

**WORLD 2 / CHAPTER 4****MONEY MARKET FUTURES**

	<b>Page</b>
<b>1. Terminology and market practice with money market futures</b>	<b>2</b>
<b>2. Price calculation of money market futures</b>	<b>8</b>
<b>3. Comparison: money market futures vs. Forward rate agreements</b>	<b>9</b>
<b>4. Main markets of money market futures</b>	<b>10</b>
<b>4.1 Tick</b>	<b>10</b>
<b>4.2 Excursus: options on money market futures</b>	<b>10</b>
<b>4.3 Excursus: Spread Strategies</b>	<b>11</b>
<b>5. Inter Contract Spread</b>	<b>12</b>

## MONEY MARKET FUTURES

### 1. Terminology and market practice with money market futures

Money market futures are contracts traded at the exchange market. Usually, the underlying is a 3-month deposit, in some currencies also a 1-month deposit, that represents the interest rate of a future time period. The term is always exactly 90 (30) days. The nominal amount of capital depends on the currency and is fixed in advance.

Money market futures can be used in a similar way to FRAs. That is, to

- eliminate a future interest rate risk (hedging)
- speculate on interest rate trends (trading)
- to arbitrage between different markets (arbitraging)

Money market futures are standardised products, because they are traded in the exchange market. Thus, some specifications are already fixed:

- each contract has a given underlying principal
- there are standardised maturity dates

Mostly, futures contracts can, depending on the currency, only be traded at certain exchanges on given trading dates (e.g. GBP on the LIFFE, etc.). Some contracts can be sold or bought (and consequently closed), at different exchanges [e.g. a USD 3-month contract purchased in Chicago (CME) and sold in Singapore (Simex)].

#### Conventions

#### Delivery dates

Delivery dates of money market futures are set by the futures exchange - usually on the third Wednesday of the last month of the quarter (March, June, September, December).

**Example:** IMM dates (International money market dates)

- every 3rd Wednesday in the due months (last months in the quarter)
- March (H), June (M), September (U), December (Z).

**Terminology of futures terms**

As stated above, the abbreviation H, M, U, and Z represent the respective months.

By introducing the so-called 1-month future contracts and the serial option on futures (with specific currencies and at specific exchanges), delivery dates have been expanded to all months: Deliveries are possible on the third Wednesday of every month, now.

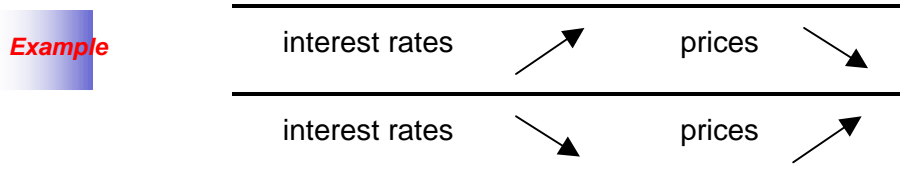
**Last trading day**

Last trading days of futures are determined by the exchanges and are usually two days before delivery date (an exception is the GBP, where the theoretical delivery date is the last trading date, i.e. same-day fixing).

**Quotation**

Prices for futures are quoted as discounts on the basis of 100. Therefore, a so-called forward interest rate of 4.50 % p.a. (i.e. an interest rate for a future period) equals a futures price of 95.50 (= 100 – 4.50).

The results of this quoting convention are illustrated below:



**Example**

If the interest rate rises from 4.50 % to 5 %, the future will fall from 95.50 to 95.00.

If the interest rate falls from 4.50 % to 4 %, the future will rise from 95.50 to 96.00.

With the quotation of an interest rate on the basis of 100, the buying/selling of a money market future has just the opposite effect to an FRA purchase/sale:

<b>FRA purchase</b>	=	<b>future short</b>
<b>FRA sale</b>	=	<b>future long</b>

A future's quote of JUNE (M) 96.64 / 96.65 corresponds to an interest rate of 3.35 % / 3.36 % p.a. for the term from the third Wednesday in June XY until the third Wednesday in September XY, in a specific currency.

### Underlying

Each futures contract assumes a standardised volume of an underlying instrument. In the case of money market futures, these underlyings are usually either interbank deposits with an agreed term (30 days or -more often- 90 days) or treasury bills with a given term.

### Volume of the contract

Not only the underlying but also the volume (principal) of a future contract is exactly specified.

In case of EUR and USD, the volume of each contract is 1,000,000; with GBP it is 500,000 per contract, etc.

### Futures purchase

- as hedging operation: → protection **against** falling interest rates
- as speculation: → speculation **on** falling interest rates

### Futures sale

- as hedging operation: → protection **against** rising interest rates
- as speculation: → speculation **on** rising interest rates

### Tick

A tick is the marginal movement of the futures price. With money market futures, a tick is usually a hundredth of 1 % (= 0.01 % = 0.0001). Since recently, also smaller units -e.g. with the USD, a hundredth of 0.5 % (= 0.005 % = 0.00005)- are used.

The tick's value can be determined in the following way:

$$\text{volume of the contract} \cdot \text{quantity of the tick} \cdot \frac{\text{term}}{360}$$

#### Example

3-month Eurodollar	1,000,000	· 0.00005	· $\frac{90}{360}$	=	USD 12.5
3-months Euro	1,000,000	· 0.00005	· $\frac{90}{360}$	=	EUR 12.5
3-month-short sterling	500,000	· 0.0001	· $\frac{90}{360}$	=	GBP 12.5
1-month Eurodollar	3,000,000	· 0.0001	· $\frac{30}{360}$	=	USD 25.0
1-month Euro	3,000,000	· 0.00005	· $\frac{30}{360}$	=	EUR 12.5
1-month CHF	1,000,000	· 0.0001	· $\frac{30}{360}$	=	CHF 25.0

### Settlement on the last trading date

While bond futures (e.g. US T-bonds, UK gilt, Euro-Bundkontrakt) need to be settled by real delivery of the underlying, the money market futures are settled cash on the last trading date. "Cash settlement" is based on the EDSP (Exchange Delivery Settlement Price); i.e. on the last trading date the interest rate of that period, on which the future contract of the BBA is based, is taken into account. Thus, the EDSP is determined (= 100 – BBA fixing rate).

 **Example**

BBA fixing for CHF on the last trading date for 3 months at 3.375 %  
 $100 - 3.375 = 96.625$ , rounded up to 96.63 EDSP

An open position of a future with 500 contracts with a purchase price of 96.50 is settled cash with a value of CHF 162,500 ( $= 500 \cdot 25 \cdot 13$ ) on the last trading date.

### Closing a futures position

Each futures position can be closed by an appropriate, opposite futures position before or at the last trading date. The closing leads to the elimination of the position and all related margins as well as profits/losses.

### Clearing house

All operations at the futures exchange are settled by the clearing house. The clearing house is the business partner of all real buyers and sellers at the exchange.

Placing the clearing house between buyer and seller reduces the credit risk. To reduce this risk to a minimum, the clearing house deals solely with registered clearing members who for their part offer their services as brokers or clearers. In order to protect against default risk of exchange members and other risks, initial margins or variation margins are calculated.

### Margins

As mentioned above, margins are required when dealing with futures. They reduce the credit risk for the exchange to a minimum. They are demanded either daily (variation margin) or otherwise in relation to the number of contracts (initial margin).

### Initial margin

- Most of the time, the initial margin is a fixed amount; differing by contract and currency, e.g. USD 350 for each 3-month eurodollar contract.
- The amount is fixed by the clearing house and changes in relation to the volatility of the markets. The initial margin serves as an additional protection against default risk in order to cover the potential loss of a market participant that could result from the daily price fluctuations.



- A spread margin is a reduced initial margin due to simultaneous long and short positions (in different periods), e.g. Eurodollar March long, 100 contracts, June short, 100 contracts.

Instead of paying a margin of  $200(\text{total amount of contracts}) \cdot 350$ , i.e. USD 70,000, a reduced spread margin is applied, e.g. USD 250. New calculation  $200(\text{total amount of contracts}) \cdot 250 = 50,000$ .

➔ **The initial margin is returned to the market participant at the expiry of the position or if the position is closed earlier.**

### Variation margin

Another way to reduce the credit risk is to use the variation margin. Here, the difference between closing price and purchase price (or the closing price of the day before) is determined daily, and thus, the real profits or losses are charged.

#### Example

5th of May, buy 100 June Euro Futures, price 96.60 (without initial margin)  
closing price 5th of May 96.65 = variation margin  $5 \cdot 25 \cdot 100 = \text{EUR } 12,500$   
(credit)

closing price 6th of May 96.57 = variation margin  $8 \cdot 25 \cdot 100 = \text{EUR } 20,000$   
(charge)

➔ Realised loss since the purchase =  $3 \cdot 25 \cdot 100 = \text{EUR } 7,500$

### Span margin

The span margin (at the LIFFE) is another form of insurance. Here, the total risk of a position is determined by using a series of risk factors. The result is converted by a specific ratio into a margin that is eventually charged.

## 2. Price calculation of money market futures

Similar to FRAs, the price of money market futures can be derived by or compared to the current interest rates in the cash markets. The formula is almost identical to the one for calculating FRA prices, it differs only due to the opposite ways of quotation:

$$FUT = 100 - \left\{ \left[ \frac{1 + \left( r_L \cdot \frac{D_L}{B} \right)}{1 + \left( r_S \cdot \frac{D_S}{B} \right)} - 1 \right] \cdot 400 \right\}$$

FUT =	price of the future
$r_L$ =	interest rate in decimals, long term
$D_L$ =	days, long term
$r_S$ =	interest rate in decimals, short term
$D_S$ =	days, short term
B =	day basis for calculation

**Example**

Assume, that the price of an Euro future, starting on June 18th, has to be calculated.

Comparable deposit rates:

3-month	3.25 %	(91 days)
6-month	3.50 %	(181 days)

$$FUT = 100 - \left\{ \left[ \frac{1 + \left( 0.0350 \cdot \frac{181}{360} \right)}{1 + \left( 0.0325 \cdot \frac{91}{360} \right)} - 1 \right] \cdot 400 \right\} = 96.28$$

This also represents an interest rate of 3.72 %.

### 3. Comparison: money market futures vs. forward rate agreements

Since money market futures and forward rate agreements have very similar effects, we compare these two instruments:

<i>FRA</i>	<i>money market future</i>
quotation = interest rate (e.g. 4.50 %)	quotation = 100 – interest rate (e.g. 95.50)
OTC product	product of exchange market
<ul style="list-style-type: none"> <li>• non-standard contracts</li> </ul>	<ul style="list-style-type: none"> <li>• standard contracts</li> </ul>
<ul style="list-style-type: none"> <li>• volume: unlimited (depending on dealer)</li> </ul>	<ul style="list-style-type: none"> <li>• volume (e.g. EUR, USD 1 Mio ) fixed, depending on currency</li> </ul>
<ul style="list-style-type: none"> <li>• terms: unlimited (broken dates, too)</li> </ul>	<ul style="list-style-type: none"> <li>• terms: 1 or 3 months (often only specific months, as March, June, etc.)</li> </ul>
<ul style="list-style-type: none"> <li>• spread: 1 – 4 points (main currencies)</li> </ul>	<ul style="list-style-type: none"> <li>• spread: mostly 1 bp, sometimes ½ bp</li> </ul>
<ul style="list-style-type: none"> <li>• small credit risk</li> </ul>	<ul style="list-style-type: none"> <li>• no credit risk</li> </ul>
<ul style="list-style-type: none"> <li>• small charge of capital</li> </ul>	<ul style="list-style-type: none"> <li>• no charge of capital</li> </ul>
<ul style="list-style-type: none"> <li>• reversal (doubled charge of the line, twice charge of capital, two FRAs in the books)</li> </ul>	<ul style="list-style-type: none"> <li>• buying / selling possible: in the future's book only balanced, open positions)</li> </ul>
<ul style="list-style-type: none"> <li>• low back office requirements</li> </ul>	<ul style="list-style-type: none"> <li>• a lot of back office work : margins must be booked daily</li> </ul>
<ul style="list-style-type: none"> <li>• calculation of interest: real number of days</li> </ul>	<ul style="list-style-type: none"> <li>• calculation of interest: always 30 or 90 days</li> </ul>
<ul style="list-style-type: none"> <li>• difference between interest rates is discounted</li> </ul>	<ul style="list-style-type: none"> <li>• if paid "flat", no discounting → "front fee" by margins</li> </ul>

## 4. Main markets of money market futures

### 4.1 Ticks

<i>Currency</i>	<i>Futures exchange</i>	<i>Volume of the contract</i>	<i>Underlying</i>	<i>Tick</i>
EURO	EUREX	3,000,000	3-Mo EURIBOR	12.5 EUR
EURO	EUREX	1,000,000	1-Mo EURIBOR	12.5 EUR
EURO	EUREX	1,000,000	3-Mo EURO LIBOR	12.5 EUR
EURO	LIFFE	3,000,000	3-Mo EURO LIBOR	12.5 EUR
DKK	FUTOP	5,000,000	CIBOR	125.0 DKK
GBP	LIFFE	500,000	LIBOR	12.50 GBP
SEK	OM Stockholm AB	1,000,000	STIBOR	25.0 SEK
SFR	LIFFE	1,000,000	LIBOR	25.0 SFR
USD	CME	1,000,000	LIBOR - 3 months	12.50 USD
USD	CME	3,000,000	LIBOR - 1 months	12.50 USD
USD	CME	1,000,000	13 weeks T bill	25 USD

### 4.2 Excursus: options on money market futures

Options on interest futures are "American" options.

With some currencies the whole premium of the option is due when the option is bought, for others the premium is valued daily (e.g. at the LIFFE) as a variation margin is charged.

### 4.3 Excursus - Spread Strategies

Generally, the simultaneous purchase and sale of futures contracts with different times to maturity and the same underlying (or different underlyings) is called a Spread

#### Intra Contract Spread

An Intra Contract spread is the simultaneous purchase and sale of futures contracts with different times to maturity and the same underlying. The "Spread" is calculated as follows:

$$\text{Spread} = \begin{array}{l} + \text{ Price of near contract} \\ - \text{ Price of far contract} \end{array}$$

If the Spread is positive or negative depends on the prices of the of the contracts. Since the price of MM – Futures is mainly determined by the yield curve structure, a steep yield curve entails lower futures prices compared to the spot price. Thus the following rules hold:

Steep yield curve → Spread negative

Inverse yield curve → Spread positive

Like in options trading, spreads on futures are also traded separately.

The terminology used is:

Buy Spread = Buy near contract

Sell Spread = Sell near contract, buy far contract

Intra – spreads carry considerably less risk than "pure" futures positions, since they depend on the relation between two contracts and not on the development of absolute values.

Accordingly, stock exchanges demand usually lower margins for Spread deals.

## 5. Inter Contract Spread

An Inter Contract Spread is the simultaneous purchase and sale of futures contracts on different underlyings. Different times to maturity are not required.

Generally, Inter Spreading pays attention to a proven correlation between two contracts and that the strategy is backed by a market opinion towards the price developments of the two futures. In contrast to Intra – Spreading, there is no convention concerning terminology.