

***Futures Relative Value Monitor***  
***Comparing the CBOT and CME Swap Futures Contracts***

The Chicago Mercantile Exchange is introducing 2yr, 5yr, and 10yr swap futures contracts today. The Chicago Board of Trade's 10yr swap futures contract was introduced last October. Both contracts are cash settled and based on ISDA (International Swaps and Derivatives Association) benchmark rates for U.S. dollar interest rate swaps, as published in the Federal Reserve's H.15 report. The CME contract settlement price is based on a rate index (100 minus the swap rate), similar to Eurodollar futures, while the CBOT contract price is based on a hypothetical 6% coupon bond price, with yield equal to the swap rate. With  $r =$  ISDA swap rate, the final futures settlement prices are given by:

$$\text{CME Price} = 100 - r$$

$$\text{CBOT Price} = 100 * [ c/r + (1 - c/r) * (1 + r/200)^{-2n} ]$$

where  $c = 6$ , the current CBOT contract coupon standard, and  $n = 10$  (maturity of swap in years). The value of a full point for the IMM contract is \$10,000, or a constant \$100 per basis point (the contracts trade in quarter basis point increments worth \$25 each). The value of a full point for the CBOT contract is \$1000 (just like the 10yr T-note and agency contracts), with the basis point value determined in the same way one determines the BPV of a bond. The BPV formulas are given by:

$$\text{CME BPV} = \$100$$

$$\text{CBOT BPV} = 5 * \{ 200c / r^2 + (1 + r / 200)^{-2n-1} * [2n * (1 - c / r) - 200c / r^2 * (1 + r / 200) ] \}$$

The table below shows some sample values of the CBOT 10yr price and BPV for different values of  $r$ . As can be seen, the CBOT BPV is generally less than 100 (and would be even smaller for a 5yr or 2yr maturity); hence, more CBOT swap futures are required to hedge a given instrument or portfolio compared to the CME contract.

<b>r</b>	<b>3.5</b>	<b>4</b>	<b>4.5</b>	<b>5</b>	<b>5.5</b>	<b>6</b>	<b>6.5</b>	<b>7</b>	<b>7.5</b>	<b>8</b>	<b>8.5</b>
<b>P</b>	<b>120.94</b>	<b>116.35</b>	<b>111.97</b>	<b>107.79</b>	<b>103.81</b>	<b>100.00</b>	<b>96.37</b>	<b>92.89</b>	<b>89.58</b>	<b>86.41</b>	<b>83.38</b>
<b>BPV</b>	<b>94.0</b>	<b>89.6</b>	<b>85.5</b>	<b>81.6</b>	<b>77.9</b>	<b>74.4</b>	<b>71.0</b>	<b>67.8</b>	<b>64.8</b>	<b>61.9</b>	<b>59.2</b>

The design of the CBOT swap contract gives it pricing characteristics that are similar to an actual interest rate swap, assuming that the swap rate does not stray too far from 6%. This makes the CBOT contract easy to price, because one needs only to determine the forward yield of the underlying swap and then apply the above price formula to determine the fair futures price. While there are many ways to calculate the forward yield of a swap, Bloomberg users may find the FWCV function to be a convenient way to determine the forward-spot rate spread. The forward spread is then added to the spot swap rate observed in the market to determine the market forward rate.

Because the CME contracts do not have the nonlinear positively convex price-yield relationship of actual swaps, the futures should price at slightly higher yields than the underlying forward swap yields. Using a normal distribution of swap rates and applying implied yield volatilities observed in the swaption market, we determined today's fair values for the convexity adjustments to the CME swap contracts (see tables on page 2). For the June 2yr, 5yr, and 10yr contracts, the adjustments are estimated at 0.5, 1.0, and 1.6bp, respectively. The convexity adjustments should be added to the forward swap rates in order to determine the fair CME swap futures price (100 minus the convexity adjusted forward swap rate).

Both the CME and CBOT contracts should be effective hedging vehicles, although the CME contract may require more frequent rebalancing due to its constant BPV. The most important factor will be which contract offers the best liquidity and pricing efficiency. Since the CBOT offers only a 10yr contract, the CME is currently the only source for 2yr and 5yr swap futures, and the CME's strength in Eurodollar futures may give it an advantage in this part of the yield curve, even if the CBOT introduces competing contracts.. The CBOT 10yr contract may have an advantage over the CME, given that it has been trading for nearly six months and has already established a reasonable level of volume, open interest, and liquidity, plus it trades side by side with the CBOT 10yr T-note and agency futures contracts.

**CME YIELD INDEX CONVEXITY ADJUSTMENT (BP)**

Trade Date: **4/8/02**  
 Contract Expiry: **6/17/02**  
 Days: **70**

<u>Yrs</u>	<u>Fwd Yield</u>	<u>BPV /mm</u>	<u>Yield Vol</u>	<u>Yield STD</u>	<u>Price Convex</u>	<u>Yield Convex</u>
2	<b>4.220</b>	189.9	<b>33.3</b>	0.615	0.0089	<b>0.5</b>
5	<b>5.330</b>	433.9	<b>25.9</b>	0.605	0.0415	<b>1.0</b>
10	<b>5.940</b>	745.9	<b>22.3</b>	0.580	0.1182	<b>1.6</b>

Trade Date: **4/8/02**  
 Contract Expiry: **9/16/02**  
 Days: **161**

<u>Yrs</u>	<u>Fwd Yield</u>	<u>BPV /mm</u>	<u>Yield Vol</u>	<u>Yield STD</u>	<u>Price Convex</u>	<u>Yield Convex</u>
2	<b>4.220</b>	189.9	<b>29.7</b>	0.832	0.0162	<b>0.9</b>
5	<b>5.330</b>	433.9	<b>24.7</b>	0.874	0.0868	<b>2.0</b>
10	<b>5.940</b>	745.9	<b>21.6</b>	0.852	0.2553	<b>3.4</b>