

# Credit Suisse Basis Points: Cross-Currency Basis Swaps

US Interest Rate Strategy

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## Cross-Currency Basis Swaps

A cross-currency basis swap (CCBS) is a floating-for-floating exchange of interest rate payments in two different currencies. Unlike other basis swaps, CCBS also exchange notional principals.

The floating reference for each leg is based on the associated reference rate, typically a three-month deposit rate, in the respective currency. Market convention is to quote the spread against the non-USD leg. Thus, in a standard CCBS, an investor would pay (receive) 3m USD LIBOR and receive (pay) the relevant 3m deposit rate in the other currency plus a spread.

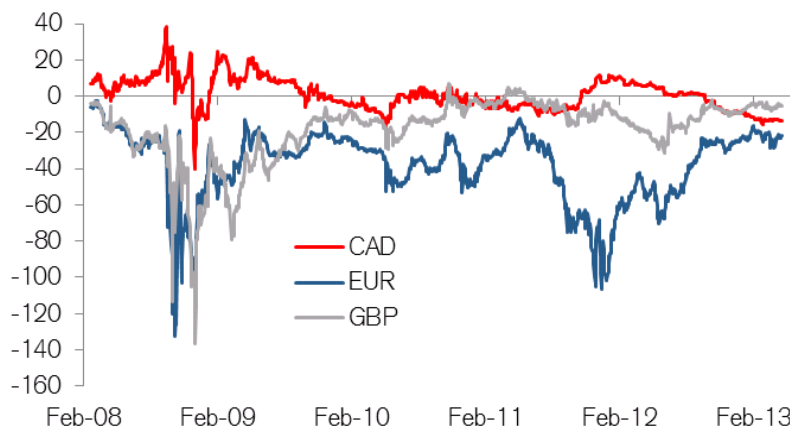
The basis spread partly reflects the difference in credit risks implied by the two reference rates.

CCBS spreads are driven by supply and demand for the products as investors swap liabilities to the desired currency or swap issuance after using foreign debt markets to avail more favorable funding.

The spreads are also driven by market perception of relative funding stresses in the two currencies, as became acutely clear during the recent financial crisis when the demand for USD funds drove most CCBS spreads lower (Exhibit 1).

**Exhibit 1: CCBS spreads dropped across multiple currencies at the height of the financial crisis as the demand for USD funds soared**

1y cross-currency basis swaps vs. 3m USD LIBOR (spread in basis points)



Source: Credit Suisse

In this introduction to CCBS, we review the mechanics of the basis swap and present a theoretical pricing methodology. We also highlight market conventions for the major currencies and show practical uses of the product.

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## Overview

**Floating-to-floating  
exchange of 3m  
deposit rates**

A cross-currency basis swap (CCBS) is a floating-for-floating exchange of interest rate payments and notional amounts in two different currencies. The floating reference for each leg is based on the associated reference rate, a three-month deposit rate, in the respective currency. For example in a standard EURUSD basis swap, an investor might pay 3m USD LIBOR and receive 3m EURIBOR plus a spread.

**Principals are also  
exchanged**

CCBS exchange payments on a quarterly basis similar to most other basis swaps. However, unlike other basis swaps, CCBS also swap notional principals.

CCBS exchange floating rates that contain innate credit risk; therefore, the basis spread partly reflects the difference in credit risks of the two reference rates. For example, in a USDCAD basis swap, the USD LIBOR is an unsecured deposit rate while CDOR is a secured rate. This potentially would tend to cause CDOR to trade below LIBOR all else being equal, which requires a positive spread on the CDOR leg to make the basis swap fair.

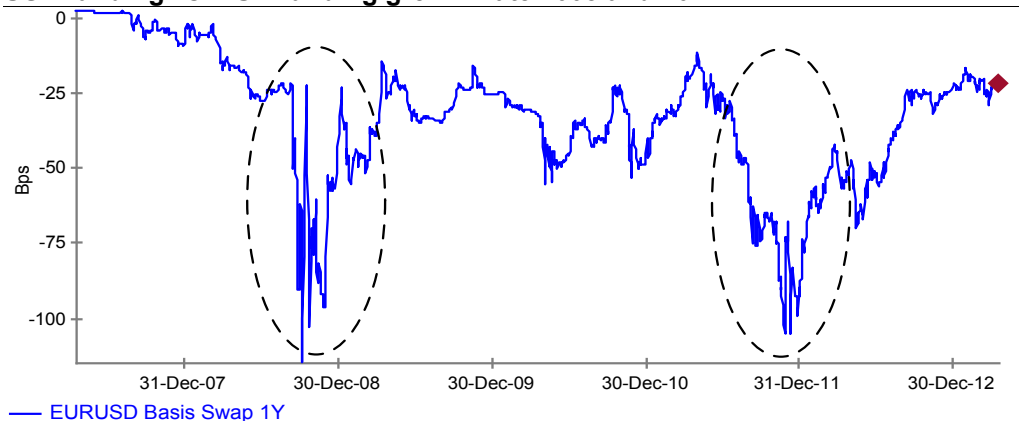
**Primarily used to  
swap liabilities into  
currency of choice  
to avail favorable  
rates or foreign  
funds**

A common use of CCBS is to exchange floating liabilities in one currency for another. With the growth of international markets, cross-currency basis swaps are used to match assets and liabilities of corporations that have exposure to foreign exchange fluctuations from international operations.

Basis swaps are used extensively to swap issuance back to the currency of choice after availing more favorable funding in a foreign market. Additionally, firms that need foreign-denominated cash can raise the funds using a cross-currency basis swap. The supply and demand for CCBS based on firms swapping issuance or raising foreign funds drives the cross-currency basis spreads.

Funding stresses and/or concerns over the credit risk of banks in one currency versus another can cause severe dislocations in CCBS spreads. A good illustration of this phenomenon was at the peak of the financial crisis when the demand for USD relative to all other currencies soared. During this time, dollar funding in the interbank cash market became extremely limited as banks' became reluctant to lend to other banks. As a result, the basis swap markets, as an alternative to acquire USD funds, saw increased demand to receive USD funds in exchange for EUR, among other currencies. This excess demand drove the EURUSD basis swap spreads down to highly negative levels as counterparties were willing to receive lower interest payments in return for US dollar funds (Exhibit 2).

**Exhibit 2: EURUSD 1Y basis swap turned extremely negative as the demand for USD funding vs. EUR funding grew in late 2008 and 2011**



Source: Credit Suisse

Other primary drivers of the basis spread include the expected forward path of the currencies themselves and the difference in the credit quality of the underlying reference instruments.

## Market Conventions

**Quoted against USD LIBOR flat**

The spread of a cross-currency basis swap is generally quoted against USD LIBOR flat. For example, the 1Y EURUSD basis swap with a spread of -28 basis points would mean the quarterly exchange of 3m EURIBOR minus 28bps (Act/360) vs. 3m LIBOR flat (Act/360) for a period of one year.

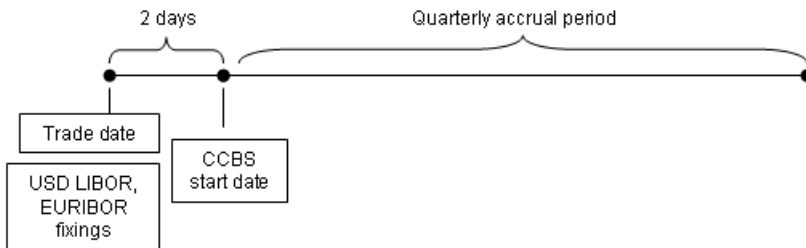
Cross-currency basis swap spreads reflect the dynamics of supply and demand and can indicate demand for a certain currency over another. The spreads also indicate the relative creditworthiness of banks in one currency dominion versus the other.

**Spot for CCBS is T+2, but individual reference rate fixings may vary**

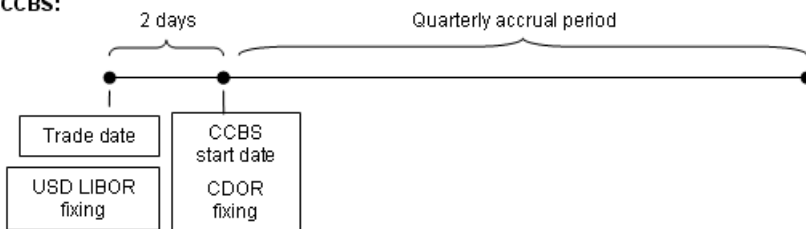
The spot for a cross-currency basis swap is T+2 (the same as USD LIBOR spot). However, the fixing date for the two legs of a cross-currency basis swap may differ depending on the convention for the relevant reference rates. In a typical EURUSD basis swap, both EUR and USD legs are tied to 3m deposit rates that fix two business days prior, i.e. the spot dates for both the 3m EURIBOR and 3m LIBOR are T+2. The same is not true, for example, in a USDCAD CCBS, where the spot for the USD leg (3m USD LIBOR) is T+2 and the spot for the CAD leg (3m CDOR) is T+0. Hence, while the first USD 3m LIBOR is known at the time when the trade is transacted, the 3m CDOR rate is known two business days later when CDOR sets. Exhibit 3 illustrates the timeline for fixings for the first accrual period of EURUSD and USDCAD cross-currency basis swaps.

**Exhibit 3: Timeline of rate fixings for a cross-currency basis swap is dictated by convention in relevant reference rates**

**EURUSD CCBS:**



**USDCAD CCBS:**



Source: Credit Suisse

CCBS conventions for some of the major currencies are listed in Exhibit 4.

**Exhibit 4: Cross-currency basis swap conventions**

Ccy Pair	Non-US Reference Rate	Non-US Ref. Rate Spot	Effective Date	Spread Basis	Quotation Convention	5Y CCBS Spread as of 2/21/2013	Index for 2yrs+ standard IRS
AUDUSD	3M Bank Bill (secured)	Same Day	T+2	Act/360 on USD and Act/365 on AUD leg	USD 3M Libor Flat	26.8bps	6m Bank Bill
EURUSD	3M Euribor (unsecured)	T+2	T+2	Act/360 on both legs	USD 3M Libor Flat	-20.8bps	6m Euribor
GBPUSD	3M GBP Libor (unsecured)	T+2	T+2	Act/360 on USD and Act/365 on GBP leg	USD 3M Libor Flat	-7.4bps	6m GBP Libor
NZDUSD	3M Bank Bill (secured)	Same Day	T+2	Act/360 on USD and Act/365 on NZD leg	USD 3M Libor Flat	35.3bps	3m Bank Bill
USDCAD	3M CDOR (secured)	Same Day	T+2	Act/360 on USD and Act/365 on CAD leg	USD 3M Libor Flat	4.75bps	3m CDOR
USDCHF	3M CHF Libor (unsecured)	T+2	T+2	Act/360 on both legs	USD 3M Libor Flat	-39.5bps	6m CHF Libor
USDJPY	3M JPY Libor (unsecured)	T+2	T+2	Act/360 on both legs	USD 3M Libor Flat	-54.25bps	6m JPY Libor

Source: Credit Suisse, the BLOOMBERG PROFESSIONAL™ service

## The mechanics of a CCBS

A cross-currency basis swap differs slightly from other basis swaps, given that notional principals are exchanged in a standard CCBS. CCBS can be mark-to-market or non-mark-to-market. Mark-to-market CCBS have adjustments to the notional principal at the quarterly payment dates based on prevailing spot exchange rates, while non-mark-to-market CCBS do not. Standard CCBS trade on a mark-to-market basis.

Examples of the two types of CCBS are presented below using EURUSD and USDCAD basis swaps. While EURUSD is used as an example for a non-mark-to-market CCBS, a standard EURUSD basis swap also trades on a mark-to-market basis.

### Non-mark-to-market CCBS

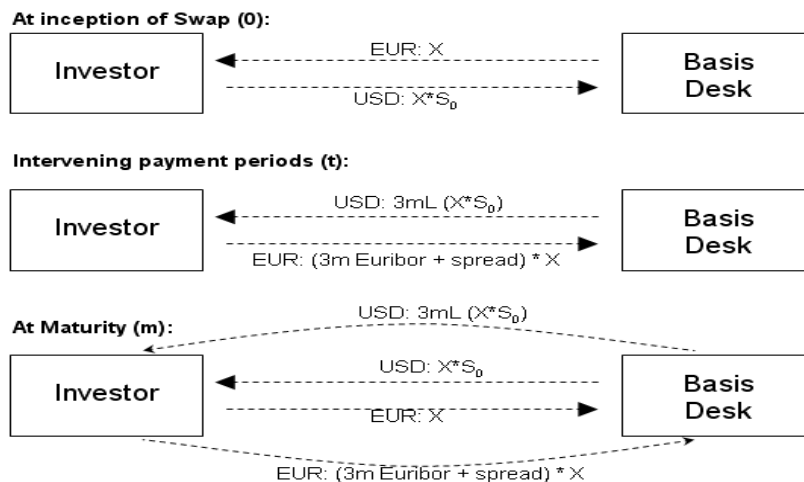
**Notional principals exchanged at onset and expiry only**

On the onset, notional principals of equivalent value, based on the current spot rate ( $S_0$ ), are exchanged. In the intervening period, at each payment date, the floating reference rates plus the predetermined spread are exchanged until expiration, when in addition to the interest rate payments, the principals are exchanged again.

Exhibit 5 shows the basic mechanics of a non-mark-to-market EURUSD cross-currency basis swap and Exhibit 6 shows a stylized example of cash flows. In a EURUSD CCBS, the floating rate references for the USD and EUR legs are 3m USD LIBOR and 3m EURIBOR, respectively – both unsecured rates that fix two business days prior to the accrual period.

**Exhibit 5: Mechanics of a non-mark-to-market EURUSD basis swap (with no principal adjustments at quarterly payment dates)**

$S_0$ : Spot exchange rate at inception of swap  
 $X$ : Notional principal of basis swap on non-USD leg



Source: Credit Suisse

**Exhibit 6: Sample cash flows of a 1YR non-mark-to-market EURUSD basis swap**

Starting Notional (EUR €)	10,000,000				
EURUSD Basis Spread (Aug 13, 2009)	-0.3350%				
Swap start date	8/17/2009				
	<b>8/17/2009</b>	<b>11/17/2009</b>	<b>2/17/2010</b>	<b>5/17/2010</b>	<b>8/17/2010</b>
Spot EURUSD	1.4082	1.4876	1.3607	1.2395	
3mEuribor	0.873%	0.714%	0.661%	0.683%	
EURIBOR fixing day	8/13/2009	11/13/2009	2/15/2010	5/13/2010	
3mLIBOR	0.440%	0.273%	0.250%	0.436%	
LIBOR fixing day	8/13/2009	11/13/2009	2/15/2010	5/13/2010	
Number of days in period	0	92	92	89	92
<b>EUR Leg (€)</b>					
Day-count convention	Act/	360			
Notional Exchange	10,000,000				-10,000,000
<b>Quarterly Cash Flows:</b>					
Qtrly Interest Rate	0	-13,749	-9,686	-8,059	-8,893
<b>Total (€)</b>	<b>10,000,000</b>	<b>-13,749</b>	<b>-9,686</b>	<b>-8,059</b>	<b>-10,008,893</b>
<b>USD Leg (US\$)</b>					
Day-count convention	Act/	360			
Notional Exchange	-14,082,000				14,082,000
<b>Quarterly Cash Flows:</b>					
Qtrly Interest Rate		15,834	9,807	8,703	15,686
<b>Total (US\$)</b>	<b>-14,082,000</b>	<b>15,834</b>	<b>9,807</b>	<b>8,703</b>	<b>14,097,686</b>

Source: Credit Suisse, Locus Analytics, the BLOOMBERG PROFESSIONAL™ service

**Principals are reset at each periodic payment date**

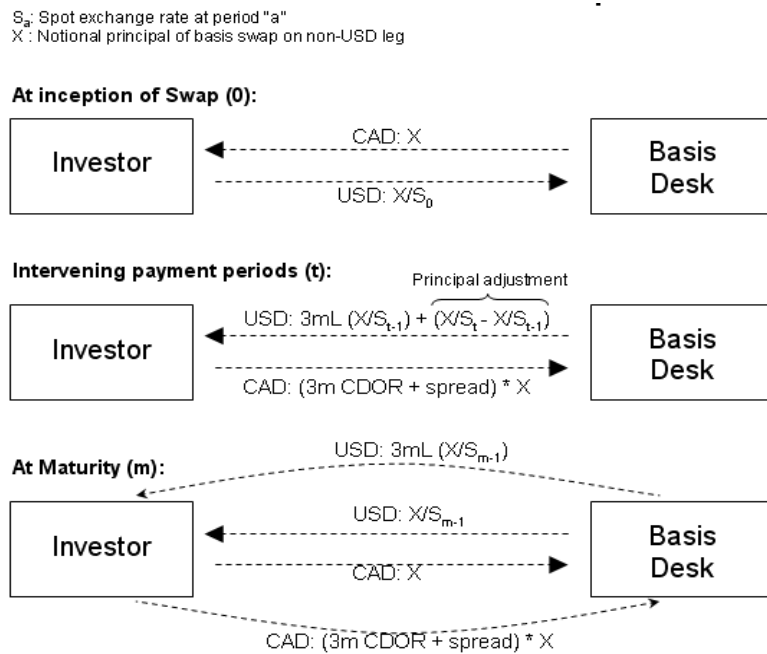
**Mark-to-market CCBS**

Similar to a non-mark-to-market CCBS, notional principals are exchanged at the onset, based on the current spot rate ( $S_0$ ), in a mark-to-market CCBS. However, the principals are reset at each quarterly payment date based on the prevailing spot exchange rates and this adjusted notional principal is then used as the basis to compute interest over the next period. Thus at each quarterly payment period, the payment consists of two parts – the change in principals due to changes in the exchange rate and the interest payments. The principals exchanged at maturity are the adjusted principals from the period just prior to the expiry date.

The mechanics of a mark-to-market USDCAD basis swap are shown in Exhibit 7. Sample cash flows of receiving CAD in a mark-to-market CCBS for a period of one-year are illustrated in Exhibit 8.

In the case of a USDCAD basis swap, the floating rate references for the USD and CAD legs are 3m USD LIBOR and 3m CDOR, respectively, where LIBOR is an unsecured rate while CDOR is an secured rate. In addition, the LIBOR leg fixes two business days prior to the accrual start date while the CDOR rate fixes on the same day the accrual periods starts.

**Exhibit 7: Mechanics of a mark-to-market USDCAD basis swap (with principal adjustments at quarterly payment dates)**



Source: Credit Suisse

**Exhibit 8: Sample cash flows of a 1YR mark-to-market USDCAD basis swap**

Starting Notional (CAD)	10,000,000				
USDCAD Basis Spread (Aug 13, 2009)	0.0622%				
Swap start date	8/17/2009				
	<b>8/17/2009</b>	<b>11/17/2009</b>	<b>2/17/2010</b>	<b>5/17/2010</b>	<b>8/17/2010</b>
Spot USDCAD	1.1086	1.051	1.0464	1.0325	
3mCDOR	0.433%	0.433%	0.440%	0.727%	
CDOR fixing day	8/17/2009	11/17/2009	2/17/2010	5/17/2010	
3mLIBOR	0.440%	0.273%	0.250%	0.436%	
LIBOR fixing day	8/13/2009	11/13/2009	2/15/2010	5/13/2010	
Number of days in period	0	92	92	89	92

**CAD Leg (CA\$)**

Day-count convention	Act/	365			
Notional/ Adj Notional	10,000,000	10,000,000	10,000,000	10,000,000	
<b>Cash Flows:</b>					
Qtrly Notional Adj	10,000,000	0	0	0	
Qtrly Interest Rate	0	-12,477	-12,477	-12,477	-19,895
Ending Notional					-10,000,000
<b>Total (CA\$)</b>	<b>10,000,000</b>	<b>-12,477</b>	<b>-12,477</b>	<b>-12,477</b>	<b>-10,019,895</b>

**USD Leg (US\$)**

Day-count convention	Act/	360			
Notional / Notional Adj	-9,020,386	-9,514,748	-9,556,575	-9,685,230	
<b>Cash Flows:</b>					
Qtrly Notional Adj	-9,020,386	-494,362	-41,827	-128,655	
Qtrly Interest Rate		10,143	6,626	5,906	10,789
Ending Notional					9,685,230
<b>Total (US\$)</b>	<b>-9,020,386</b>	<b>-484,219</b>	<b>-35,201</b>	<b>-122,749</b>	<b>9,696,019</b>

Source: Credit Suisse

## Pricing CCBS

From an economic perspective, CCBS reflects the difference between the funding basis of the two currencies – where the funding basis is defined as the spread between the rate at which an investor can actually expect to borrow in a given currency and that currency's benchmark rate.

Determining the fair spread on a cross-currency basis swap is easiest when a liquid forward foreign exchange contract is traded. According to the principle of interest rate parity, a forward exchange rate is equal to the spot rate adjusted for the relative interest rates of the currencies.

To price a cross-currency basis swap, we need the FX forward rate, as well as forward projections of each floating rate to be exchanged out to the swap maturity. We calculate these forward rates (for EURIBOR and LIBOR in the EURUSD example below) from the nominal swap curve in each currency.

Since principals are exchanged, we can think of the CCBS as the exchange of two bonds: one denominated in the home currency and paying the home currency's floating rate, and the other denominated in the foreign currency, paying the foreign currency's floating rate plus the variable spread.

We know the principals of the two “bonds” are set equal at inception, so exchanging them is fair if they “yield” the same thing. We calculate the yield to maturity on each bond, **adjusting the internal rate of return (IRR) on the foreign bond by the foreign currency’s appreciation implied by the FX forward**. The fair spread of the CCBS is the spread that, when applied to the foreign bond’s cash flows, results in the two bonds having the same yield to maturity (YTM).

### Exhibit 9: Example of USDEUR CCBS pricing for a trade on 22 February 2013

Cash Flow Date	Accrual Start Date	Fwd 3m LIBOR	Fwd 3m EURIBOR	EURIBOR + Spread	Spread (bps)	
					USD Cash Flow	EUR Cash Flow
26-Feb-13					(1,000,000)	759,503
28-May-13	26-Feb-13	0.288	0.218	-0.037	728	71
27-Aug-13	28-May-13	0.283	0.190	-0.065	714	125
26-Nov-13	27-Aug-13	0.321	0.259	0.004	810	-8
26-Feb-14	26-Nov-13	0.348	0.310	0.055	1,000,888	759,609
			YTM		0.31%	-0.01%
			EUR Forward Appreciation			0.32%
			All-in YTM		0.31%	0.31%

Source: Credit Suisse, the BLOOMBERG PROFESSIONAL™ service

In the above example, we calculate the IRRs on a USD floating-rate bond of \$1M notional, and a EUR bond that pays EURIBOR + spread on the equivalent \$759k notional (as of February 22, 2013). We find the adjusted IRR on the EUR bond given that the forward FX market expects EUR to appreciate 32bps. Next, we set the spread such that the adjusted IRRs on each leg are equivalent. The resultant -25 basis point spread is equal to market pricing on February 22.

The calculations above suggest that FX forwards and CCBS are inherently linked, with one implying the other and vice versa assuming liquid markets for both. In reality, however, liquidity in FX forwards diminishes sharply beyond two-year maturities, whereas long-dated CCBS remain fairly observable. Thus short-dated CCBS are generally implied from the FX forward market and long-dated CCBS are used to back into FX forwards of longer maturities.

## Using the USDJPY CCBS to Avail Favorable Funding

Japanese funding markets have been attractive, especially for highly rated issuers given the extremely low rates for a prolonged period of time. An American issuer can avail cheaper USD funding in the Japanese yen (JPY) markets with the help of the USDJPY basis swap. In order to do so, an issuer can first raise JPY funds and then swap the exposure back into USD with the help of a CCBS.

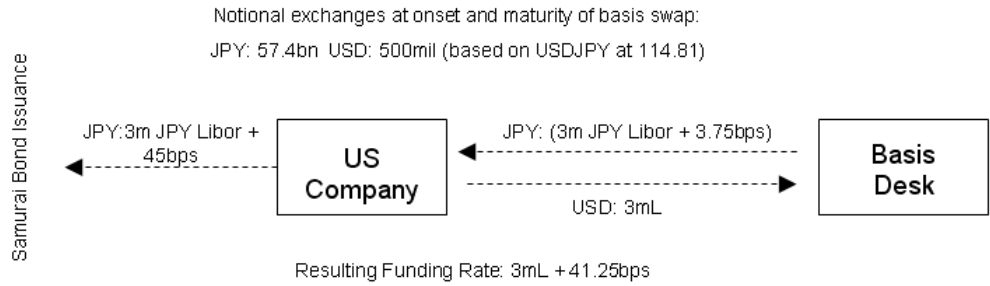
For example, on September 28, 2007, assuming a US pharmaceutical company needed \$500 million for five years, it could have raised the funds in the Japanese yen market (by issuing a Samurai bond<sup>1</sup>) at 3m JPY LIBOR + 45bps (based on prevailing rates). The rate for the same size issue in the US markets for a similarly rated issuer was around 3mL +68bps.

The US company could have then swapped the JPY exposure back into USD by using a 5-year USDJPY basis swap with a 3.75bp spread, resulting in a funding rate of 3mL+41.25bp, almost 27bp cheaper than raising the same funds in the local USD market. Exhibit 10 shows the mechanics of the transaction.

<sup>1</sup> A bond issued in JPY by a foreign issuer.



**Exhibit 10: Using a CCBS to avail better funding rates in the Samurai market**



Source: Credit Suisse, the BLOOMBERG PROFESSIONAL™ service

**Using the EURUSD CCBS to Express a View on Funding Stresses**

The lower the cross-currency basis swap spread – for a CCBS with one USD leg – the lower the interest rate an investor is willing to accept in return for USD-denominated funding. Therefore, the cross-currency basis swap spread captures market perceptions of funding stresses in the foreign currency. For example, if euro credit risk were to rise substantially, we would see a significant move lower in the EURUSD cross-currency basis swap spread – as was the case during the sovereign debt crisis of 2010 and 2011.

A view that European funding concerns would resurge, driving up demand for USD funds versus EUR funds could be expressed by lending EUR and borrowing USD through a EURUSD basis swap. If the view materialized, the spread would decrease further and the position could be unwound at a profit by borrowing EUR and lending USD in another basis swap with overlapping maturity.

Specifically, if an investor, on October 22, 2010, thought there was a potential for the funding concerns in Europe to re-emerge, he/she could enter a short position in the 1-year EURUSD CCBS spread (by borrowing USD and lending EUR). Three months later, on January 21, 2011, if the investor closed the trade based on the view that the situation in Europe was nearing stability, he/she would have gained approximately 10bp (with the nine-month EURUSD basis swap spread at -36bps). Exhibit 12 presents the trade mechanics.

**Exhibit 11: Funding concerns push down EURUSD CCBS spreads**

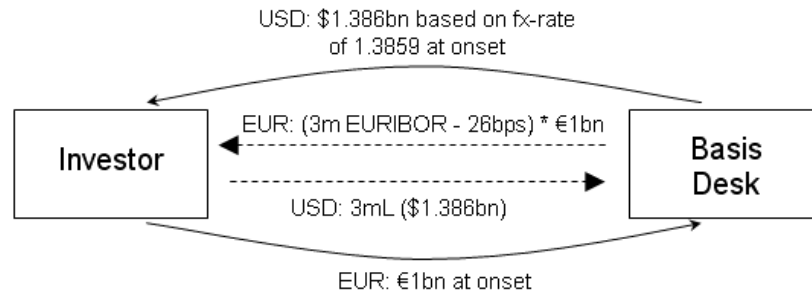


Source: Credit Suisse

**Exhibit 12: Using CCBS to express view on funding stresses**

**Trade date: Oct 22, 2010**

**1Y EURUSD CCBS spread: -26bps**



**Unwind on January 21, 2011:**

9m EURUSD CCBS spread: -36bps, **Realized P&L: 10bps approx**

Source: Credit Suisse

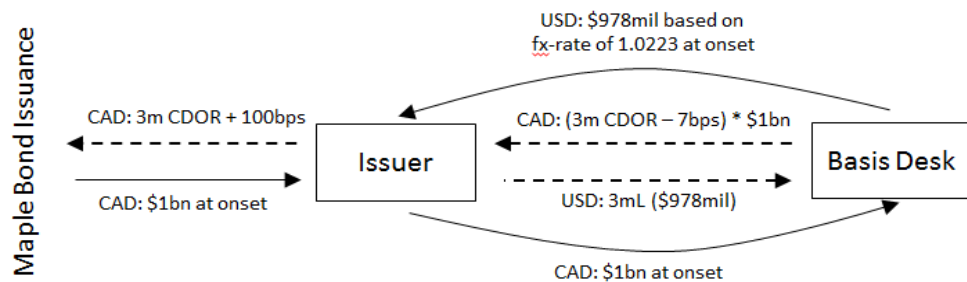
**Using CCBS to Hedge Foreign Currency Issuance**

A US-dollar-denominated bank borrowing in foreign currency markets can swap back exposure to USD through the basis swap markets. For example, US banks can issue bonds denominated in CAD (“Maple bonds”<sup>2</sup>) to allow Canadian investment without exposing debt holders to currency risks.

The bank could then use USDCAD basis swaps to transform most of its liability back into USD. Specifically, if a US company issued CAD \$1bn notional of 2-year Maple bonds with a floating rate of 3m CDOR + 100bp, it could switch the CAD liability, both principal and coupon, to USD by receiving the spread in a 2-year USDCAD basis swap (-7bp), i.e., receiving the CAD leg and paying the USD leg. Exhibit 13 shows the structure of the swap based on February 22, 2013 market levels. The effective currency exposure in CAD would now be limited to 107bp of CAD \$1bn instead of the entire principal and interim interest payments.

**Exhibit 13: Swapping a CAD liability to mostly USD**

Based on market exchange rates and basis spread levels as of COB February 22, 2013



Resulting Liability: Principal of US \$978mil; Coupon of 107bps\*\$1bn CAD and 3mL (\$978mil)

Source: Credit Suisse

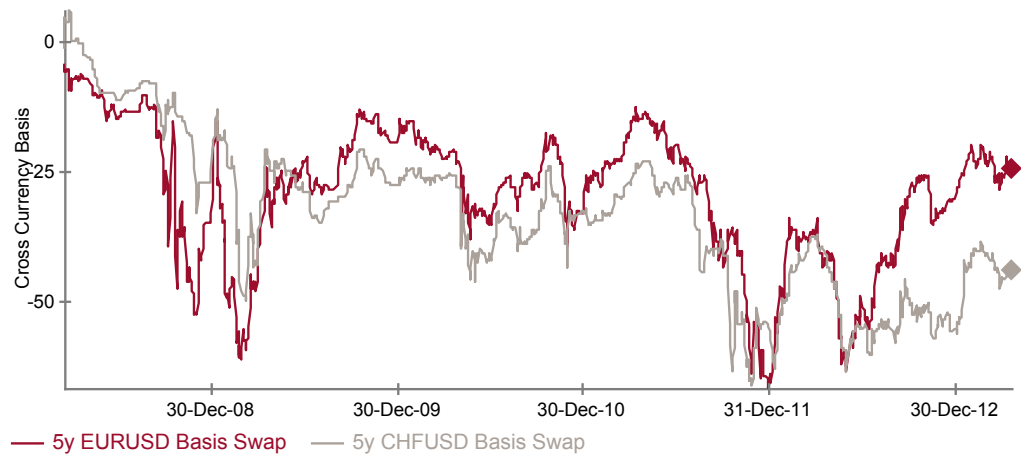
<sup>2</sup> A CAD-denominated bond issued by a foreign issuer.

## Using CCBS to Express a Speculative Convergence View

As cross-currency basis swaps gained broader awareness through the funding crisis in recent years, a new class of non-traditional investors has started to trade in these markets. Fast money clients and hedge funds are increasingly expressing speculative relative value views through either outright or convergence trades.

An example of a convergence opportunity can currently be found between EURUSD and CHFUSD basis swaps. Historically the two cross-currency basis tend to trade closely, as shown in Exhibit 14. However, since the middle of last year, the EURUSD basis has rebounded sharply as European financial stress improved while CHFUSD basis lagged due to issuance activity. As a convergence trade, investors can receive five-year EURUSD basis and pay five-year CHFUSD and look for the dislocation to normalize either with renewed funding stress in Europe or a slowdown in such issuance activity.

### Exhibit 14: As a convergence trade, investors can receive five-year EURUSD basis and pay five-year CHFUSD



Source: Credit Suisse Locus

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## Disclosure Appendix

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### Analyst Certification

I, Michael Chang and Carl Lantz, certify that (1) the views expressed in this report accurately reflect my personal views about all of the subject companies and securities and (2) no part of my compensation was, is or will be directly or indirectly related to the specific recommendations or views expressed in this report.

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