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# Learning Curve

## An introduction to the use of the Bloomberg system in swaps analysis

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### Introduction

Interest rate swaps are agreements between two or more parties to exchange cash flows during a specific period of time according to a prearranged formula. The first swap contracts were created in 1981 (Hull 1998). The market for swaps since then has grown very rapidly and this growth illustrates perfectly the flexibility of financial engineering in debt capital markets (Choudhry, Joannas, Pereira and Pienaar, 2001).

The objective of this paper is to illustrate how to access the Bloomberg Professional System for the purposes of swap trading and analysis. The following topics are considered:

- swap rates and default settings;
- forward rates;
- plain vanilla and exotic swap calculators;
- hedging;
- asset swap calculator.

Any discussion of the technical

methodologies used in calculating the various components of swaps, such as bootstrapping and gap analysis, is omitted as these would remove the introductory nature of this paper, and in any event these concepts are well covered in existing literature. For information on these areas, the interested reader should consult Hull (1998), Steiner (1997) and Choudhry *et al.* (2001), where the main concepts are illustrated in accessible fashion.

### Swap rates and defaults

Swap rates are essential for a swap trader for two reasons. First, they are needed to create zero coupon spot rates, which are manipulated into a set of discount factors to discount back the fixed and projected floating cash flows of the swap; and secondly, they are also used to project the floating leg of the swap.

Generic long-term swap rates can be found on IRSB<Go>. Users have the option of specifying the currency required, and receiving real time

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18:40 EURO SWAP RATES Page 1 / 3

94<GO> View News.

SECURITY	BID	ASK	CHANGE	OPEN	HIGH	LOW	TIME
Euro Swap Annual							
2) 1 Year EUSA1	3.6830	3.6950	-.0205	3.7115	3.7625	3.6725	17:59
3) 1.5 Year EUSA1F	3.8430	3.8580	-.0290	3.8805	3.9200	3.8375	17:59
4) 2 Year EUSA2	4.0050	4.0250	-.0060	4.0280	4.0945	3.4910	17:59
5) 3 Year EUSA3	4.2650	4.2850	+.0692	4.2825	4.3995	3.8875	17:59
6) 4 Year EUSA4	4.4575	4.4875	-.0287	4.5000	4.5875	4.4575	17:58
7) 5 Year EUSA5	4.6150	4.6450	-.0262	4.6550	4.7065	4.6137	17:58
8) 6 Year EUSA6	4.7475	4.7775	-.0313	4.7960	4.8390	4.7450	17:58
9) 7 Year EUSA7	4.8625	4.8825	-.0350	4.8903	4.9450	4.8600	17:59
10) 8 Year EUSA8	4.9500	4.9800	-.0362	5.0000	5.0375	4.9500	17:59
11) 9 Year EUSA9	5.0225	5.0525	-.0363	5.0763	5.1100	5.0250	17:59
12) 10 Year EUSA10	5.0825	5.1025	-.0400	5.1300	5.1702	5.0825	17:59
13) 12 Year EUSA12	5.1700	5.2000	-.0375	5.2200	5.2550	5.1700	17:59
14) 15 Year EUSA15	5.2500	5.2700	-.0475	5.3075	5.3412	5.2525	17:59
15) 20 Year EUSA20	5.2975	5.3175	-.0500	5.3575	5.3913	5.2975	17:59
16) 25 Year EUSA25	5.2925	5.3225	-.0475	5.3538	5.3938	5.2963	17:59
17) 30 Year EUSA30	5.2600	5.2900	-.0475	5.3212	5.3612	5.2663	17:59

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Figure 1 IRSB Bloomberg's live swap rate screen



Figure 2 GP Bloomberg's graph of the historical variations of the five year swap rate

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 Enter # <Go> to Access a Specific Curve.

United States								
Curve	Curve Number	Source	Contributor preferences					Mkt
			1st	2nd	3rd	4th	5th	
1) USD Swaps(30/360,S/A)	23	1	PREB				CMPL	U
2) T-Bill Swaps	32	1					CMPT	U
3) Fed Funds Swaps	33	1					CMPT	U
4) CP Swaps	34	1					CMPT	U
5) USD OIS Swaps	42	1					CMPT	U
6) Muni Swaps	43	1					CMPL	U
7) USD Swaps(Act/360,Ann)	47	1					CMPT	U
8) US 1mth Libor	50	1					CMPT	U
9) US 6mth Libor	51	1					CMPT	U
10) US T-BILL	52	1					CMPT	U
11) Spreadlock Matrix	82	2						U
12) Fed Funds Spreads	85	1					CMPT	U
13) Prime Spreads	86	1					CMPT	U
14) CP Swap Spreads	87	1					CMPT	U

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Figure 3 SWDF <Go> Bloomberg's swap defaults screen

monitors of the swap rates. If users wish to analyse the historical variation of the specific swap rate, they can click into a specific rate and with GP<Go> access a historical graph of these values. These screens are shown in Figures 1 and 2.

Different screens are used to access short-term swap rates. From screen EDSF<Go>, one can calculate the yields of synthetic forward rate agreements constructed with strips of IMM or SMX Eurodollar future contracts. This function contains options that enable users to set required parameters, including:

- modifying day counts of the underlying security;
- customising the date range so that one can hedge debt for a period that does not fall exactly on the futures contract expiration date.

Users can also price debt instruments and adjust for convexity bias if desired.

The swap screens may be fed directly with contributed rates from specific dealers or brokers such as Tullet & Tokyo International. Typing TTKL <Go> or MRKT <Go> will access these rates, where there is a list of the different contributors. If users wish to use specific contributed swap rates they can do this on SWDF<Go>. On this screen, which is illustrated in Figure 3, users are presented with a range of options to use as defaults for a specific currency; examples include:

- standard rates;
- user specific rates;
- spreads to bench mark rates;
- rates derived from the futures curve.

### Forward rates

Bloomberg uses par coupon swap rates to calculate implied forward rates so that projected floating rate cash flows can be calculated. This function will be

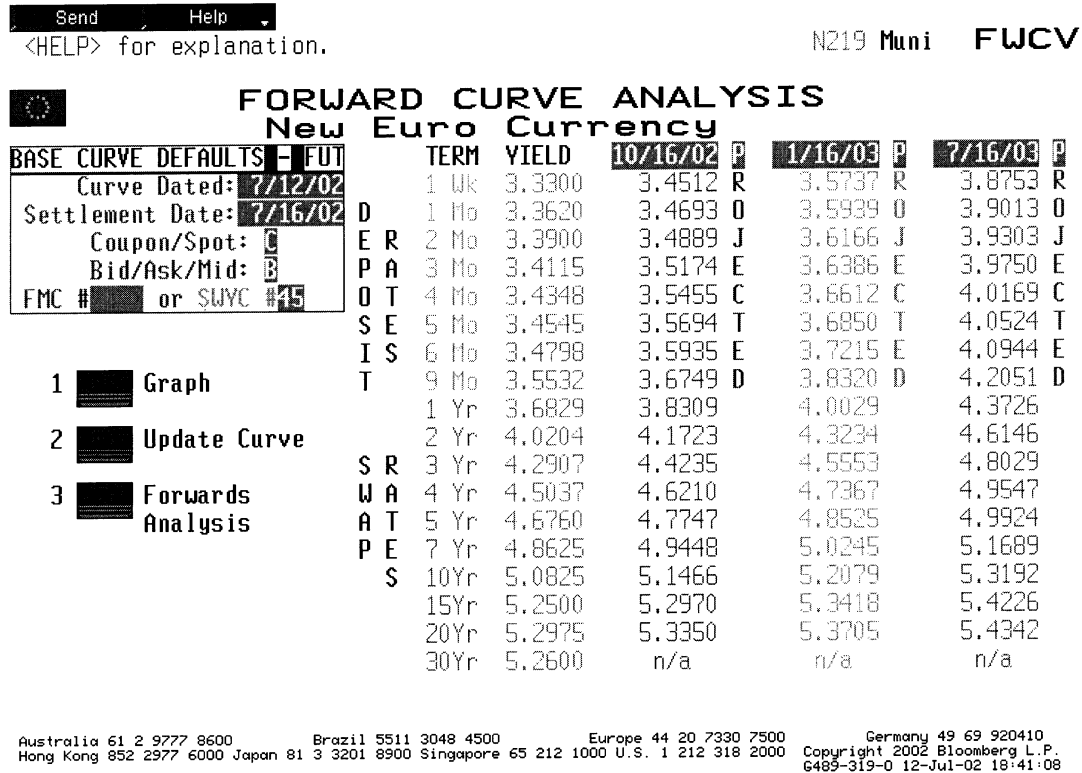


Figure 4 FWCV Bloomberg's forward analysis screen

especially useful for corporate treasurers who can use screen FWCV to help formulate an investment strategy or to find the best time to borrow money based on the forward curve projections. With the FWCV function the user sets a particular country currency, and is presented with calculated interest rates. These are set out in four columns on page 2 of the screen. The first column shows the present deposit and swap rates. The second to the fourth columns show the projected rates based on the dates specified on top of each column. This will be useful for a comparison of the forward rates on different dates. This function allows users to set the spot date and settlement date for the curve, as well as specifying whether the coupon or the spot rate is used.

These screens are shown in Figures 4 and 5 respectively.

A graph of the yield curve can be observed on the same FWCV function. Users type 3<Go> for the implied forward curve of a specific date as well as receiving data in a tabulated format. This is shown in Figure 6.

### Plain vanilla swap calculator

Screen BCSW<Go>, is the Bloomberg plain vanilla swap calculator. This function allows users to specify the attributes of a simple vanilla swap and price it, examine its future cash flows and apply a simple future scenario analysis. When accessing the function, the screen defaults to a five-year swap, starting now and maturing in five years. The screen will use the current five-year swap rate as the fixed rate payment, as can be seen in Figure 7. For analysts and swap traders this function calculates the

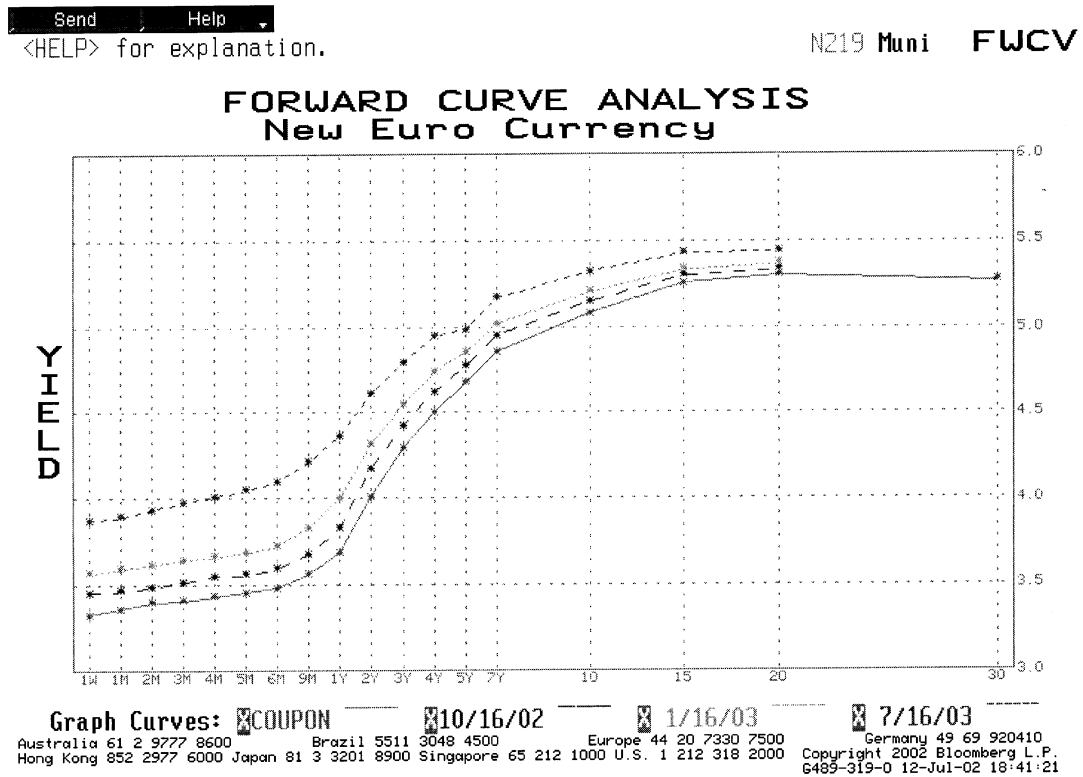


Figure 5 FWCV Bloomberg's forward yield curves

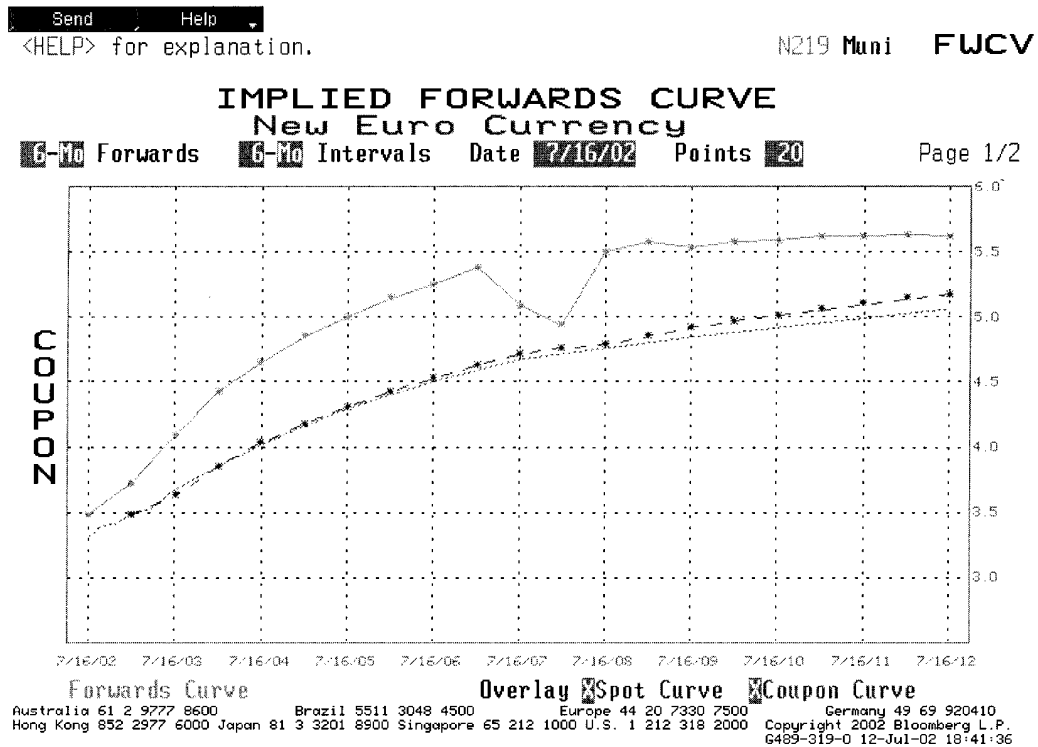


Figure 6 FWCV Bloomberg's implied forwards curve

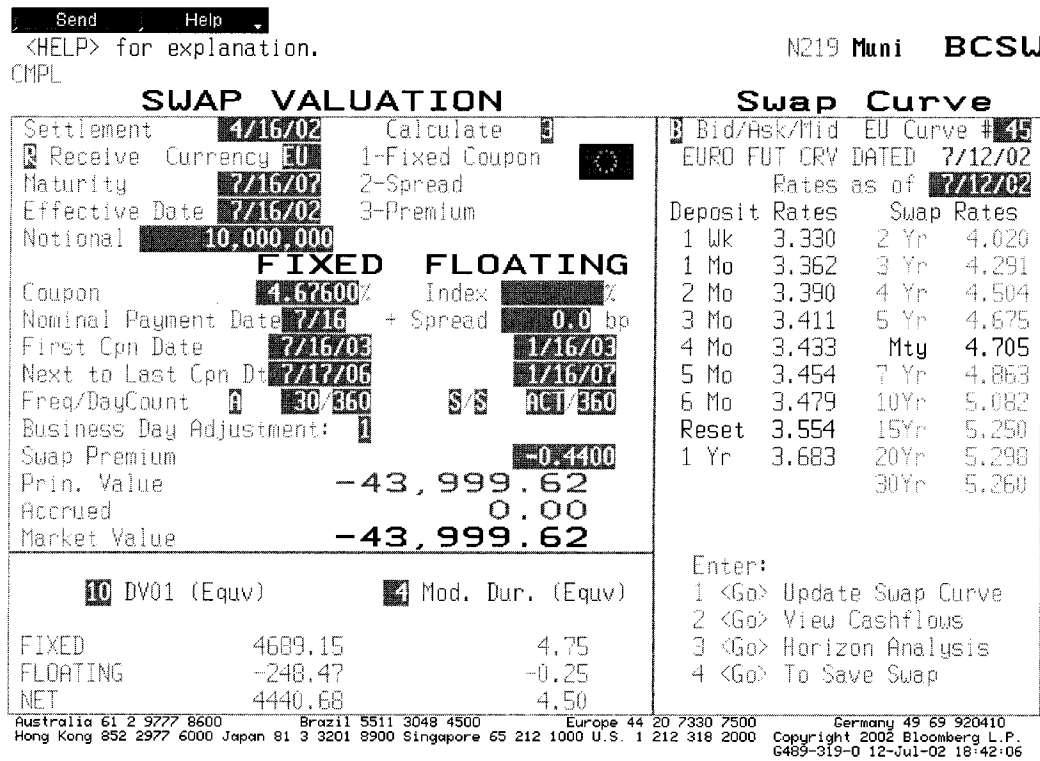


Figure 7 BCSW Bloomberg's plain vanilla swap calculator

market value of the swap (which is simply the sum of the difference between the net present value of the future fixed cash flows and the floating rate); in addition, users will have the option of calculating a fixed coupon or a spread to Libor that will make the premium of the swap equal to zero.

Users have the option of choosing to be on the pay or receive side, selecting the specific date on which the swap curve should be based, as well as which side of the market they want the rates to be based on, such as Mid, Bid or Ask. There is also the option of selecting a user-created swap curve, which a trader may require for their own specific model application. An additional user-selected parameter on the first page of screen BCSW is the option of calculating a number of variables for each specific leg of the swap. These parameters include

Modified Duration, Risk, Accrued Interest and Premium.

After the various necessary inputs on the structure of the swap have been selected, page 2 of screen BCSW shows the cash flows of the two legs of the swap as well as the payment dates, net difference and present value of the difference between the two sets of cash flows. The last two columns give users the option of viewing other variables related to valuing swaps, such as discount factor and floating index. Lastly, this function enables users to perform simple scenario analysis. Page 3 of BCSW will allow one to perform a scenario analysis based on changes in yield. Here, there is the option of shifting the swap curve by a number of basis points and analysing how the value of the swap will evolve based on the parameters given on page 1.

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Fixed vs. Floating (non-amortizing) Calctype: 253
COUNTERPARTY TRADE TICKER/TRAD SERIES DEAL #
EFFECTIVE DATE 2/ 1/02 MATURITY DATE 2/ 1/06 BUSINESS DAYS TE
(Friday) (Wednesday)
'Pay'/'R'ceive
FIXED<-----F-----> FLOAT
Curr: EUR Notional Amt: 1 MM Curr: EUR Notional Amt: 1 MM
Coupon: 5 % Latest Index: 3.384 %
Bond eqv./Mmkt basis: Y Spread: bp
Day Count: 30/360 Day Count: ACT/360
Payment Freq: A Reset Freq: S
SWYC Curve #: 45 SWYC Curve #: 45
CALCULATIONS: Principal Exchanged: N
Risk Calculation Type: N
Duration: S/A
Business Day Adjustment: E
Convert notional by FX: N
NOTES:
FIRM 9001
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Automatically reset rates (Y/N): Y
Floating rate index: EURO06M Index
# of days prior to accrual: 2
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Figure 8 SWPL Bloomberg's interest rate derivatives add screen

## Exotic swaps

The market in swaps extends beyond plain vanilla swaps. Contracts that feature variations on the plain vanilla structure are generally termed *exotic swaps*.

Examples of exotic swaps include floating-floating swaps, amortising, accreting and roller coaster swaps, constant maturity swaps and fixed-fixed swaps. Users can calculate values for these swaps on the Bloomberg system.

Swaps other than plain vanillas need to be initially created in SWPL<Go>. Here Swap dealers can choose what type of swap they would like to create. For the purpose of this example, the process for amortising swaps is described here. Initially a page is displayed where the main parameters need to be input. Once this is complete, selecting <Go> will automatically fill in the rest of the fields (which can be altered by the user if

required). The second page will give the option of entering the nominal payments, as well as the first coupon and next to last coupon. On the third page users are given the choice of creating an amortising, accreting or rollercoaster swap. If amortising is chosen, for example, it is possible to specify exactly what percentage of notional is required to amortise for the specific date. Once all the parameters are placed, selecting <Go> will activate the screen, from which typing SWAP<Go> will bring up the swap calculator. This screen will look very similar to the BCSW screen. Here, once again, users can choose whether they want to calculate the premium, fixed rate or spread over Libor. The last four columns feature added options, such as per cent of current notional outstanding.

With these screens, users can save swaps, send them to other Bloomberg

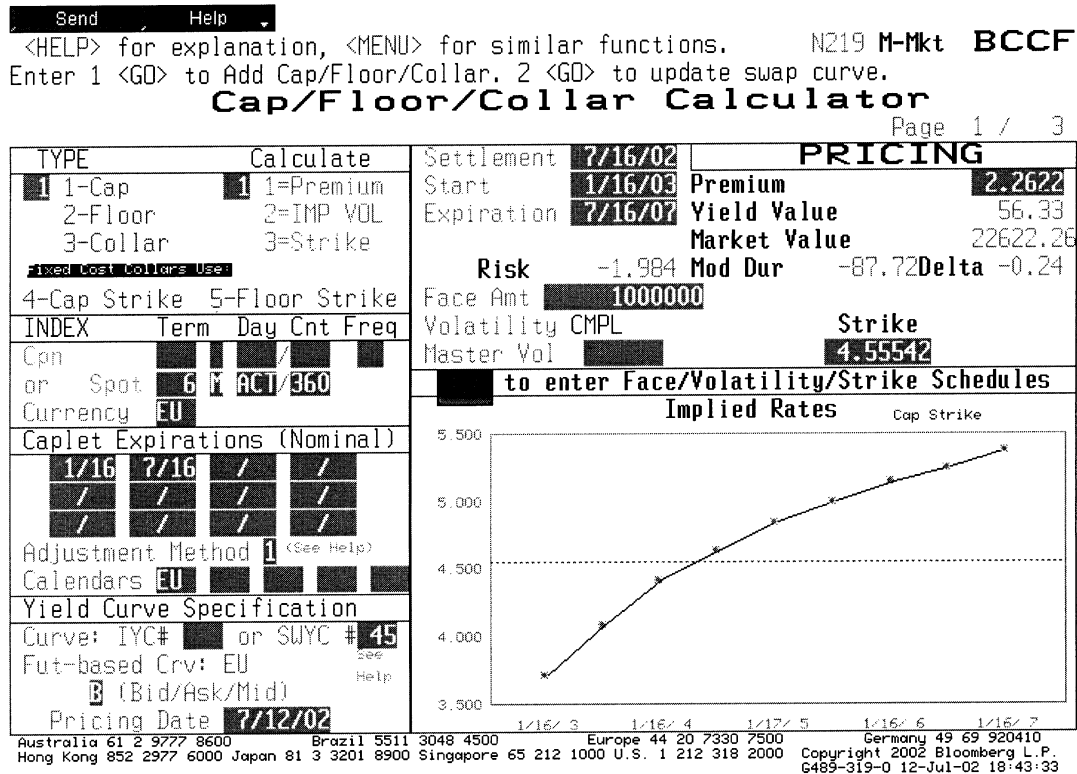


Figure 9 BCCF Bloomberg's cap/floor/collar calculator

users for confirmation of trades, and update already existing swaps. When creating swaps in SWPL there is the option of allowing the user only to view the swaps or the whole firm. Stored swaps can be viewed by typing /all<CORP><Go>. Swaps can also be deleted if users so wish.

### Caps floors and collars

Interest rate swaps are a form of fixed income derivative, but these derivatives can be further hedged using tools such as caps, floors and collars. These instruments are used to hedge positions held in swaps, where there is risk of loss due to exposure to changes in interest rates. That is, for the pay-fixed side of the swap, to protect against loss due to fall in rates below a certain level, the user will create a swap to hedge the position.

Players on the floating side who are worried that rates will rise will buy a cap so that there is a limit to losses suffered if rates rise. As before, an analytical description of caps, floors and collars is omitted, rather it is assumed that the reader will access other texts for a description of the mathematics and methodologies behind these instruments.

Screen BCCF<Go> is Bloomberg's Cap, Floor and Collar calculator. As with BCSW, the screen will default to a five-year instrument starting from the current date and maturing in five years' time. Users specify the instrument they are valuing, whether the cap or floor and may select implied volatility. It is also possible to specify a structure for the calculator, ie make amortisation schedules, and specify varying strike rates and volatility assumptions.

The screen is illustrated in Figure 9.



Currency		Bond		Underlying Curves	
From EUR	To EUR	Buy/Sell	Par Amt	1000 M	Price Date EU
		Workout	1/22/04 @ 100.0000		7/12/02
Spot F/X	1.000	Swap		Crv Settle	7/17/02
Trade Settlement	7/17/02	Fixed	3.86965%	ACT/ACT	1
		Floating	3.38511%	ACT/360	2
		Swap Par Amt(FLT)	1000 M	Z-Spread	130.4 bp
<b>Gross Spread Valuation</b>					
Implied Value 100.7303				Money	Spread(bp)
				18.8M	= 126.7
<b>Swapped Spread Details</b>					
Calculate		Money		Spread(bp)	
1: Bond Price	98.85199 / 5.16144%				
Swap Price	100	Cash Out	-1.1480	11.5M	= 77.4 bp
2: Swap Rate	3.86965%	Bond Cpn	4.3750	7.3M	= 49.3
Redemption Premium / Discount	0.0000%			0.0	= 0.0
Funding Spread	0.0 bp			0.0M	= 0.0
3: Swapped Spread					126.7 bp
1 <Go> for X-currency spread summary, 2 <Go> to save, 3 <Go> to update swap crv					
Australia 61 2 9777 8600		Brazil 5511 3048 4500		Europe 44 20 7330 7500	
Hong Kong 852 2977 6000		Japan 81 3 3201 8900		Singapore 65 212 1000 U.S. 1 212 318 2000	
				Germany 49 69 920410	
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Figure 10 ASW Bloomberg's asset swap calculator screen

### Asset swap calculators

Let us assume that an investor is long a specified fixed-coupon bond and wishes to swap the cash flows of this bond so that he or she receives a floating rate cash flow, plus a spread above or below Libor, and exchange the fixed cash flow. The Bloomberg Asset Swap Calculator screen can be used to analyse the asset swap constructed to set up the exchange of cash flows. The user enters the 'ticker' of the required bond followed by the <Corp> key and then ASW <Go> to bring up the asset swap calculator screen.<sup>1</sup> The screen is illustrated in Figure 10.

The two most important variables that this function calculates are the *Gross Spread* and the *Z-Spread*. The gross spread is the basis points difference between the price of the swap in the market and the implied

value of the swap. The implied value is calculated by discounting the future values of the bond with the rates specific to each term structure of the bond's cash flow. The Z-spread is the spread that one has to add to each point of the swap curve so that the implied value of the bond will equate with its market value. Bloomberg's ASW function allows the user to select the specific swap curve required, as well as specifying the settlement date of the curve. In addition, as with screens SWPL and BCCE, ASW can be saved once parameters are set, and sent to other system users.

### Conclusion

A number of screens that swap traders and analysts can use on the Bloomberg system have been introduced. This is

not the full extent of screens available and in a later issue we hope to illustrate the screens that can be used for other swap products such as credit default swaps.

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**Notes**

1. Bonds are identified on the Bloomberg system via short codes known as 'tickers'. This is usually related in some way to the corporate or sovereign entity

that has issued the bond, for example 'T' for US Treasuries or 'IBM' for bonds issued by the IBM Corporation.

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