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Eurodollar futures and LIBOR

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Abstract. The Chicago Mercantile Exchange is a global derivatives market place. The CME group is an order driven exchange that facilitates the trading of forward, futures and options contract on numerous products within key asset classes such as agriculture/ energy/metals, equities, interest rates, and exchange rates. Hence a very popular US interest rate futures contract is the three-month Eurodollar futures traded on the CME.
Keywords. Eurodollar; LIBOR; Interest rates; Financial crises.
JEL. N10; N20; E40; E50; G21.

1. Introduction

The Eurodollar interest rate is the rate of interest earned on Eurodollars deposited by one bank with another bank. It is in many ways the same as the London Interbank Offer Rate (LIBOR). The 3-month Eurodollar futures contracts are futures contracts on the three-month Eurodollar interest rate. The contracts have maturities in March, June, September and December for up to 10 years in the future.

Calculation:

If X is the quoted price for a Eurodollar futures contract, the exchange defines the value of one contract as:

$$10{,}000\,[100-0.25(100-X)] \qquad (1)$$

Thus, the Settlement price of 95.53 for the June 2011 contract as shown in the tables below, corresponds to the contract price of:

$$10{,}000[100 - 025(100-95.53] = \$988{,}825$$

It can be seen from equation [1] that a change of one basis point or 0.01 in a Eurodollar futures quote corresponds to a contract price change of $25.

When the third Wednesday of the delivery month is reached the contract is settle in cash. The final marketing to market sets Q equal to 100 – R where R is the actual three-month Eurodollar interest rate on that day, expressed with quarterly compounding and an actual/360-day count convention. Thus, if the three-month Eurodollar interest rate on the third Wednesday of the delivery month is 8% the final marking to market is 92 and the final contract price from equation [1] is:

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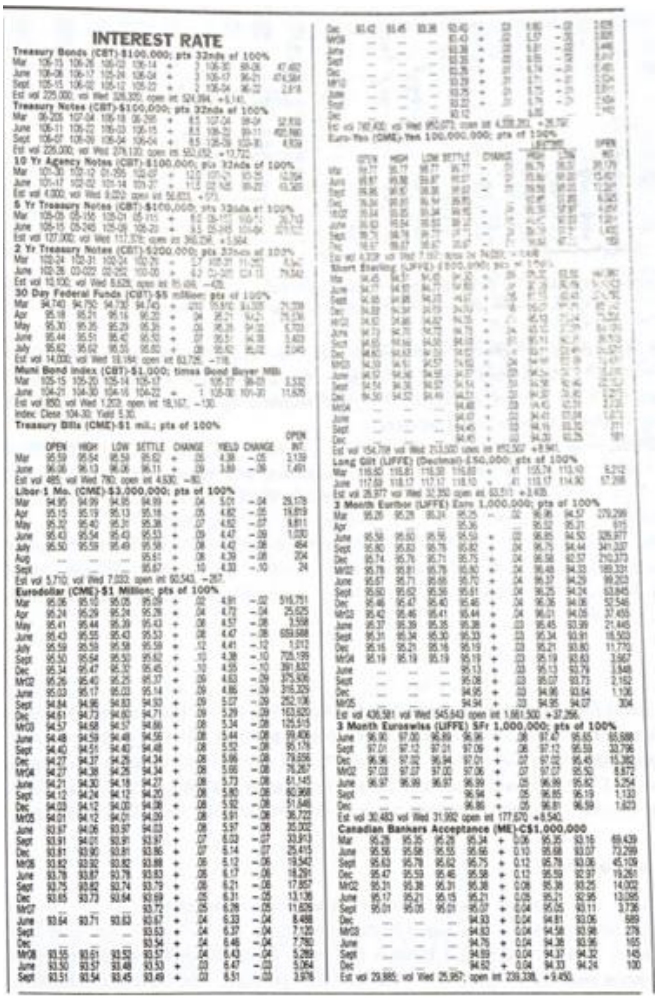
10,000[100-0.25(100-92)] = $980,000

If Q is a Eurodollar futures quote, (100-Q) % is the Eurodollar futures interest rate for a three-month period beginning on the third Wednesday of the delivery month. If Q is a Eurodollar futures quote, (100-Q) % is the Eurodollar futures interest rate for a three-month period beginning on the third Wednesday of the delivery month. Thus, the below table indicates that on March 15, 2011 the futures interest rate for the three-month period beginning Wednesday June 20, 2001, was 100-95.53 = 4.47%. This is expressed with quarterly compounding and an actual/360-day count convention.

Other contract similar to the CME Eurodollar future contract trade on interest rates in other countries. As shown in the table below CME and SGX trade Eur- yen contracts, LIFFE and MATIF trade Euribor contracts (i.e contracts on the three-month Libor rate for the euro) and LIFFE trades three-moth Euro Swiss futures

Interest rate futures quotes from the WSJ March 16 2001.
(Columns show month, open, high, low, settle change, lifetime high, lifetime low, and open interest, respectively)


INTEREST RATE

Treasury Bonds (CBT)-$100,000; pts 32nds of 100%

Treasury Notes (CBT)-$100,000; pts 32nds of 100%

10 Yr Agency Notes (CBT)-$100,000; pts 32nds of 100%

5 Yr Treasury Notes (CBT)-$100,000; pts 32nds of 100%

2 Yr Treasury Notes (CBT)-$200,000; pts 32nds of 100%

30 Day Federal Funds (CBT)-$5 million; pts of 100%

Muni Bond Index (CBT)-$1,000; times Bond Buyer MBI

Treasury Bills (CME)-$1 mil.; pts of 100%

Libor-1 Mo. (CME)-$3,000,000; pts of 100%

Eurodollar (CME)-$1 Million; pts of 100%

Euro-Yen (CME)-Yen 100,000,000; pts of 100%

Short Sterling (LIFFE)-£500,000; pts of 100%

Long Gilt (LIFFE) (Decimal)-£50,000; pts of 100%

3 Month Euribor (LIFFE) Euro 1,000,000; pts of 100%

3 Month Euroswiss (LIFFE) SFr 1,000,000; pts of 100%

Canadian Bankers Acceptance (ME)-C$1,000,000

2. Forward vs future rates

For short maturities (upto one year) the Eurodollar interest rate can be assumed to be the same as the corresponding forward interest rate.

A convexity adjustment is made to convert Eurodollar future rates to forward interest rates.

$$Forward\ \ Rate = \ \ Futures\ Rate - \frac{1}{2}\,\sigma^2 t_1 t_2$$

Where t_1 is the time to maturity of the futures contract, t_2 is the time to maturity of the rate underlying the futures contract and σ is the standard deviation of change in the short-term interest rate in one year. Both rate are expressed with continuous compounding. A typical value for σ is 1.2% or 0.012.

Hence,

Considering the situation where σ=0.012 and we wish to calculate the forward rate when the eight-year Eurodollar futures price quote is 94. In this case In this case t_1 = 8, t_2=8.25, and the convexity adjusted,

$$\frac{1}{2} \times 0.012^2 \times 8 \times 0.00475$$

Or 0.475%. The futures rate is 6% per annum on an actual/360 basis with quarterly compounding. This is 6 x 365/360 = 6.083% per anum on an actual/365 basis with quarterly compounding or 6.038% with continuous compounding. The forward rate is, therefore 6.038-0.475=5.563% per annum with continuous compounding.

The forward rate is less than the futures rate. The size of the adjustment is roughly proportional to the square of the time to maturity of the futures contract. Thus, the convexity adjustment for the eight-year contract is approximately 64 times for a one-year contract.

3. The LIBOR zero curve

The LIBOR zero curve which is also sometimes referred to as the swap zero curve is frequently used as a risk-free-zero curve when derivatives are valued. Spot LIBOR rates are used to determine very short-term LIBOR zero rates. After that Euro futures (i.e Eurodollar futures, Euroyen futures, Euribor futures, etc.) are frequently used. Once a convexity adjustment such as that just described is made, the Euro futures contract define forward rates for future three-month time periods.

In the US, March, June, September and December Eurodollar futures are often used to determine the LIBOR zero curve out to five years. Suppose that the ith Eurodollar futures contract matures at time Ti (i=1,2,..). We usually assume that the forward interest rate calculated from this futures contract applies to the Period Ti to Ti+1. (There is at most a small approximation here). This enables a bootstrap procedure to be sued to determine zero rates. Suppose that Fi is the forward rate calculated from the ith Eurodollar futures contract and Ri is the zero rate for a maturity Ti:

Then we have

$$F_1 = \frac{R_{i+1}\,T_{t+1} - R_i T_i}{T_{i+1} - T_i}$$

So that,

$$R_{i+1} = \frac{F_i(T_{i+1} - T_i) + R_i T_i}{T_{i+1}}$$

Hence,

The 400-day LIBOR zero rate has been calculated as 4.80% with continuous compounding and from a Eurodollar future quote it has been calculated that the forward rate for a 91 day period beginning in 400 days is 5.30% with continuous compounding We can use the above equations to obtain the 491-day rate as

$$\frac{0.053\ x\ 91 + 0.048\ x\ 400}{491} = 004893$$

Overnight euro LIBOR Interest Rates

Last Month-June 2020 Last Year-2019 Full Term- 2001-2020

1-month US Dollar LIBOR Interest rate.

Last Month-June 2020 Last Year-2019 Full Term- 2001-2020

6-month British pound sterling LIBOR interest rate

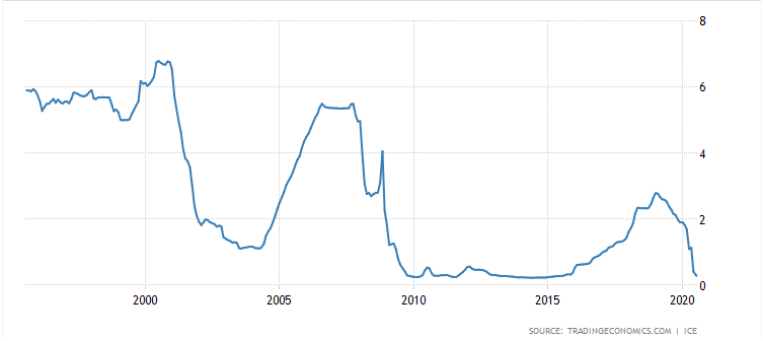
Last Month-June 2020 Last Year-2019 Full Term- 2001-2020

12-Month US Dollar LIBOR interest rate

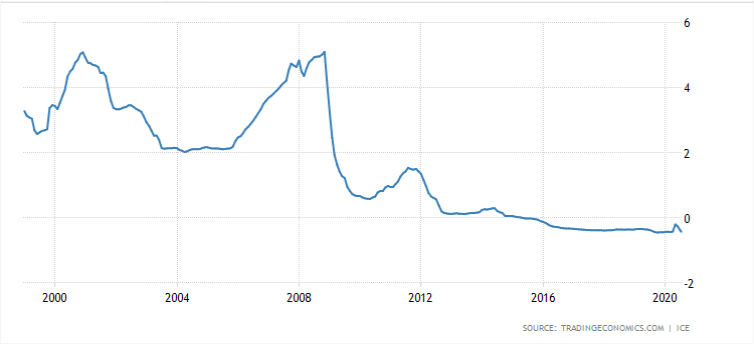
Last Month-June 2020 Last Year-2019 Full Term- 2001-2020

Source: [Retrieved from].

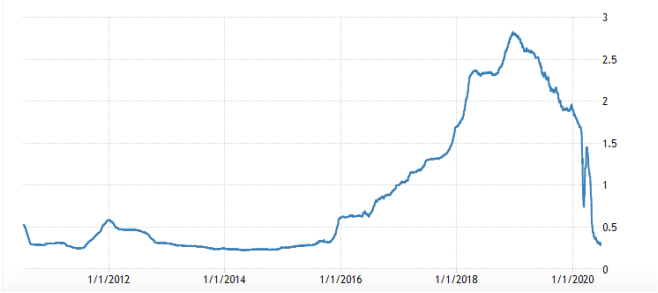
US Dollar LIBOR Three Month Rate



Euro LIBOR Three Month Rate



US – Three Month LIBOR, based on US Dollar



British Pound Libor Three Month Rate

Source: [Retrieved from].

Eurodollar futures provide an effective means for companies for companies and banks to secure interest rate for money they plan to borrow or lend in the future. The Eurodollar is used to hedge against yield curve

changes over multiple years in the future. A Eurodollar future is a cash settled futures contract who price moves in response to the LIBOR interest rate. Eurodollar futures are a way for companies and banks to lock in an interest rate today, for money they intend to borrow or lend in the future. LIBOR is the average interbank interest rate at which a selection of banks on the London money market are prepared to lend to one another. The LIBOR comes in 7 maturities (from over to 12 months) and in 5 different currencies. The LIBOR is important because lenders, including banks and other financial institutions use LIBOR as the benchmark reference for determining interest rate for various debt instruments. It is also used as benchmark for mortgages, corporate loans, government bonds, credit cards, student loans in various countries. Hence, the importance of both the Eurodollar future and LIBOR rates cannot be stressed enough especially in the case international financial management and financial crises.

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