

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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Outline

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A collage of various international banknotes including US, Euro, and Chinese currency, overlaid with a world map and a line graph. The word "Purpose" is centered in white text.

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

- **Phase-one products (Launched on 22th January 2018)**
 - **TAIEX Futures and Mini-TAIEX Futures: Spot month contracts, next calendar month contracts and the calendar spread orders composed of a spot month contract and the next calendar month contract of.**
- **Phase-two products (Launched on 19th November 2018):**
 - **All Domestic Equity Index Futures: The spot month, the next two calendar months, and the next three quarterly months and calendar spread.**
- **Phase-three products (Taifex will launch in May 2019):**
 - **All contract months of TAIEX Options.**

Applicable trading time

■ Applicable trading time¹

Regular Trading Session	Opening Call Auction (8:30 ~ 8:45)	Not Applicable
	Continuous Matching (8:45 ~ 13:45)	Applicable
After-Hour Trading Session	Opening Call Auction (14:50 ~ 15:00)	Not Applicable
	Continuous Matching (15:00 ~ next day 5:00)	Applicable

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

How dynamic price banding works

- TAIEX checks each new order¹ (including limit orders, market orders and market with protection orders²) 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.
 - ◆ Upon receiving a combination order of TAIFEX Options, each component (leg) of the combination order will be checked. If any simulated matched price of the components (legs) exceed its price band, the combination order will be rejected.

**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, TAIEX 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 TAIEX's dynamic price band.*

1. Price modifications are treated as new orders and are subject to dynamic price banding.

2. Implied orders constructed by TAIEX' trading system are not actual orders and therefore not subject to dynamic price banding.

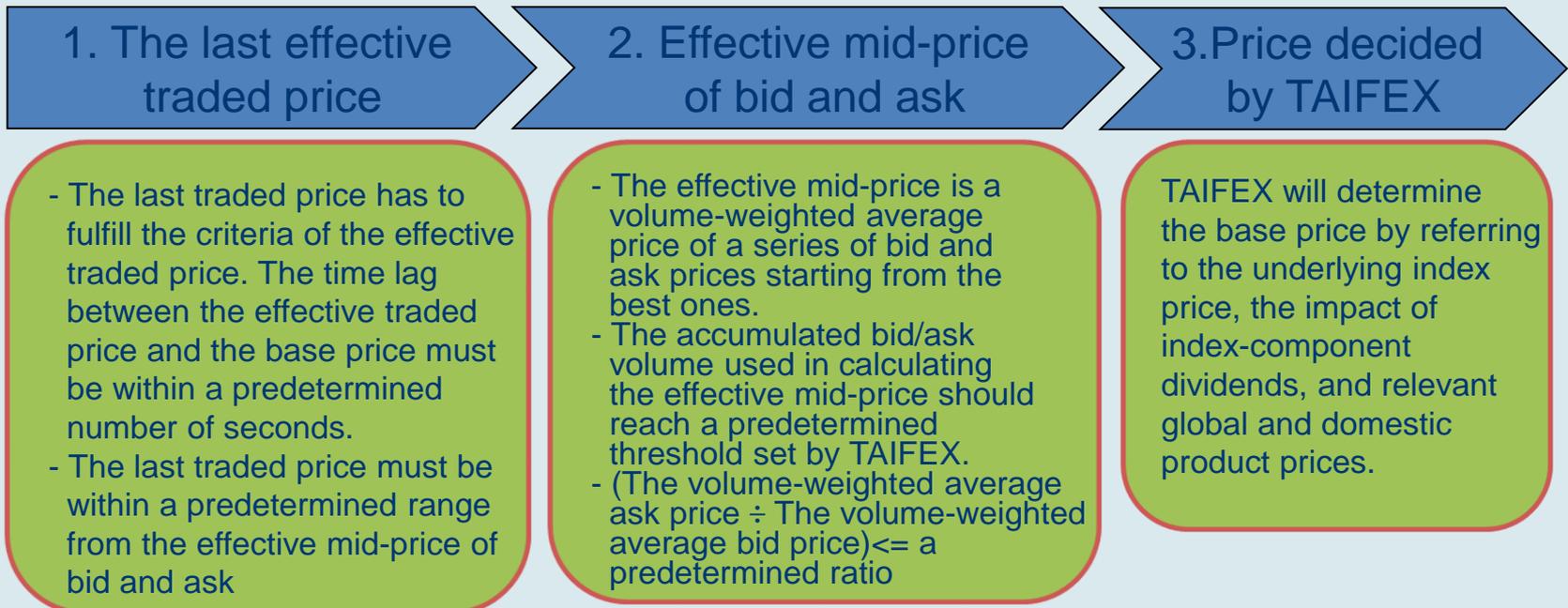
Calculation of the limits of dynamic price band(Domestic Equity Index Futures)

■ 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 : The most recent closing price \times rejection threshold (2%)

■ Base price determination sequence



Calculation of the limits of dynamic price band(Taifex Options)

■ Upper limit : base price + Variation range

■ Lower limit : base price - Variation range

- The most recent closing price x rejection threshold (2%), adjusted with the Delta value and expiry of each contract

■ Base price determination sequence

◆ Base price is calculated using options pricing model with the following parameters:

- Underlying Price
- Volatility
- Interest Rate
- Strike Price
- Time to expiration

Calculation of the variation range(Domestic Equity Index Futures)

■ Variation Range

- ◆ Outright Month Contracts: the most recent closing price of the underlying index × **outright rejection threshold (2%)**
- ◆ Calendar Spread: the most recent closing price of the underlying index × **spread rejection threshold (1%)**

■ Example: Assuming a TAIEX index closing price of 11,000 points on Nov. 5:

- ◆ For the after-hour trading session beginning at 3pm on Nov. 5 and the regular trading session beginning at 8:45am on Nov. 6:
 - The TX and MTX variation range for spot month and the next calendar month contracts is 220 points (=11,000 × 2%).
 - The TX and MTX variation range for calendar spread orders is 110 points (=11,000 × 1%).

Calculation of the variation range (Taifex Options)

■ Weekly Contracts and the Front month contract:

◆ Prior to the latest Delta Value of the trading session is available

➤ the most recent closing price of underlying index × rejection threshold (2%)

◆ After the latest Delta Value of the trading session is available

➤ the most recent closing price of underlying index × rejection threshold (2%) × Delta × 2

- When the absolute value of Delta is less than 0.25, Delta value will be replaced with 0.25.
- When the absolute value of Delta is greater than 0.5, Delta value will be replaced with 0.5.

■ Other expiration months

◆ The most recent closing price of underlying index × rejection threshold (2%)

Taifex Options variation range calculation example

- Assuming that the last closing price of the TAIEX index is 10,000 points, the variation range of TXO for the following regular trading session are calculated as follow :
- For the weekly contracts and the front month contract
 - ◆ Prior to the latest Delta Value of the trading session is available: variation range = $10,000 \times 2\% = 200$ points
 - ◆ After the latest Delta Value of the trading session is available:
 - When the absolute value of Delta = 0.1 (less than 0.25), variation range = $10,000 \times 2\% \times 0.25 \times 2 = 100$ points
 - When the absolute value of Delta = 0.3, variation range = $10,000 \times 2\% \times 0.3 \times 2 = 120$ points
 - When the absolute value of Delta = 0.5, variation range = $10,000 \times 2\% \times 0.5 \times 2 = 200$ points
 - If the absolute value of Delta = 0.7 (greater than 0.5), variation range = $10,000 \times 2\% \times 0.5 \times 2 = 200$ points
- For other expiration months : Variation range = $10,000 \times 2\% = 200$ points

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.

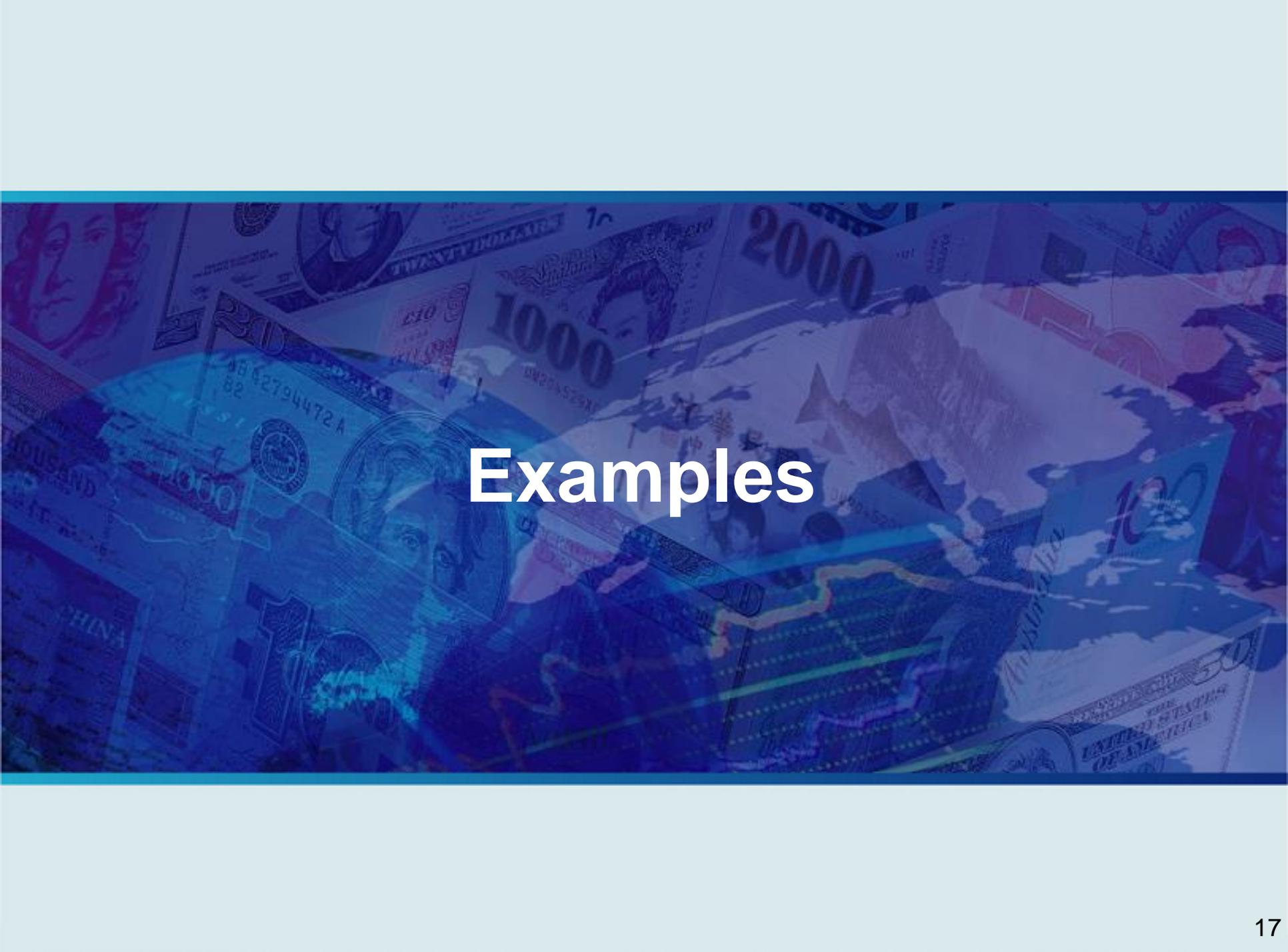
Other issues

- **Unusual market conditions: TAIFEX may adjust the variation range or suspend the dynamic price banding mechanism when necessary.**
 - ◆ Quantitative standards
 - When the futures trading volatility index reaching the limit set at TAIFEX' discretion, TAIFEX may announce adjustments to the variation range.
 - When domestic or foreign futures market or spot market raise or decline more than a certain ratio set by TAIFEX, TAIFEX may double the variation range of TAIFEX Call Options upper limit and Put Options lower limit.
 - ◆ Non-Quantitative standards
 - In the event of a natural disaster, riot, war or other force majeure events that may affect the trading at TAIFEX, TAIFEX may announce adjustments to the variation range or the suspension of dynamic price banding.
 - For circumstances that may affect the normal operation of dynamic price banding, TAIFEX may announce the suspension of dynamic price banding.
 - For other circumstances deem necessary, TAIFEX may announce adjustments to the variation range.

Other issues(cont.)

■ System messages

- ◆ When an order is rejected due to dynamic price banding: the “simulated matched prices exceeded dynamic price banding” system message and “the upper limit/lower limit belonging to the rejected order” will be sent.
- ◆ 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.

A collage of various international banknotes including US, Euro, and Chinese currency, overlaid with a world map and a data visualization. The word "Examples" is centered in white text.

Examples

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

- Assuming the base price (the last effective traded price) is 1,250 pts and the variation range is 25 pts, the upper limit of the dynamic price band is 1,275 pts (=1,250+25).
- If an investor submits an ROD limit order to buy 15 lots of the TF spot month contract at 1,255 pts:
- According to the order book at the time, the simulated matched prices are 1,250 pts (7 lots), 1,250.2 pts (3 lots), and 1,250.4 pts (5 lots). Therefore, the order will not be rejected.

Bid	Price	Ask
	1275.2	8

	1250.8	15
	1250.6	12
	1250.4	5
	1250.2	3
	1250	7
15	9999	
22	9998	
13	9997	
10	9996	
10	9995	

1,275 pts –
the upper
limit of DPB

*DPB=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 450 pts and the variation range is 9 pts, the lower limit of the dynamic price band is 441 pts (=450-9).
- If an investor submits an ROD limit order to sell 15 lots of the TE next calendar month contract at 449.5 pts:
- According to the order book at the time, the simulated matched prices are 449.95 pts (5 lots), 449.9 pts (3 lots), 449.85 pts (3 lots) and 449.8 pts (4 lots). Therefore, the order will not be rejected.

Bid	Price	Ask
	450.2	15
	450.15	10
	450.1	7
	450.05	8
	450	10
5	449.95	
3	449.9	
3	449.85	
10	449.8	
5	449.75	
...	...	
20	440.9	

441 pts –
the lower
limit of DPB

*DPB=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 8,000 pts and the variation range is 160 pts, the upper limit of the dynamic price band is 8,160 pts (=8,000+160). If an investor submits a limit order to buy 15 lots of the T5F spot month contract at 8,400 pts:
- According to the order book at the time, the simulated matched prices are 8,001 pts (10 lots), 8,300 pts (2 lots) and 8,400 pts (3 lots):
 - ◆ If the order is an ROD order or IOC order: 10 lots will be matched at 8,001 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
	8600	10
	8500	10
	8400	3
	8300	2
	8001	10
5	7999	
2	7998	
3	7997	
10	7996	
10	7995	

8,160 pts –
the upper
limit of DPB

*DPB=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 12,500 pts and the variation range is 250 pts, the lower limit of the dynamic price band is 12,250 pts (=12,500-250). If an investor submits a limit order to sell 15 lots of the XIF spot month contract at 11,900 pts:
- According to the order book at the time, the simulated matched prices are 12,499 pts (5 lots), 12,050 pts (3 lots), 12,000 pts (3 lots) and 11,990 pts (4 lots):
 - ◆ If the order is an ROD order or IOC order: 5 lots will be matched at 12,499 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
	12505	10
	12504	10
	12503	7
	12502	5
	12501	10
5	12499	
3	12050	
3	12000	
10	11990	
5	11980	

12,250 pts
– the lower
limit of DPB

*DPB=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 140 pts and the variation range is 2.8 pts, the upper limit of the dynamic price band is 142.8 pts (=140+2.8). If an investor submits a market order to buy 15 lots of the GTF spot month contract:
- According to the order book at the time, the simulated matched prices are 140 pts (10 lots), 144 pts (2 lots) and 145 pts (3 lots):
 - ◆ If the order is an IOC order: 10 lots will be matched at 140 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
	146	20
	145.5	10
	145	3
	144	2
	140	10
5	139.95	
2	139.9	
3	139.85	
10	139.8	
20	139.75	

142.8 pts
– the upper
limit of DPB

*DPB=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 10,900 pts and the variation range is 218 pts, the lower limit of the dynamic price band is 10,682 pts (=10,900-218). If an investor submits a market order to sell 20 lots of the MTX weekly contract:
- According to the order book at the time, the simulated matched prices are 10,899 pts (10 lots), 10,650 pts (4 lots) and 10,600 pts (6 lots):
 - ◆ If the order is an IOC order: 10 lots will be matched at 10,899 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
	10905	10
	10904	10
	10903	7
	10902	5
	10901	20
10	10899	
4	10650	
6	10600	
10	10500	
25	10400	

10,682
pts – the
lower limit
of DPB

*DPB=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 10,800 pts and the variation range is 216 pts, the upper limit of the dynamic price band is 11,016 pts (=10,800+216). If an investor submits a market with protection order to buy 15 lots of the TX next calendar month contract:
- If the converted buying price of the MWP order is 11,068 pts (=11,014 pts [best bid] + 54 pts [protected range]):
- According to the order book at the time, the simulated matched prices are 11,015 pts (10 lots), 11,018 pts (2 lots) and 11,050 pts (3 lots):
 - ◆ If the order is an IOC order: 10 lots will be matched at 11,015 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
	11200	10
	11100	10
	11050	3
	11018	2
	11015	10
1	11014	
2	10800	
3	10799	
10	10798	
10	10797	

11,016 pts
– the upper
limit of DPB

*DPB=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 13,000 pts and the variation range is 260 pts, the lower limit of the dynamic price band is 12,740 pts (=13,000-260). If an investor submits a market with protection order to sell 15 lots of the XIF spot month contract:
- If the converted selling price of the MWP order is 12,685 pts (=12,750 pts [best ask] - 65 pts [protected range]):
- According to the order book at the time, the simulated matched prices are 12,745 pts (6 lots), 12,735 pts (3 lots) and 12,725 pts (6 lots)
 - ◆ If the order is an IOC order: 6 lots will be matched at 12,745 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
	13004	20
	13003	9
	13002	7
	13001	15
	12750	1
6	12745	
3	12735	
7	12725	
10	12715	
15	12710	

12,740 pts
– the lower
limit of
DPB

*DPB=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 1,200 points and the variation range is 24 points, the upper limit of the dynamic price band is 1,224 (=1,200+24). If an investor submits a limit order to buy 15 lots of the TX spot month contract at 1,240 pts:
- According to the order book at the time, the simulated matched prices are 1,200.2 pts (8 lots) and 1,200.4 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 1,200.2 pts and 2 lots at 1,200.4 pts, while the remaining 5 lots will be rejected as the bid price 1,240 is above the upper limit (1,224).
 - ◆ If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	1270	10
	1260	10
	1250	3
	1200.4	2
	1200.2	8
5	1200	
2	1199.8	
3	1199.6	
10	1199.4	
10	1199.2	

1,224 pts –
the upper
limit of
DPB

*DPB=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 480 pts and the variation range is 9.6 pts, the lower limit of the dynamic price band is 470.4 pts (=480-9.6). If an investor submits a limit order to sell 15 lots of the TE spot month contract at 460 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 460 pts is below the lower limit (470.4 pts).
 - ◆ If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	480.8	10
	480.6	10
	480.4	3
	480.2	2
	480	7
3	450	
10	445	
5	440	
No other orders		

470.4 pts –
the lower
limit of DPB

*DPB=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 125 pts, the upper limit of the dynamic price band is 116 pts ($=-9+125$). If an investor submits a limit order to buy 20 lots of the XIF spot / next calendar month spread at 150 pts:

- According to the order book at the time, the simulated matched prices are -8 pts (10 lots), -7 pts (2 lots) and 120 pts (8 lots):

- ◆ If the order is an ROD or IOC order: 10 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(120 pts) is above the upper limit(116 pts).
- ◆ If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	125	5
	122	7
	120	10
	-7	2
	-8	10
15	-10	
2	-11	
3	-12	
4	-13	
5	-14	

116 pts –
the upper
limit of DPB

*DPB=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 80 pts, the lower limit of the dynamic price band is -89 (= -9 - 80). If an investor submits a market order to sell 15 lots of the T5F 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 -95 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 (-95 pts) is below the lower limit (-89 pts).
 - ◆ 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	-95	
4	-100	
5	-105	

-89 pts –
the lower
limit of
DPB

*DPB=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
DPB

*DPB=dynamic price band

Example 14 (Combination order): Limit buy order without simulated matched prices, bid price above the upper limit

- Assuming the base price (the effective mid-price of the bid and ask) is -1 pts and the variation range is 4.5 pts, the upper limit of the dynamic price band is 3.5 pts ($= -1 + 4.5$). If an investor submits a limit order to buy 15 lots of the TE spot / next calendar month spread at 5 pts:

- According to the order book at the time, the simulated matched prices are -0.5 pts (5 lots), 0.5 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 -0.5 pts, 2 lots at -0.5 pts while the remaining 8 lots will be rejected as the bid price of 5 pts is above the upper limit (3.5 pts).
- ◆ If the order is an FOK order: the whole order will be rejected.

Bid	Price	Ask
	7.4	5
	7.2	7
	7	10
	0.5	2
	-0.5	5
5	-1	
2	-1.1	
3	-1.15	
4	-1.2	
5	-1.3	

3.5 pts –
the upper
limit of
DPB

*DPB=dynamic price band

Example 15 :Market buy order with simulated matched prices above the upper limit (Taifex Options Single order)

- Assuming that the last closing price of the TAIEX index is 10,000 points, the variation range of the front month contract of TAIEX 9600 PUT Option for the day session is 200 points, and the absolute value of Delta is 0.9, then the upper and lower limits of the dynamic price band will be 400 points ($=200+(10,000 \times 2\% \times 0.5 \times 2)$) and 100 points ($=300 - (10,000 \times 2\% \times 0.5 \times 2)$), respectively.
- If an investor submits a market order to buy 5 lot of TAIEX 9600 PUT Option contract, and the simulated matched price is 402, which is above the upper limit of 400 points, the order will be rejected.

Bid	Price	Ask
	615	9
	611	7
	518	5
	415	5
	402	5
10	198	
5	177	
10	165	
5	140	
10	120	

400pts –
the upper
limit of
DPB

*DPB=dynamic price band

Example 15 :Market buy order with simulated matched prices above the upper limit (Taifex Options Combination order)

- Assuming that the upper limit of the second month contract of TAIEX 9600 PUT options is 250 points and the lower limit is 0.1 points. Also, the upper limit of the second month contract of TAIEX 9500 PUT options is 240 points and the lower limit is 0.1 points.
- If an investor submits a long calendar spread combination order to buy 5 lot of 9500 PUT and sell 5 lot of 9600 PUT when the order books are below. As the simulated matched price of the 9500 PUT is 244 points, which is above the upper limit of 240 points, the combination order will be rejected.

Order book of 9500 put

Bid	Price	Ask
	280	9
	274	7
	273	5
	270	5
	244	5
10	150	
5	143	
10	135	

Order book of 9600 put

Bid	Price	Ask
	190	11
	167	14
	165	13
	162	18
	158	11
9	154	
8	149	
5	147	

240pts – the upper limit of DPB

*DPB=dynamic price band



Thank You