Futures Market Dynamic Price Banding Mechanism

Invigorating Futures Trading and Serving the Real Economy

Fulfilling Hedging Needs and Facilitating Price Discovery

Taiwan Futures Exchange
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Purpose

Purpose

- **Reduce abnormal price fluctuations by preventing erroneous trades, fat finger incidents and momentary intraday order book imbalances**
- **Enhance market integrity**
- **Stay in line with global markets**

Introduction

Applicable products and trading time

■ Phase-one products

- ◆ TX / MTX:
  - ✓ Spot month contracts
  - ✓ Next calendar month contracts
  - ✓ Calendar spread orders composed of a spot month contract and the next calendar month contract

■ Applicable trading time[1]

- ◆ Opening call auction: Not applicable

- ◆ Intraday continuous matching: Applicable

1. Dynamic price banding is not applicable to block trades.

How dynamic price banding works

- TAIFEX checks each new order[1] (including limit orders, market orders and market with protection orders[2]) and simulates matched prices based on the order book at the time.

    - Buy Orders: simulated matched price > the upper limit of dynamic price band → reject order
    - Sell Orders: simulated matched price < the lower limit of dynamic price band → reject order
    - Only new orders that may cause abnormal price movements will be rejected; other transactions remain unaffected.

When simulated matched prices can't be generated for a newly submitted buy (sell) order because there is no existing counterparty sell (buy) order in the order book, TAIFEX will reject the buy (sell) order if the designated bid (offer) price of the buy (sell) order is above (below) the upper (lower) limit of TAIFEX's dynamic price band.
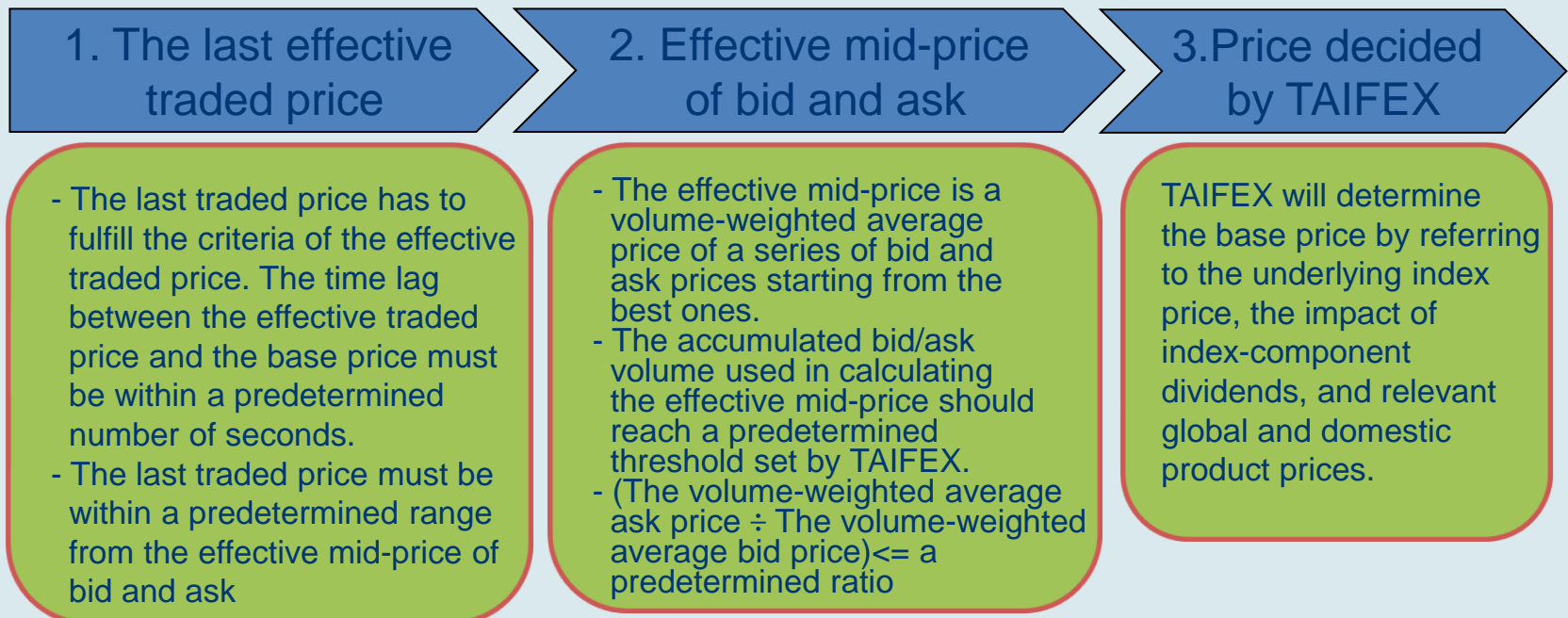
1. Price modifications are treated as new orders and are subject to dynamic price banding.
2. Implied orders constructed by TAIFEX' trading system are not actual orders and therefore not subject to dynamic price banding.

Calculation of the limits of dynamic price band

- Upper limit : base price + Variation range
- Lower limit : base price - Variation range

  - Ranges are calculated before market open every day.
  - The range is fixed for during the trading session.

- Base price determination sequence

1. The last effective traded price	2. Effective mid-price of bid and ask	3. Price decided by TAIFEX
- The last traded price has to fulfill the criteria of the effective traded price. The time lag between the effective traded price and the base price must be within a predetermined number of seconds. - The last traded price must be within a predetermined range from the effective mid-price of bid and ask	- The effective mid-price is a volume-weighted average price of a series of bid and ask prices starting from the best ones. - The accumulated bid/ask volume used in calculating the effective mid-price should reach a predetermined threshold set by TAIFEX. - (The volume-weighted average ask price ÷ The volume-weighted average bid price)<= a predetermined ratio	TAIFEX will determine the base price by referring to the underlying index price, the impact of index-component dividends, and relevant global and domestic product prices.

Calculation of the variation range

- **TX and MTX variation range**

  - Spot month contracts and the next calendar month contracts: <u>the last closing price</u> of the underlying index × **2%**

  - Calendar spread orders composed of a spot month contract and the next calendar month contract: <u>the last closing price</u> of the underlying index × **1%**

- **Example: Assuming a TAIEX index closing price of 10,500 points on Oct. 5:**

  - For the after-hour trading session beginning at 3pm on Oct. 5 and the regular trading session beginning at 8:45am on Oct. 6:
    - The TX and MTX variation range for spot month and the next calendar month contracts is 210 points (=10,500×2%).
    - The TX and MTX variation range for calendar spread orders composed of a spot month contract and the next calendar month contract is 105 points (=10,500×1%).

Dynamic price banding with different order types

Order type	Treatment
Rest of Session (ROD)	■ Any portion of the order of which the simulated matched price is above (below) the upper (lower) limit of TAIFEX' dynamic price band will be rejected, while the remainder of the order with simulated matched prices within the dynamic price band will be executed.
Immediate or Cancel (IOC)	
Fill or Kill (FOK)	■ If any of the simulated matched prices are above (below) the upper (lower) limit of TAIFEX' dynamic price band, the whole order will be rejected.

■ **Example: an investor submits a limit order to buy 5 lots of the TX spot month contract. The simulated matched prices of 4 lots are within the dynamic price band, while the simulated match price of 1 lot exceeds the upper limit.**

- ◆ If the limit order is an ROD or IOC order: 4 lots will be executed, while 1 lot will be rejected.
- ◆ If the limit order is an FOK order: the whole order (5 lots) will be rejected.

Other issues

- **Unusual market conditions: TAIFEX may adjust the variation range or suspend the dynamic price banding mechanism when necessary.**
  - ◆ Quantitative indicators: When predetermined quantitative indicators are triggered, TAIFEX may adjust the variation range. (For example, double the original variation range.)
  - ◆ Qualitative indicators: In the event of a natural disaster, riot, war, or other force majeure event, TAIFEX may adjust the variation range or suspend the dynamic price banding mechanism.

- **System messages**
  - ◆ When an order is rejected due to dynamic price banding: the "simulated matched prices exceeded dynamic price banding" system message will be sent.
  - ◆ Variation range: the dynamic price banding variation ranges of applicable products will be sent through the system before market open.
  - ◆ Adjustment to variation range: the "variation range relaxed" system message will be sent before market open or during trading hours.
  - ◆ Suspension of the dynamic price banding mechanism:
    - ➢ Qualitative indicators reached: the "dynamic price banding mechanism suspended" system message will be sent;
    - ➢ Suspension of dynamic price banding due to system failure: the "dynamic price banding mechanism suspended" system message will be sent. Once the system issue is resolved, the "dynamic price banding mechanism resumed" system message will be sent.

Examples

Example 1: Limit buy order with simulated matched prices below the upper limit

- Assuming the base price (the last effective traded price) is 10,000 pts and the variation range is 200 pts, the upper limit of the dynamic price band is 10,200 pts (=10,000+200).
- If an investor submits an ROD limit order to buy 15 lots of the TX spot month contract at 10,010 pts:
- According to the order book at the time, the simulated matched prices are 10,001 pts (7 lots), 10,002 pts (3 lots), and 10,003 pts (5 lots). Therefore, the order will not be rejected.

Bid	Price	Ask
	10201	8
	…	…
	10005	15
	10004	12
	10003	5
	10002	3
	10001	7
15	9999	
22	9998	
13	9997	
10	9996	
10	9995	

10,200 pts – the upper limit of dynamic price band

Example 2: Limit sell order with simulated matched prices above the lower limit

- Assuming the base price (the last effective traded price) is 9,999 pts and the variation range is 200 pts, the lower limit of the dynamic price band is 9,799 pts (=9,999-200).
- If an investor submits an ROD limit order to sell 15 lots of the TX spot month contract at 9,990 pts:
- According to the order book at the time, the simulated matched prices are 9,998 pts (5 lots), 9,997 pts (3 lots), 9,996 pts (3 lots) and 9,995 pts (4 lots). Therefore, the order will not be rejected.

Bid	Price	Ask
	10004	15
	10003	10
	10002	7
	10001	8
	10000	10
5	9998	
3	9997	
3	9996	
10	9995	
5	9990	
…	…	
20	9798	

9,799 pts – the lower limit of dynamic price band

Example 3: Limit buy order with simulated matched prices above the upper limit

- Assuming the base price (the last effective traded price) is 10,000 pts and the variation range is 200 pts, the upper limit of the dynamic price band is 10,200 pts (=10,000+200). If an investor submits a limit order to buy 15 lots of the TX spot month contract at 10,400 pts:

- According to the order book at the time, the simulated matched prices are 10,001 pts (10 lots), 10,300 pts (2 lots) and 10,400 pts (3 lots):
  - ◆ If the order is an ROD order or IOC order: 10 lots will be matched at 10,001 pts, while the remaining 5 lots will be rejected as their simulated matched prices are above the upper limit.
  - ◆ If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	10600	10
	10500	10
	10400	3
	10300	2
	10001	10
5	9999	
2	9998	
3	9997	
10	9996	
10	9995	

10,200 pts – the upper limit of dynamic price band

Example 4: Limit sell order with simulated matched prices below the lower limit

- Assuming the base price (the effective mid-price of the bid and ask) is 10,000 pts and the variation range is 200 pts, the lower limit of the dynamic price band is 9,800 pts (=10,000-200). If an investor submits a limit order to sell 15 lots of the TX spot month contract at 9,600 pts:

- According to the order book at the time, the simulated matched prices are 9,999 pts (5 lots), 9,750 pts (3 lots), 9,700 pts (3 lots) and 9,650 pts (4 lots):
  - ◆ If the order is an ROD order or IOC order: 5 lots will be matched at 9,999 pts, while the remaining 10 lots will be rejected as their simulated matched prices are below the lower limit.
  - ◆ If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	10005	10
	10004	10
	10003	7
	10002	5
	10001	10
5	9999	
3	9750	
3	9700	
10	9650	
5	9600	

9,800 pts – the lower limit of dynamic price band

Example 5: Market buy order with simulated matched prices above the upper limit

- Assuming the base price (the last effective traded price) is 10,001 pts and the variation range is 210 pts, the upper limit of the dynamic price band is 10,211 pts (=10,001+210). If an investor submits a market order to buy 15 lots of the TX spot month contract:

- According to the order book at the time, the simulated matched prices are 10,001 pts (10 lots), 10,400 pts (2 lots) and 10,450 pts (3 lots):
  - ◆ If the order is an IOC order: 10 lots will be matched at 10,001 pts, while the remaining 5 lots will be rejected as their simulated matched prices are above the upper limit.
  - ◆ If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	10600	20
	10500	10
	10450	3
	10400	2
	10001	10
5	9999	
2	9998	
3	9997	
10	9996	
20	9995	

10,211 pts – the upper limit of dynamic price band

Example 6: Market sell order with simulated matched prices below the lower limit

- Assuming the base price (the effective mid-price of the bid and ask) is 10,000 pts and the variation range is 210 pts, the lower limit of the dynamic price band is 9,790 pts (=10,000-210). If an investor submits a market order to sell 20 lots of the TX spot month contract:

- According to the order book at the time, the simulated matched prices are 9,999 pts (10 lots), 9,750 pts (4 lots) and 9,700 pts (6 lots):
  - ◆ If the order is an IOC order: 10 lots will be matched at 9,999 pts, while the remaining 10 lots will be rejected as their simulated matched prices are below the lower limit.
  - ◆ If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	10005	10
	10004	10
	10003	7
	10002	5
	10001	20
10	9999	
4	9750	
6	9700	
10	9650	
25	9600	

9,790 pts – the lower limit of dynamic price band

Example 7: Market with protection buy order with simulated matched prices above the upper limit

- Assuming the base price (the last effective traded price) is 10,000 pts and the variation range is 200 pts, the upper limit of the dynamic price band is 10,200 pts (=10,000+200). If an investor submits a market with protection order to buy 15 lots of the TX spot month contract:

- If the converted buying price of the MWP order is 10,210 pts (=10,160 pts [best bid] + 50 pts [protected range]):

- According to the order book at the time, the simulated matched prices are 10,161 pts (10 lots), 10,205 pts (2 lots) and 10,208 pts (3 lots):

  - ◆ If the order is an IOC order: 10 lots will be matched at 10,161 pts, while the remaining 5 lots will be rejected as their simulated matched prices are above the upper limit.
  - ◆ If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	10400	10
	10300	10
	10208	3
	10205	2
	10161	10
1	10160	
2	9999	
3	9998	
10	9997	
10	9996	

10,200 pts – the upper limit of dynamic price band

Example 8: Market with protection sell order with simulated matched prices below the lower limit

- Assuming the base price (the last effective traded price) is 10,000 pts and the variation range is 200 pts, the lower limit of the dynamic price band is 9,800 pts (=10,000-200). If an investor submits a market with protection order to sell 15 lots of the TX spot month contract:

- If the converted selling price of the MWP order is 9,790 pts (=9,840 pts [best ask] - 50 pts [protected range]):

- According to the order book at the time, the simulated matched prices are 9,839 pts (6 lots), 9,798 pts (3 lots) and 9,795 pts (6 lots) :
  - ◆ If the order is an IOC order: 6 lots will be matched at 9,839 pts, while the remaining 9 lots will be rejected as their simulated matched prices are below the lower limit.
  - ◆ If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	10004	20
	10003	9
	10002	7
	10001	15
	9840	1
6	9839	
3	9798	
7	9795	
10	9700	
15	9600	

9,800 pts – the lower limit of dynamic price band

Example 9: Limit buy order without simulated matched prices, bid price above the upper limit

■ Assuming the base price (the last effective traded price) is 10,000 points and the variation range is 200 points, the upper limit of the dynamic price band is 10,200 (=10,000+200). If an investor submits a limit order to buy 15 lots of the TX spot month contract at 10,500 pts:

■ According to the order book at the time, the simulated matched prices are 10,001 pts (8 lots) and 10,002 pts (2 lots) while the remaining 5 lots do not have simulated matched prices as there are no matching counterparty orders:

  ◆ If the order is an ROD or IOC order: 8 lots will be matched at 10,001 pts and 2 lots at 10,002 pts, while the remaining 5 lots will be rejected as the bid price 10,500 is above the upper limit (10,200).
  ◆ If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	10900	10
	10800	10
	10700	3
	10002	2
	10001	8
5	9999	
2	9998	
3	9997	
10	9996	
10	9995	

10,200 pts – the upper limit of dynamic price band

Example 10: Limit sell order without simulated matched prices, ask price below the lower limit

■ Assuming the base price (the last effective traded price) is 9,998 pts and the variation range is 200 pts, the lower limit of the dynamic price band is 9,798 pts (=9,998-200). If an investor submits a limit order to sell 15 lots of the TX spot month contract at 9,500 pts:

■ According to the order book at the time, no simulated matched prices can be generated :

◆ If the order is an ROD or IOC order: the whole order will be rejected as the ask price 9,500 pts is below the lower limit (9,798 pts).

◆ If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	10005	10
	10004	10
	10003	3
	10002	2
	10001	7
3	9200	
10	9100	
5	9000	
No other orders		

9,798 pts – the lower limit of dynamic price band

Example 11 (Combination order): Limit buy order with simulated matched prices above the upper limit

- Assuming the base price (the effective mid-price of the bid and ask) is -9 pts and the variation range is 100 pts, the upper limit of the dynamic price band is 91 pts (=-9+100). If an investor submits a limit order to buy 15 lots of the TX spot / next calendar month spread at 150 pts:

- According to the order book at the time, the simulated matched prices are -8 pts (5 lots), -7 pts (2 lots) and 100 pts (8 lots):

  - ◆ If the order is an ROD or IOC order: 5 lots will be matched at -8 pts and 2 lots at -7 pts, while the remaining 8 lots will be rejected as their simulated matched price is above the upper limit.

  - ◆ If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	110	5
	105	7
	100	10
	-7	2
	-8	5
5	-10	
2	-11	
3	-12	
4	-13	
5	-14	

91 pts – the upper limit of dynamic price band

Example 12 (Combination order): Limit sell order with simulated matched prices below the lower limit

- Assuming the base price (the last effective traded price) is -9 pts and the variation range is 100 pts, the lower limit of the dynamic price band is -109 (=-9-100). If an investor submits a market order to sell 15 lots of the TX spot / next calendar month spread:

- According to the order book at the time, the simulated matched prices are -10 pts (10 lots), -11 pts (2 lots) and -120 pts (3 lots):

  - ◆ If the order is an ROD or IOC order: 10 lots will be matched at -10 pts and 2 lots at -11 pts, while the remaining 3 lots will be rejected as their simulated matched price is below the lower limit.

  - ◆ If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	-4	5
	-5	7
	-6	10
	-7	2
	-8	6
10	-10	
2	-11	
3	-120	
4	-130	
5	-140	

109 pts – the lower limit of dynamic price band

Example 13 (Combination order): Market with protection buy order with simulated matched prices above the upper limit

- Assuming the base price (the last effective traded price) is -10 pts and the variation range is 100 pts, the upper limit of the dynamic price band is 90 pts (=-10+100). If an investor submits a market with protection order to buy 15 lots of the TX spot / next calendar month spread:

- If the converted buying price of the MWP order is 105 pts (=80 pts [best bid] + 25 pts [protected range]):

- According to the order book at the time, the simulated matched prices are 82 pts (5 lots), 95 pts (2 lots) and 100 pts (8 lots):

  - If the order is an IOC order: 5 lots will be matched at 82 pts, while the remaining 10 lots will be rejected as their simulated matched prices are above the upper limit.

  - If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	110	5
	105	7
	100	10
	95	2
	82	5
5	80	
2	-10	
3	-11	
4	-12	
5	-13	

90 pts – the upper limit of dynamic price band

Example 14 (Combination order): Limit buy order w/o simulated matched prices, bid price above the upper limit

- Assuming the base price (the effective mid-price of the bid and ask) is -9 pts and the variation range is 100 pts, the upper limit of the dynamic price band is 91 pts (=-9+100). If an investor submits a limit order to buy 15 lots of the TX spot / next calendar month spread at 150 pts:

- According to the order book at the time, the simulated matched prices are -8 pts (5 lots), -7 pts (2 lots) but the remaining 8 lots do not have simulated matched prices because there are no matching counterparty orders:

    - ◆ If the order is an ROD or IOC order: 5 lots will be matched at -8 pts, 2 lots at -7 pts while the remaining 8 lots will be rejected as the bid price of 150 pts is above the upper limit (91 pts).

    - ◆ If the order is an FOK order: the whole order will be rejected.

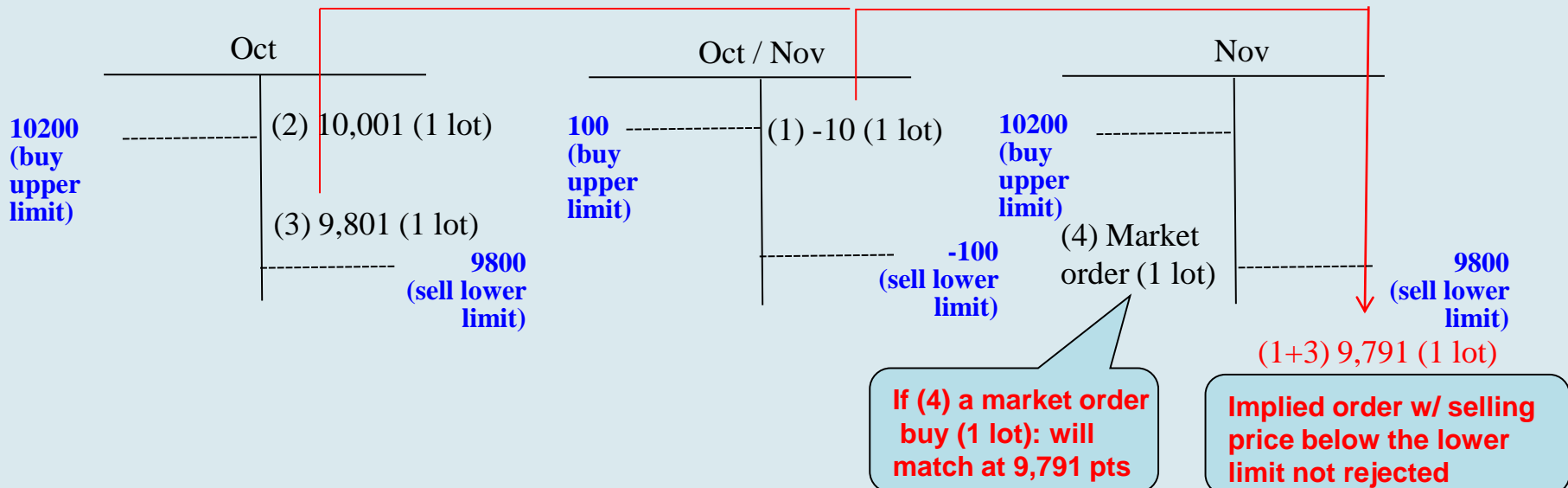| Bid	Price	Ask
	170	5
	165	7
	160	10
	-7	2
	-8	5
5	-10	
2	-11	
3	-12	
4	-13	
5	-14	

91 pts – the upper limit of dynamic price band

Example 15: Dynamic price banding not applicable to implied orders

- The implied functionality of TAIFEX includes (1) implied out orders: outright orders of one expiry month derived from an existing outright order of another expiry month and an existing spread order. (2) implied in orders: spread orders derived from two existing outright orders of different expiry months.
- Dynamic price banding is designed to reject orders that cause abnormal price fluctuations. As implied orders are not actual orders that can be rejected, they are not subject to dynamic price banding.
- Generally speaking, the implied buy (sell) price will not exceed the upper (lower) limit:
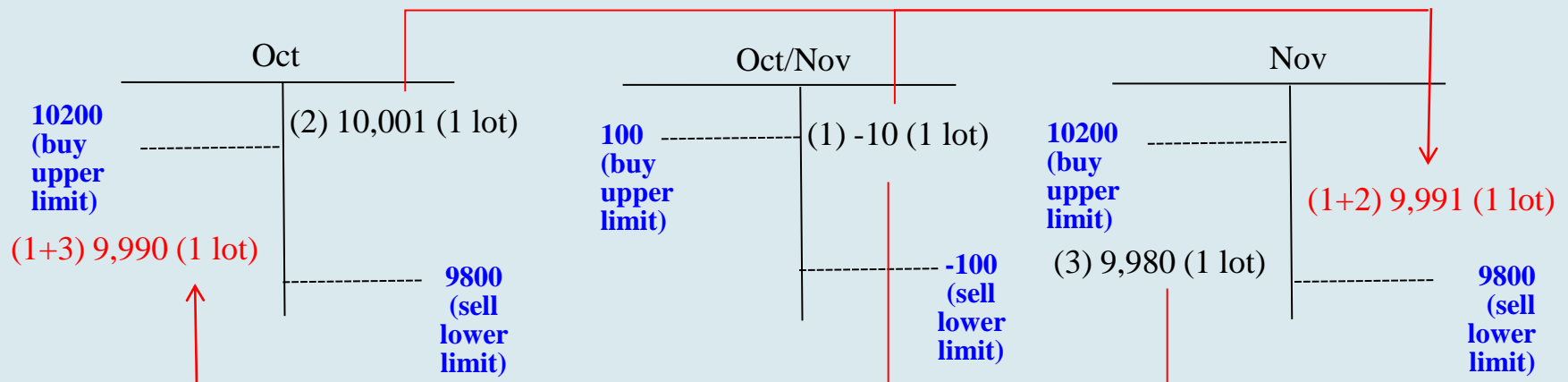
Example 15 (cont.): Dynamic price banding not applicable to implied orders

- However, when order books are imbalanced, the buying (selling) price of implied orders may exceed the upper (lower) limit of the dynamic price band.
- As implied orders are not subject to dynamic price banding, their implied prices can become actual matched prices.
- Example 1: An outright order of one expiry month implied out from an existing outright order of another expiry month and an existing spread order, in which the selling price of the implied out order is below the lower limit of the dynamic price band of the expiry month:
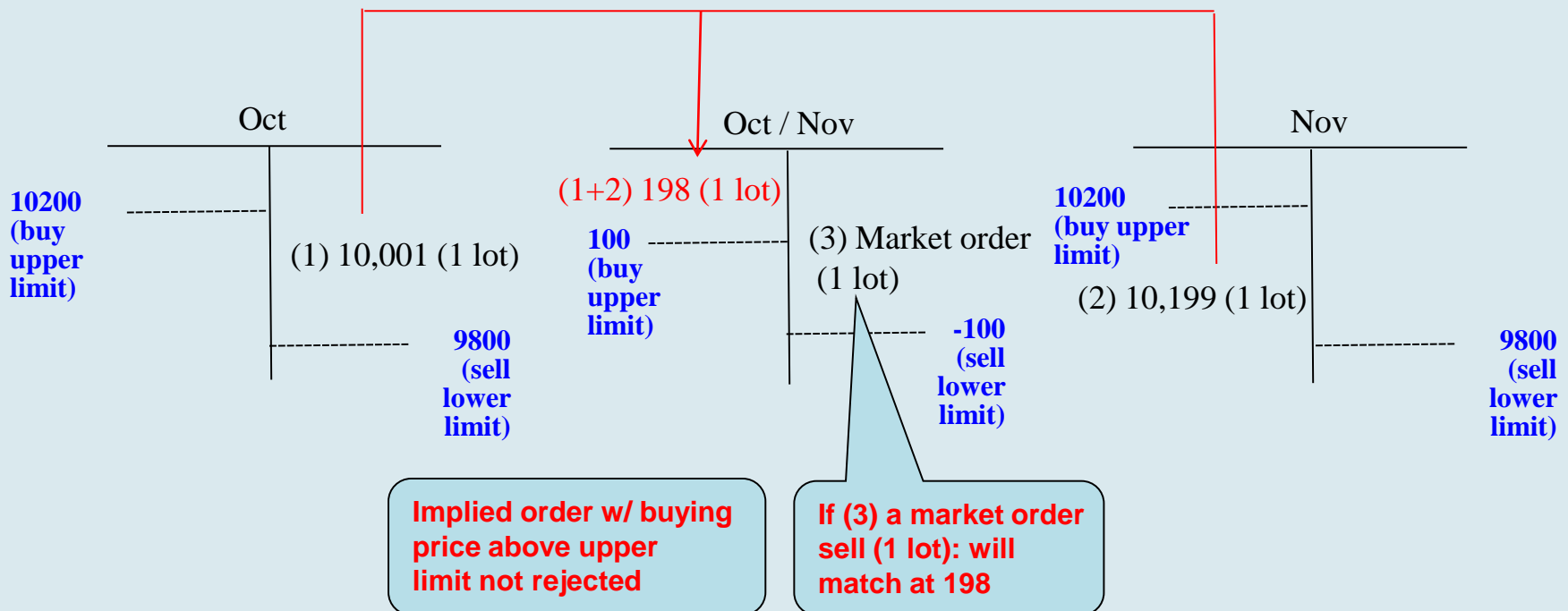
Oct	Oct / Nov	Nov
10200 (buy upper limit) ------------- (2) 10,001 (1 lot)	**100 (buy upper limit)** ------------- (1) -10 (1 lot)	**10200 (buy upper limit)** -------------
(3) 9,801 (1 lot) **9800 (sell lower limit)**	**-100 (sell lower limit)** (4) Market order (1 lot)	**9800 (sell lower limit)** (1+3) 9,791 (1 lot)

If (4) a market order buy (1 lot): will match at 9,791 pts

Implied order w/ selling price below the lower limit not rejected

■ Example 2: An outright order of one expiry month implied by an existing outright order of another expiry month and an existing spread order, in which the buying price of the implied outright order is above the upper limit of the dynamic price band of the expiry month:
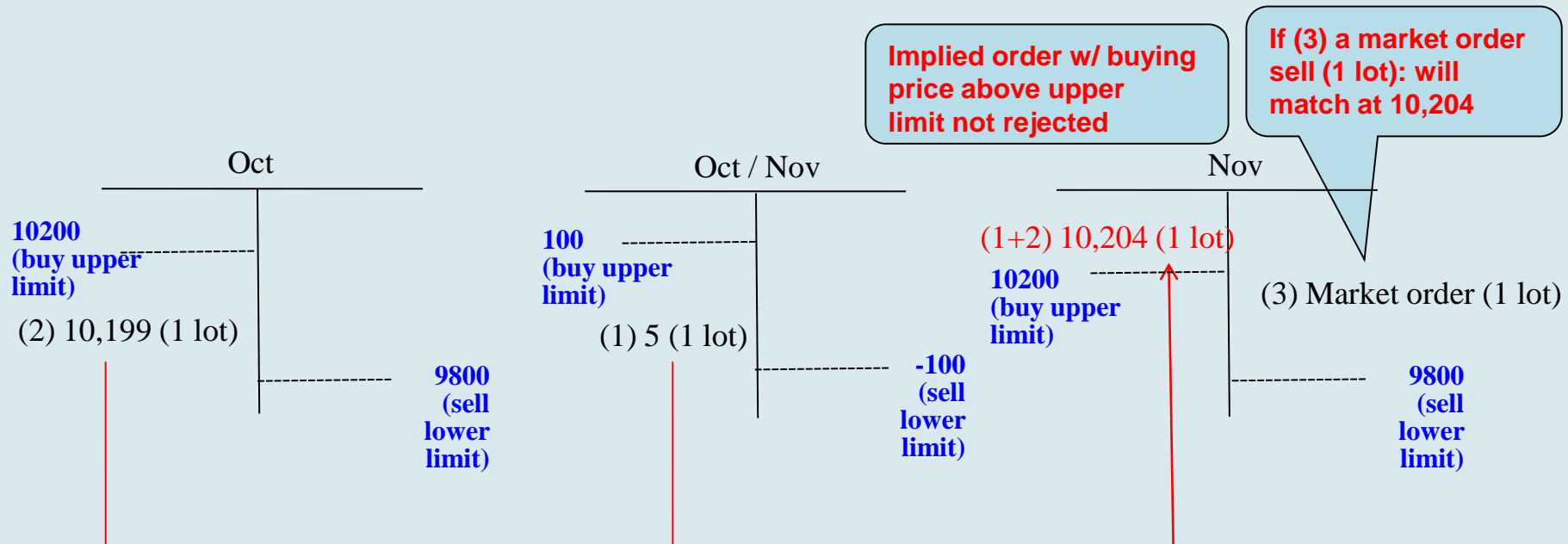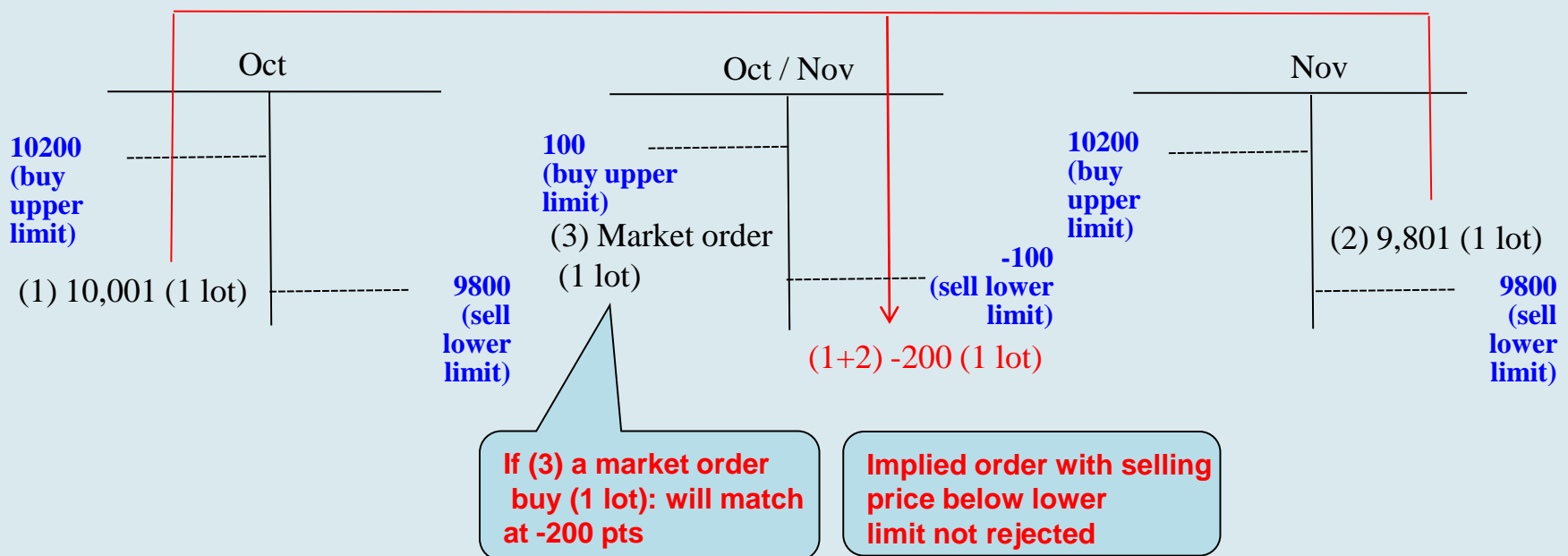
Example 15 (cont.): Dynamic price banding not applicable to implied orders

- Example 3: An implied in spread order (derived from two existing outright orders of different expiry months) with a buying price above the upper limit of the spread dynamic price band:

- Example 4: An implied in spread order (derived from two existing outright orders of different expiry months) with a selling price below the lower limit of the spread dynamic price band:

Oct   Oct / Nov   Nov

10200 (buy upper limit)

(1) 10,001 (1 lot)

9800 (sell lower limit)

100 (buy upper limit)

(3) Market order (1 lot)

-100 (sell lower limit)

(1+2) -200 (1 lot)

10200 (buy upper limit)

(2) 9,801 (1 lot)

9800 (sell lower limit)

If (3) a market order buy (1 lot): will match at -200 pts

Implied order with selling price below lower limit not rejected

Thank You

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