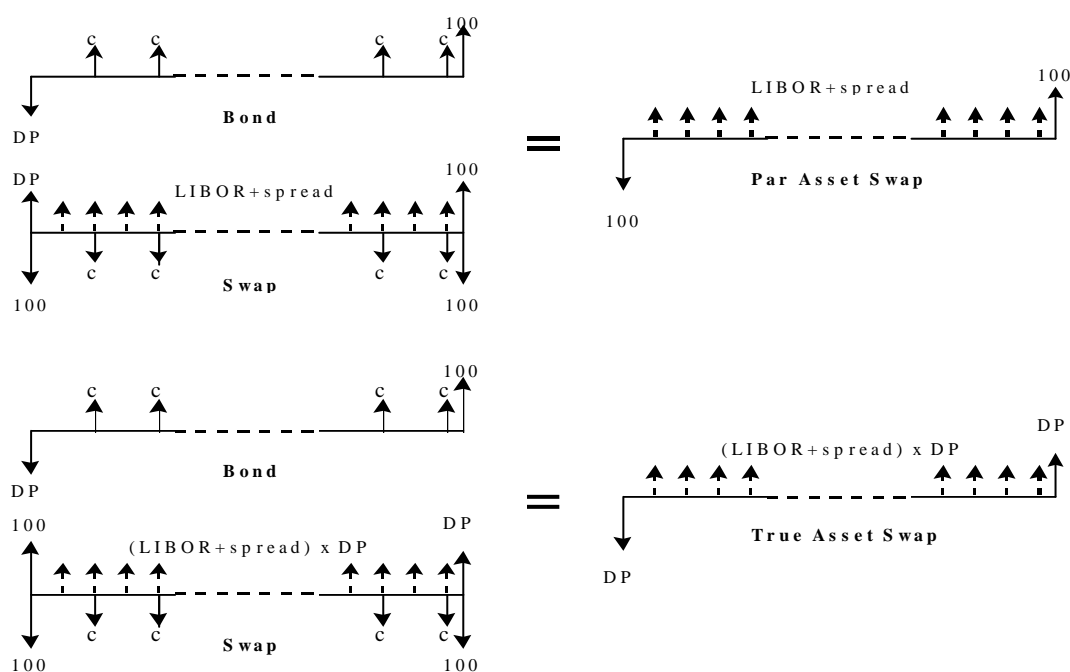
Investors can transact a variety of packages

- *Par asset swaps* - the price of the complete package and the notional are fixed at par. Typically there will be an up-front exchange of cash flows to compensate for the non-par price of the bond. Par asset swap packages are transacted more commonly than any other asset swap. See Figure 1.3 (top).
- *True asset swaps* - the price of the complete package and notional are fixed at the dirty price of the bond. These are also known as market-value asset swaps. See Figure 1.3 (bottom).

- *Cross-currency asset swap*: the package is arranged so that the fixed and floating payments are made in different currencies. This package is achieved by combining the asset swap with a basis swap. Cross-currency asset swaps can be an efficient vehicle for exploiting relative-value opportunities across both currencies and assets.

A basis swap involves receiving floating payments indexed off short-term rates in one currency and paying floating rates indexed off short-term rates in another currency, together with an final exchange of principle. It is usual to quote a basis swap for a currency against US\$, and it is expressed as the spread over/under LIBOR on the non-\$ leg that one would pay/receive for \$ LIBOR flat. For example if the 5-year PLN/\$ basis swap is quoted -25bp/+5bp, then one would receive WIBOR -25bp for paying \$LIBOR flat, and pay WIBOR+5bp, for receiving \$LIBOR flat. Basis swap pricing is a function of the supply-demand differential for liquid forms of the currencies involved.

Figure 1.3: Cash flow structure of par and true asset swap packages



2. Overview of CEEMEA asset swap markets

Government bond asset swap markets, with the asset swap traded as a single product, exist in the Czech Republic, Poland and South Africa. Given that the Hungarian market was only liberalized recently, the swap market is as yet too illiquid to support an effective bond asset swap market.

Asset swap packages are usually constructed at par, with the swap leg priced at or close to mid-market. This substantially reduces transaction costs, making the active trading of bond asset swaps practical.

Czech Republic: The small size of the bond market and a lack of foreign investor interest limit the depth and liquidity of the asset swap market. Due to the small size of the Czech Government Bond (CZGB) market, bonds typically trade rich to swaps.

Poland: The Polish bond market is relatively liquid, except for the 10-year bond and swap sector, where transaction costs are larger, and periods of illiquidity can occur. Typically bonds have traded rich to swaps, though recently this behavior has changed.

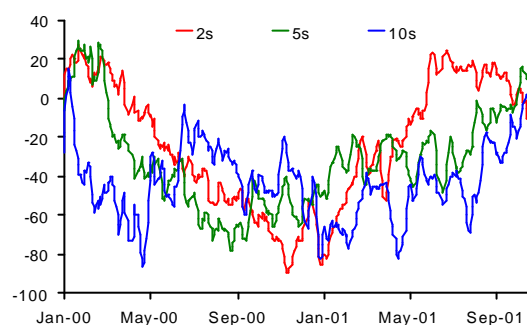
- Short-end T-Bills and 2-year Polish Government Bonds (POLGBs) can trade rich due to strong domestic demand from buy-and-hold investors.
- The 5-year off-the-run bonds usually trade the widest to swaps due to a combination of large outstanding issuance and relative illiquidity. The 5-year benchmark bond's asset swap spread can be very volatile, given its favored status with local banks and offshore leveraged investors as a short-term positioning vehicle.
- Long-end, 10-year POLGBs, typically trade rich due strong demand from Euro-convergence funds and domestic life-assurance companies

As can be seen in Figure 2.1 Poland's asset swap market is relatively volatile, with monthly moves of 20bp to 40bp not uncommon.

South Africa: The asset swap market is the less volatile than Czech or Poland. While both swap and bond liquidity is high, the tendency for swap market-makers to hedge positions with liquid bond issues such as the R150 and R153 can in effect "lock" the bond-swap basis. As can be seen in Figure 2.2, over the period Jan-99 to Nov-01 the R150 asset swap spread widened around 30bp, while the R153 asset swap spread remained range-bound. Furthermore, the three-legged nature of South African Government Bonds (SAGBs) and lack of a reliable 3-month fixing also complicates the structuring of asset swap packages.

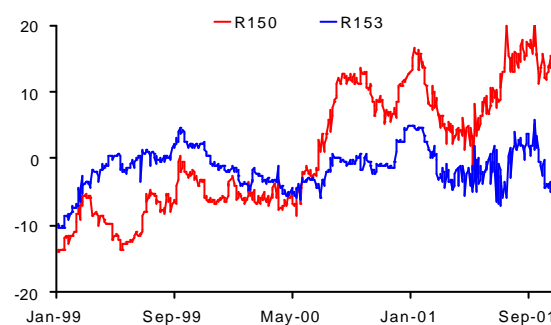
Most SAGBs trade flat to cheap against swaps, though the long-end R186 asset swaps rich due to a strong domestic demand for duration.

Figure 2.1: POLGB 2, 5, & 10-year par asset swap spreads, Jan-00 to Nov-01



Source: SalomonSmithBarney

Figure 2.2: SAGB R150 & R153 par asset swap spreads, Jan-99 to Nov-01



Source: SalomonSmithBarney

3. Relative-value analysis using asset swaps

The essence of relative-value analysis is replication of cash flows at cheaper cost - usually by taking "basis risk". This contrasts with yield curve analysis that is centered on the valuation of mismatched cash flows. Asset swaps are ideal for relative-value analysis of government bonds because the process of constructing a synthetic FRN creates a level playing field.

- For government bonds there are no variations in credit risk
- By replicating bond's fixed cash flows with swaps, we hedge mismatches in
 - coupon
 - interest-rate duration (directional risk)
 - curve exposure
- The asset swap package can be transacted¹.

By removing a significant number of potential sources for anomalies, then any residual variations must be attributed to factors such as liquidity or supply-demand.

In G7 markets government asset-swaps are already an established way for market participants to measure and capture relative-value between swap and government bond markets. Indeed in the Euro-area the swap curve provides the only homogenous term structure available, and because of this asset swap spreads have become the most common tool applied in relative value analysis of government bond markets.

The simplest form of relative value analysis can be achieved by tracking the asset swap spread (we abbreviate this to ASW) of a number of bonds in a similar maturity sector over time. The objective is to identify a bond that has a current asset swap spread

that is anomalous to both its own history and that of its peers.

We can track this cheapness/richness using a *Z-score*

$$Z - score = \frac{Current\ ASW - Average\ ASW}{Standard\ Deviation\ of\ ASW}$$

Typically the Z-score will be measured by using daily observations over a 3-month to 6-month period. A positive number denotes that the bond is trading cheap to its historic range, and, conversely, a negative number denotes it is trading expensive. For example, assuming asset swap spreads are normally distributed then a Z-score of +1 denotes that the bond's asset swap spread is 1 standard deviation cheap to its historical range, while a Z-score of -2 denotes that a bond's asset swap is 2 standard deviations expensive to its range.

Example: In Figure 3.1 we show the par asset swap spreads of bond in the 5-year sector of the POLGB curve. The Z-scores are as follows

POLGB	Jun-05	Oct-05	Feb-06	May-06
Z-score	+0.1	+0.7	+0.3	-1.7

As can be seen, the POLGB 8.5% May-06, is trading rich to other bonds. This is to be expected given that it had benchmark status. However, in this case it was trading almost 2 standard trades expensive to its own history, while other bonds are trading fair to slightly cheap to their own trading ranges.

This anomaly can present an opportunity for investors:

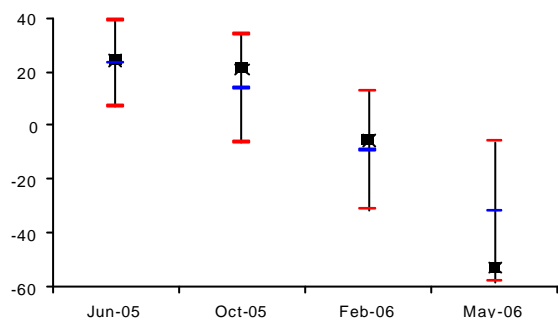
Real-money investors: sell May-06s and buy a cheaper 5-year off-the-run, such as the POLGB 8.5% Oct-05 or POLGB 8.5% Feb-06. This provides a yield pick-up and avoids a capital loss against the rest of the 5-year sector if the May-06 cheapens up.

Leveraged investors: as a directional trade investors can reverse asset swap the POLGB 8.5% May-06 - selling the bond short and receiving swaps. As a

¹ This can be contrasted with bond par curves, where choices over bond selection and curve construction algorithm are required. Moreover, any relative value observed is often impossible to capture.

relative value trade an investor can reverse asset swap the May-06, and asset swap the Oct-05 or Feb-06. This would be a positive carry trade, with the objective to net a positive capital gain from "mean-reversion" of the Oct-05/May-06 asset swap spread differential to more historically typical levels.

Figure 3.1. POLGB asset swap spreads, July-6, 2001. Spot value, 3-month average and 2 standard deviation bands



Source: SalomonSmithBarney

Financing risk: As synthetic securities, asset swaps require the purchase of a specific asset. For funded investors the financing cost of such an asset over time (the cost of carry) will affect the P&L of such a position. Financing can be obtained from a number of sources: FX forwards, term deposits, or the repo market (buy/sell market).

The cost of carry can be approximated to be:

$$\text{Carry} \approx \text{Asset Swap Spread} + \text{LIBOR} - \text{FundingRate}$$

If the purchaser of the asset swap package happens to fund the bond at LIBOR then effectively they will immunize the floating cash flows and simply earn the asset swap spread. The funding levels of the purchaser will be critical in a decision about what asset swap spread will represent value.

Example: An investor can fund in the South African market at 3-month JIBAR -20bp. The R150 has an asset swap spread of +18bp. After taking funding into account the investor can place the R150 on the balance sheet at a running spread of +38bp. This may or may not be considered a worthwhile investment depending on the investor's view of South Africa's sovereign

local currency credit risk, swap counter-party risk and the direction and volatility of the government bond-swap basis.

Forward asset swaps spreads: The repo market can offer beneficial funding rates over LIBOR deposits or the FX forward market. However, if the bond is funded through repo, rather than LIBOR, then the purchaser is now exposed to both the basis risk between swap curve and bond curve, but in addition between repo market and LIBOR. We can break this financing basis between the repo rate and LIBOR into two pieces:

- A repo rate analogous to General Collateral for a generic bond funding
- A special repo rate for a specific bond.

The importance of bonds trading special in the repo market should not be underestimated. A special repo rate demonstrates there is additional demand to borrow bonds, and hence it can be funded at lower rates than GC. Participants who are currently short usually drive this additional demand for the bond. For this reason the specialness of a bond is a good indicator of the supply-demand in a market. As such it will be a key driver for outright yield differentials: special bonds often yield less, and consequently asset swap more expensively. Hence while a bond may trade expensive on a spot asset swap basis, it may also trade special in the repo market. The interplay of these two effects will impact the cost of carry. To capture the effect of actual funding of each bond and hence the basis between the special and GC repo rates we must evaluate the forward asset swap spread of each bond. This will capture any financing bias and allow us to identify the cheapest bond to asset swap.

We can approximate the forward asset swap spread using:

$$\text{ForwardASW} \approx \text{SpotASW} + \frac{(\text{Libor} - \text{Repo}) \times \text{Time}}{\text{ModDuration}_{\text{Forward}}}$$

As can be seen from the above formula, shorter duration bonds will have more attractive break-evens

for the same funding advantage. However, the potential for capital gain will be smaller due to the lower PVBP.

Example: During August 2001, repo rates on benchmark 5-year bond, POLGB 8.5% May-06, averaged 10% for up to 1-month. During this period, 6-month WIBOR averaged 14.0%. The spot asset swap spread of the bond was WIBOR flat. The cost of carry and forward asset swap spread were then

$$\text{Carry (May-06)} = +33\text{bp/month}$$

$$\text{Forward ASW (May-06)} = +11\text{bp}$$

We can compare this with an older, less liquid bond such as the POLGB 8.5% Oct-05. This bond averaged 13.50% in repo, with spot asset swap spread of WIBOR+8bp. For this bond the carry and forward asset swap spread were:

$$\text{Carry (Oct-05)} = +4\text{bp/month}$$

$$\text{Forward ASW (Oct-05)} = +9\text{bp}$$

The Oct-05 bond has a breakeven cushion of only 1bp per month, while the May-06 has an 11bp breakeven cushion per month. While the May-06 is more expensive on a spot asset swap basis, for an investor who can access the repo market it is a cheaper bond to own.

"Optical" swap spreads versus asset swap spreads: It is very important to distinguish between the asset swap spread of a government bond and the swap spread. The swap spread is simply calculated by subtracting the swap yield interpolated to the same maturity as the bond from the bond yield (hence it is "optical"):

$$\text{Swap spread} = \text{Interpolated Swap Yield} - \text{Bond Yield}$$

A movement in the bond-swap basis can be expressed in terms of a change in the swap spread or a change in the asset swap spread. The use of these two types of measure together has been known to cause some confusion. For an optical swap spread we measure the interpolated swap yield using the bond yield as the reference frame. For an asset swap spread we measure

the bond yield using the swap curve as the reference frame. As a result we get the following relations

$$\text{Bond outperforms swap} \Rightarrow \text{Swap spread widens} \\ \text{Asset swap richens (tightens)}$$

$$\text{Bond underperforms swap} \Rightarrow \text{Swap spread narrows} \\ \text{Asset swap cheapens (widens)}$$

Interpolating against an equivalent maturity swap can be highly misleading. While tenor is matched, it does not match coupons, duration or curve sensitivity. Such a position will be far more sensitive to yield level and curve shape than an asset swap package. Interpolating the swap rate on a duration equivalent basis, rather than maturity equivalent basis, will improve the approximation but will still not be as accurate as an asset swap spread.

The differences between optical swap spreads and asset swap spreads will become most apparent under the following conditions

- The bond's dirty price is substantially above or below par due to coupon effects.
- The swap zero curve is particularly steep, particularly inverted, or even humped.

Example: As can be observed in Figure 3.2, the biggest difference, 13bp, between asset swap spreads and optical spreads is found on the POLGB 0% Apr-03. With a zero coupon, the bond trades at a significant discount (a price of 86.25), and in addition is located at the more inverted short-end of the curve.

Figure 3.2: Difference between optical & asset swaps spreads, POLGB market, Nov-30 2001

POLGB	Optical swap spread	Par asset swap
0% Apr-03	28	15
0% Aug-03	9	4
8.5% May-06	17	13
8.5% Nov-06	10	9
6.0% Nov-09	-20	-14
6.0% Nov-10	-24	-16

Source: SalomonSmithBarney

4. Drivers of government-swap spreads

In this section we aim to summarize the factors that can influence the variation of asset swap spreads across the yield curve. In G7 fixed income markets the drivers of government-swap spreads are relatively well known. However, given the relative immaturity of swap and credit markets in countries such as the Czech Republic, Poland and South Africa, less is known about how these same drivers describe observed market variations in asset swap spreads.

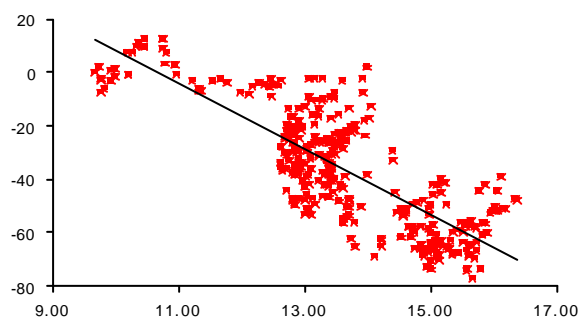
We identify 4 drivers of asset swap spreads:

- Yield level
- Curve shape
- Supply-demand
- Liquidity

Yield level: Swap spreads tend to rise and fall with the overall level of yields. Lower yields reflect reduced inflation expectations, reducing yield volatility and most other risk premia. In more advanced markets (Euro or US\$) the ratio of government-swap spreads to yields tends to be stable and mean reverting.

Example: In Figure 4.1 we plot the asset swap spread of the rolling POLGB 5-year benchmark against the Polish 5-year swap rate ($R^2=64\%$). As swap yields fell, swaps outperformed bonds, and asset swap spreads cheapened. Based on the last 18-months of data, a 100bp fall in yields is associated with a 12bp widening in asset swap spreads.

Figure 4.1. POLGB 5-year par asset swap versus 5-year swap yield, Mar-00 to Nov-01



Source: SalomonSmithBarney

Curve shape: Asset swaps spreads have been observed to be correlated with the shape of the yield curve, richening as the curve flattens.

Segmentation of the investor base for swaps and bonds is partly responsible. Users of swaps tend to be funded investors, such as banks and proprietary trading desks. These types of investors are therefore effectively benchmarked against LIBOR. In contrast, government bond investors are usually constrained against longer duration benchmarks reducing their use of short-maturity instruments, and are often cash-constrained, limiting their ability to short the market.

As the curve flattens (and inverts) funded investors will increasingly show an aversion to running receiver swaps positions, given the increasingly negative carry. Government bond investors will be far less impacted when measured against their longer duration benchmark. Bonds outperform swaps and asset swap spreads tighten. Conversely as the yield curve steepens or disinverts, a receiver swap position will have increasingly positive carry (or less punitive negative carry) and asset swap spreads widen.

Example: In Figure 4.2 we plot the asset swap spread of the rolling POLGB 5-year benchmark against the Polish 6-month/5-year swap yield differential ($R^2=44\%$). As the curve has disinverted, the negative carry associated with receiver swap positions has become less punitive. Funded investors' preference for taking on long positions through swaps has increased at the expense of long bond positions, and bond asset swaps spreads have consequently cheapened. Based on the above regression, a 100bp disinversion in the 6m/5s spread is associated with a 10bp widening in asset swap spreads.

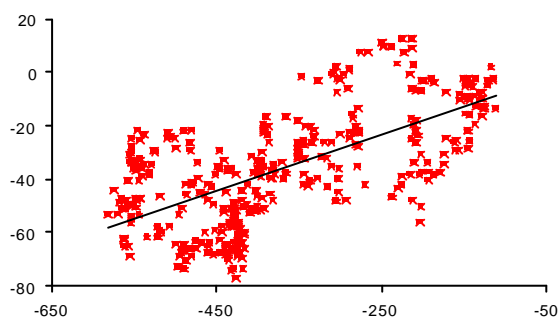
Government bond supply-demand: Swaps spreads in G7 markets can often be interpreted as a measure of the relative supply and demand for spread product versus government bond product. As a result, swaps spreads can narrow (government bond asset swap spreads cheapen) as the relative amount of government

issuance increases, and conversely swap spreads can widen (government bond asset swap spreads tighten) as relative issuance of spread product increases.

In emerging local markets, interest rate swaps can be directly linked to the EuroKoruna, EuroRand or EuroZloty corporate bond market through the process of asset swapping. Issuers such as the World Bank or EIB often cross-currency asset swap their fixed rate paper. Given that some of these bonds have large issuance sizes, this can cause short-term distortions in the swap market, at least until the flows are absorbed.

However, until the corporate bond markets are more fully developed we can consider supply-demand for credit product to be relatively stable. Asset swap spreads will then be driven by the tension between government bond supply and investor's demand for duration.

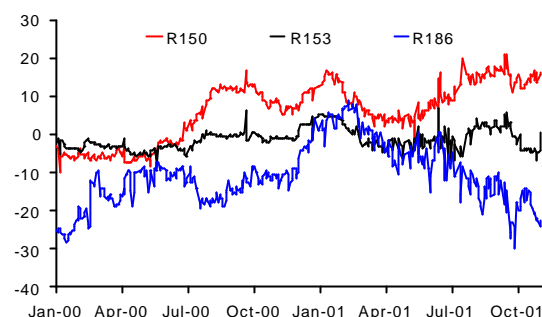
Figure 4.2. POLGB 5-year par asset swap versus 6m/5-year yield differential, Mar-00 to Nov-01



Source: SalomonSmithBarney

Example: In Figure 4.3 we show the par asset swap spreads of three benchmark SAGBs, the R150, R153 and R186, over the past 2 years. It is possible to observe that while the par asset swap spreads of the R150 and R153 have remained relatively range-bound, the R186 asset swap spread has richened (bonds have outperformed swaps) quite substantially. This richening can be attributed to a) demand from local pension and life assurance funds for long duration assets to match liabilities b) demand for long duration bonds to hedge short positions in long duration, zero coupon EuroRand issues.

Figure 4.3. R150, R153 & R186 par asset swap spreads



Source: SalomonSmithBarney

Market Liquidity: The relative liquidity of bonds versus swaps varies across the yield curve. Liquidity is in itself a vague and misunderstood concept, and is more than just transaction costs or the amount that can be transacted. The BIS have highlighted three related measures of market liquidity: *tightness*, *depth* and *resilience*. *Tightness* denotes the transaction cost relative to mid-market pricing. *Depth* denotes the volume of trading possible without affecting prevailing market prices. *Resilience* denotes the speed at which price variations resulting from trades are dissipated and normal market trading conditions are restored.

Of these only tightness can be quantified easily. For a market participant who actively trades the market (rather than operates on a buy-and-hold approach) the additional transaction cost multiplied by anticipated turnover of a position will define the relative liquidity premium between two otherwise identical assets.

$$\text{Liquidity premium} = \frac{\text{Additional transaction cost (cents)}}{\text{Holding period (years)}}$$

The additional yield premium required to hold a less liquid bond over a higher liquidity bond will directly feed through to the asset swap spread.

Example: consider two Polish 5-year bonds, A and B, each with modified duration of 3-years, and bid/offer of 5bp and 10bp, respectively. The transaction costs of these two bonds are 15 cents and 30 cents, respectively. If the investor has an average turnover period of 6-months (twice per year) then assuming

everything else is equal then the additional yield premium of bond B over A should be

$$\text{Yield premium} = 15 \times 2 = 30\text{bp}$$

The investor will require the yield (or asset swap spread) of bond B to be 30bp higher than of bond A.

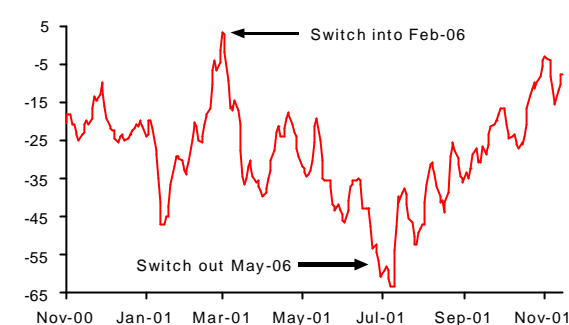
Depth and resilience are harder to quantify. Factors such as issue size time since issuance, and benchmark or off-the-run status can have significant impact. Benchmark bonds, in particular, can have higher liquidity (lower transaction costs, more trading volume) than off-the-runs and are more likely to trade special in repo, reducing financing costs; both effects make benchmark bonds trade richer on an asset swap basis. The loss of this benchmark status, however, can result in a significant cheapening of the bond relative to swaps and off-the-run bonds.

Example: In Figure 4.4 we graph the asset swap spread difference between the POLGB 5-year benchmark and a basket of 3 off-the-run 5-year bonds. The basis between the benchmark bond and off-the-run has an average of 25bp, but can be highly volatile. This volatility presents trading opportunities:

In early March-2001 the new Feb-06 benchmark was trading flat to the off-the-run POLGBs – this offered an excellent opportunity to switch out of the off-the-runs into the new bond and gain liquidity and benchmark status at no yield give-up.

Conversely, in July-01, the May-06 was trading very expensive to comparable off-the-run bonds. For funded investors with a bullish view on the market and a short-term horizon (1 month or less) the lower transaction costs and potentially lower funding costs could justify buying the May-06 over an off-the-run. But for a real-money investor with a 6-month horizon the slightly lower transactions costs were unlikely to make up for the potential loss of benchmark premium as Nov-2001 approached, with the consequent issuing of a new 5-year benchmark. It would have been advisable to switch out of this bond and buy an older bond such as the Feb-06.

Figure 4. 4. Asset swap differential between POLGB 5-year benchmark and a basket of 5-year off-the-runs



Source: SalomonSmithBarney

5. Conclusions

Using bond asset swaps spreads to identify relative-value in local bond markets provides an additional tool to both real-money and leveraged investors.

For real-money investors, studying the time evolution of bond asset swap spreads and the variation of these spreads across the curve, will inform their choice of maturity sector and the specific bond to buy. Built-in to these variations in asset swap spreads is important information on the technical position of the market.

For leveraged investors, or those that can access the interest rate swap market, there is an additional advantage. Unlike most other valuation measures, the relative-value observed can be captured directly through the construction of an asset swap package. These asset swap packages not only allow investors to take direct views on the government bond–swap basis, but in addition, more sophisticated views on the relative liquidity premia between bonds, or on bond supply-demand dynamics. Given appropriate funding, asset swap packages can also become low risk carry trades. For investors who are sensitive to the value-at-risk (V@R) of their portfolios, asset swaps provide an attractive method by which to capture market anomalies, whilst de-coupling collateral risks.

Appendix: Evaluating asset swap spreads

To construct an asset swap package we:

- Buy the bond to be swapped
- Pay a swap, arranged such that the fixed leg of the swap exactly offsets the fixed coupon payments, c , of the bond
- Adjust the floating leg of the swap, which is multiplied by the notional, N , so that the net present value is a defined package price, PP .

To evaluate the asset swap spread, three pieces of information are required

- Swap curve, to generate the zero curve from which the discount factors are calculated: df for fixed cash flows and dg for floating cash flows
- Bond's market price, or dirty price, DP
- Floating conventions: LIBOR index L , payment periods in $days$, and day count convention, dcc .

For the purposes of valuing an asset swap package, we need to ensure that cash flows from the asset swap dealer's perspective will have zero net present value to obtain the fair value spread for the asset swap. This is no more than an expression of the no-arbitrage condition². The general formula is then as follows:

$$PV_{paid} = PV_{received}, \text{ with}$$

$$PV_{paid} = PP + \sum_{i=1}^p c_i df_i + 1 \cdot df_p$$

$$PV_{received} = DP + N \cdot \left[\sum_{j=1}^n (L_j + s) \frac{days_j}{dcc} dg_j + 1 \cdot dg_j \right]$$

The principal value of 1 is put explicitly in the formula for the received cash flows to denote that we are presently valuing the floating leg including the principal payment. When computing the PV we use the

same LIBOR curve for discounting as used for calculating the floating cash flow leg. We then obtain:

$$\sum_{j=1}^n L_j \frac{days_j}{dcc} dg_j + 1 \cdot dg_n = 1$$

Note that this formula arises from the assumption that the floating leg uses a *simple front stub*. If the time to maturity is not a multiple of the time between floating payments, then the beginning stub period has a payment proportional to the length of the stub period.

The equation can then be simplified as follows:

$$PP + \sum_{i=1}^p c_i df_i + 1 \cdot df_p = DP + N \cdot \left[1 + \sum_{j=1}^n s \frac{days_j}{dcc} dg_j \right]$$

Par Asset Swap: We set the package price and notional to 1, to obtain the following relationship between the spread and the bond price:

$$ParAssetSwapSpread = \frac{\sum_{i=1}^p c_i df_i + 1 \cdot df_p - DP}{\sum_{j=1}^n s \frac{days_j}{dcc} dg_j}$$

Note there will be an exchange of cash flow at the beginning of the deal, given by the difference between the bond's dirty price and par.

True Asset Swap: We set the package price and the notional equal to DP , to obtain the following relationship between the spread and the bond price:

$$TrueAssetSwapSpread = \frac{\sum_{i=1}^p c_i df_i + 1 \cdot df_p - DP}{DP \cdot \sum_{j=1}^n \frac{days_j}{dcc} dg_j}$$

We then recover the intuitive result that:

$$True Asset Swap Spread = ParAssetSwapSpread / DP$$

Note there is an exchange of cash flow at the end of the deal, given by the difference between the bond's dirty price and bond redemption value.

² We ignore credit charges, transaction costs and other supply-demand factors.

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