

# OMS FAST MM

- Market Maker
- Spread Order
- Hedge Order

- DERIVATIVES MARKET (VIOP)
- EQUITY MARKET
- FX

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As of 2013, the order messages created by the integration of very low-latency market price processing (ITCH protocol) and order forwarding (OUCH protocol) infrastructures by coding the order creation models experienced in our current market making product and the strategies tailored to the institution, can be delivered at low delays (200 microseconds) is to be transmitted to the markets (Borsa Istanbul, FX Liquidity Providers) together with protection orders and managed automatically. With the OMS Fast MM product, orders transmitted to the market can be automatically improved/worsened, adjusted for quantity, and canceled according to market price changes. Automatic protection orders can be sent to both FX quotation providers and Borsa Istanbul markets.

Since it is developed on the infrastructure protocols (ITCH, OUCH) of the end-to-end HFT platforms, the order creation and transmission time is in the microsecond levels.

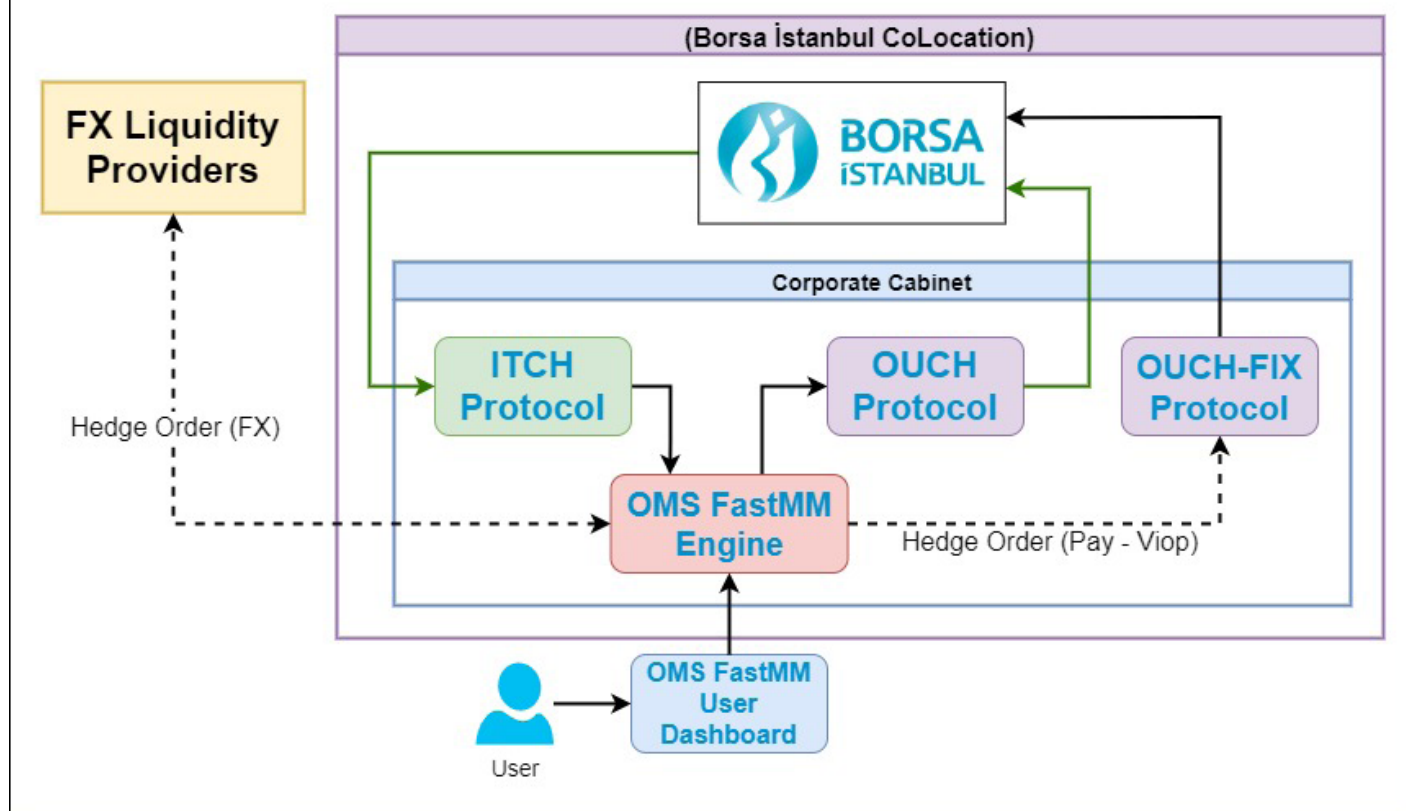
Thanks to its development to run on the Windows Operating system and its easy-to-manage interfaces, it has been ensured that the institution can be used by direct investment experts or private investors without the need for extra software development and system personnel.

## PURPOSE

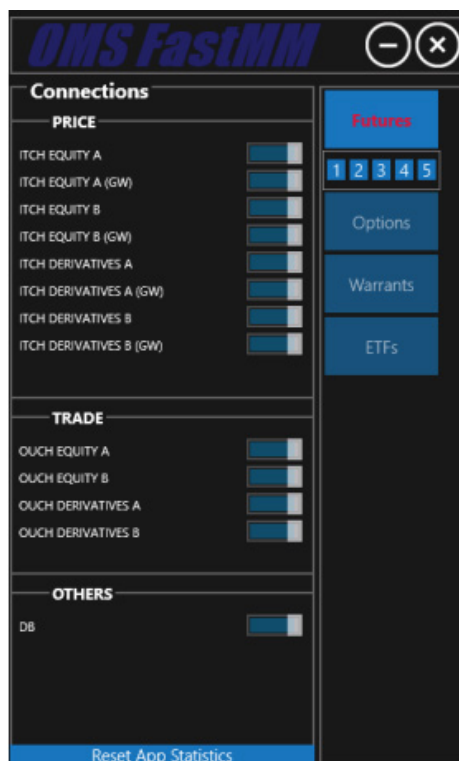
- It works on Borsa İstanbul Data Center (CoLocation) infrastructure.
- The application is actively used by some investment institutions.
- It uses the new technologies of Borsa İstanbul allocated for HFT /Algo companies.
  - ITCH is a direct data feed product that enables HFT/Algo type of traders to access market by order (tick by tick) data. Along with the main ITCH flow, which is transmitted via multicast, there are rewind and glimpse services in place to be used in package loss and late connections.
  - OUCH is the low-level native protocol for connecting to the Genium INET Trading system. It is designed to offer the maximum possible performance at the cost of flexibility and ease of use. The messages are binary encoded in OUCH Protocol, which means that all numeric values are represented as binary values.
- Application Management is easy thanks to the display screen that appeals to the end user.
- Through with Application Wizard, Market Making and Strategy Market Order definitions can be easily made.
- Orders are transmitted at very low times. (Round trip values are minimum 200 microseconds, maximum 800 microseconds, and 300 microseconds on average in all stages of receiving market data with the ITCH protocol, processing the order in coding within the framework of predetermined rules, and transmitting it over the OUCH protocol, which is the order transmission protocol.
- It has the capacity to generate a maximum of 5000 orders per second.
- It can run on virtual or physical servers with Windows Operating system. Therefore, application management can be made easier.
- Order strategies that are specific to the institution can be developed.
- Borsa İstanbul complies with Market Maker regulations and trading rules.
- Orders sent to the Futures and Options Market can automatically send Protection Orders to the BIST Equity Market or (FX Quotation Provider) Leveraged Instruments Market.
- The orders sent to the BIST Equity Market can automatically send the Protection Orders to the BIST Futures and Options Market or (FX Quotation Provider) Leveraged Instruments Market.

## SYSTEM TOPOLOGY

Matriks OMS FastMM Application Diagram

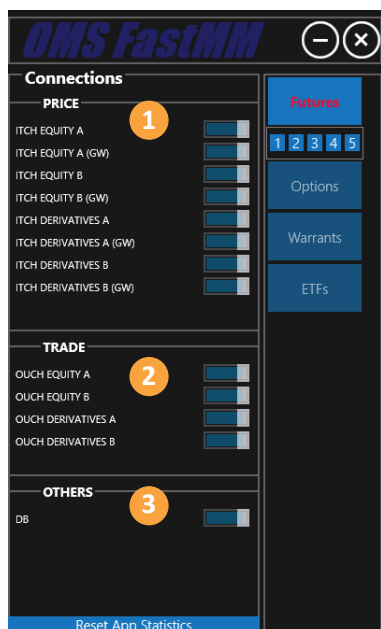


## SCREENS



Futures

Max Tran	Tran	Spr	Int R	Int R	Then P	SYMBOL	Then P	Int R	Spr	Tran	Max Tran	Max Tran	Tran	Spr	Int R	Int R	Then P	SYMBOL
0	0	0.00	0.00	0.00	0.00	F_AFFES1022	0	0.00	0.00	0	0	0	0	0.00	0.00	0.00	0	
0	0	0.00	0.00	0.00	0.00	F_AKBW1022	0	0.00	0.00	0	0	0	0	0.00	0.00	0.00	0	
0	0	0.00	0.00	0.00	0.00	F_AKBW1122	0	0.00	0.00	0	0	0	0	0.00	0.00	0.00	0	
0	0	0.00	0.00	0.00	0.00	F_AKBW1222	0	0.00	0.00	0	0	0	0	0.00	0.00	0.00	0	
0	0	0.00	0.00	0.00	0.00	F_AKBW1222	0	0.00	0.00	0	0	0	0	0.00	0.00	0.00	0	



On the left is the panel showing the status of the connections.

1. Price
2. Trade
3. Others

## MAIN SCREEN

- i. **ITCH EQUITY A** : Equity Market ITCH Primary price channel, data for contracts A-J comes from this channel.
- ii. **ITCH EQUITY A (GW)** : Equity Market ITCH Primary reserve price channel, data for contracts between A-J also comes from this channel.
- iii. **ITCH EQUITY B** : Share ITCH Secondary price channel, data for K-Z contracts come from this channel.
- iv. **ITCH EQUITY B (GW)** : Equity Market ITCH Secondary reserve price channel, data for K-Z contracts come from this channel as well..
- v. **ITCH DERIVATIVES A** : Derivatives Market (VIOP) ITCH Primary price channel, data for contracts between A-J comes from this channel.
- vi. **ITCH DERIVATIVES A (GW)** : Derivatives Market (VIOP) ITCH Primary reserve price channel, data for contracts between A-J also comes from this channel.
- vii. **ITCH DERIVATIVES B** : Derivatives Market (VIOP) ITCH Secondary price channel, data for K-Z contracts come from this channel.
- viii. **ITCH DERIVATIVES B (GW)** : Derivatives Market (VIOP) ITCH Secondary reserve price channel, data for K-Z contracts also comes from this channel.

**1.2 PRICE;**

- i. **OUCH EQUITY A** : Equity Market OUCH is the Primary Trading Channel, order transmission for contracts between A-J is made through this channel.
- ii. **OUCH EQUITY B** : Month OUCH Secondary Trading Channel, order transmission for contracts between K-Z is made through this channel.
- iii. **OUCH DERIVATIVES A** : Derivatives Market (VIOP) OUCH Primary Trading Channel, order transmission for contracts between A-J is done through this channel
- iv. **OUCH DERIVATIVES B** : Derivatives Market (VIOP) OUCH Secondary Trading Channel, order transmission for contracts between K-Z is made through this channel.

**1.3 OTHERS;**

- i. **DB** : Database connection.

## MAIN SCREEN

On the right are the keys that open the market making screens.

### 1.4 FUTURES

- i. Opens the futures market making screen. Extra keys have been added to open from 5 different screens. People using multiple screens can make different designs for different underlying assets.

### 1.5 OPTIONS

- i. Opens the option market making screen.

### 1.6 WARRANTS

- i. The warrant opens the market making screen.

### 1.7 ETFs

- i. Stock Exchange traded funds opens the market making screen.



## MARKET MAKING CONTRACT DETAIL SCREEN

When bid qty is double-clicked, the screen opens. Is to specify the numbers we will enter. Quantities to be determined for multiple levels at once. Instead of the determination of the first stage and other stages,

It is the screen where market making definitions, limits and transaction information of the contract to be market maker are displayed.

i. **Bid Qty** : Bid quotation amount to be sent.

ii. **Ask Qty**: Ask quotation amount to be sent.

iii. **Min Qty** : The minimum amount of quotation to submit.

iv. **Quotes** : Number of tiers to send orders. By default, this field is 1. This field includes the quotations to be sent; It also allows you to send quotations to price steps - down for buying and up for selling.

*As an example, let's give the number of levels 3, the calculated theoretical price is 5.01-5.03, normally we send a bid quotation to 5.01 and a bid quotation to 5.03. When there are 3 levels, it will send a bid quotation to 5.01-5.00-4.99 levels and a ask quotation to 5.03-5.04-5.05 levels at the same time.*

## MARKET MAKING CONTRACT DETAIL SCREEN

**v. Hedge Active:** Indicates whether to hedge when the quotes are realized. **If the hedge is active; For futures, it automatically hedges in the stock market for the underlying asset of the contract size \* trade amount.**

**vi. Static Spread :** While calculating the Buy and Sell theoretical prices, "Bid Spread" and "Ask Spread" (the spread definitions entered from the third screen) are fixed as the spread entered on the "Associated Spread". If this parameter is active, fixation is made and there is no up-down spread in the Bid-Ask Spreads due to calculations. If this parameter is not active and "Ask Spread Depends on Bid Spread" parameter is active, there is no guarantee that "Bid Spread" and "Ask Spread" will differ as much as "Depending Spread". Because if it is not a fixed spread, after calculating the interest from the entered spreads in the first stage, by keeping these interests constant, the spread calculations are made again for each price change.

**vii. Equity Acc :** The field to select the share account to which hedge orders will be sent.

**viii. Derivatives Acc :** The field to select the Derivatives Market (VIOP) account to which the Market Maker quotes will be sent.

**ix. Ask Spread BOUND TO Bid Spread :** If this parameter is selected, the "Ask Spread" value on screen 3 is locked so that it cannot be changed manually. "Ask Spread" is found by adding "Associated Spread" to "Bid Spread" value. If this parameter is to be selected, it would be more appropriate to select it in "Fixed Spread".

**x. BOUND Spread :** If the "Ask Spread Depends on Bid Spread" parameter is active, this value is used to calculate the "Ask Spread" value. It would be more appropriate to choose "Fixed Spread" so that this parameter can be used more efficiently.

**xi. Depth Limit Multiplier :** This parameter is 1 by default. While calculating the theoretical buying and selling prices, if the number of shares corresponding to the quotation amount to be sent is not in levels multiplied by this coefficient, the prices in the second stages are used, not the best buying or selling price. If this parameter is 0, the best Bid-Ask prices are used without checking the quantity.

**xii. Dividend :** If there is a dividend affecting the forward contract, the dividend amount should be entered in this field. While calculating the theoretical prices, the dividend is included in the calculation. In the theoretical calculations; When calculating the theoretical purchase price, as the share purchase price; "Bid Price - Dividend Amount", as the selling price of the share while calculating the theoretical selling price; "Equity Ask Price - Dividend Amount" is used.

## MARKET MAKING CONTRACT DETAIL SCREEN

**xiii. Bid Transaction Qty** : The amount realized from the bid quotes sent to the Derivatives Market (VIOP) side.

**xiv. Ask Transaction Qty** : The amount realized from the sales quotes sent to Derivatives Market (VIOP).

**xv. Ask Hedge Order Qty** : Hedge ask order amount sent to the equity side after the bid transactions made by Derivatives Market (VIOP).

**xvi. Bid Hedge Order Qty** : Hedge bid order amount sent to the equity side after the sales transactions realized on the Derivatives Market (VIOP) side.

**xvii. Ask Hedge Transaction Qty** : The sales order amount realized from the hedge ask orders sent to the Equity Market side.

**xviii. Bid Hedge Transaction Qty** : The bid order amount realized from the hedge bid orders sent to the Equity Market side.

**xix. Average Bid Price** : The average price of the transactions realized from the bid quotes sent to Derivatives Market (VIOP).

**xx. AverageAsk Price** : The average price of the transactions realized from the sales quotes sent to Derivatives Market (VIOP).

**xxi. Average Hedge Ask Price** : The average price of the transactions executed from the ask hedge orders sent to the Equity Market.

**xxii. Average Hedge Bid Price** : The average price of the transactions executed from the bid hedge orders sent to the Equity Market.

## MARKET MAKING CONTRACT DETAIL SCREEN

**xxiii. Bid Hedge Rate :** The average interest rate of Derivatives Market (VIOP)-Equity Market transactions calculated by taking into account the "Average Bid Price", the "Average Hedge Ask Price" and the days to maturity.

**Formula:**
$$((\text{Average Bid Price} + \text{Dividend} - \text{Average Hedge Ask Price}) * 365) / (\text{Day to Maturity} * \text{Average Hedge Ask Price})$$

**xxiv. Ask Hedge Rate :** Average interest rate of Derivatives Market (VIOP)-Equity Market transactions calculated by taking the "Average Ask Price" into account the "Average Hedge Bid Price" and the days to maturity.

**Formula:**
$$((\text{Average Ask Price} + \text{Dividend} - \text{Average Hedge Bid Price}) * 365) / (\text{Day to Maturity} * \text{Average Hedge Bid Price})$$

## MARKET MAKING SCREEN

Underlying :  < 1 > Equity Acc :  < 0.85 > Derivatives Acc :

**Futures** ☐

Max Tran	Tran	Size	Int R	Diff	Theo P	SYMBOL	Theo P	Diff	Int R	Spr	Tran	Max Tran	Max Tran	Tran	Size	Int R	Diff	Theo P	SYMBOL	Theo P	Diff	Int R	Spr	Tran	Max Tran
200	0	0.05	16.71	-0.01	5.51	F_AKOH0621	5.54	0.01	23.35	0.07	0	200	20	0	0.81	17.91	-0.08	83.36	F_PQSO0621	83.75	0.23	23.17	0.05	0	20
200	0	0.15	20.05	0.01	5.61	F_AKOH0721	5.64	0.02	22.69	0.17	0	200	20	0	1.81	16.01	-0.11	84.36	F_PQSO0721	85.01	0.42	20.39	0.01	0	20
50	0	0.37	21.49	0.08	31.79	F_ARCL0621	31.84	0.12	23.22	0.40	0	50	200	0	0.11	21.24	0.01	9.56	F_SAH0621	9.59	0.03	25.08	0.13	0	200
50	0	0.91	21.14	0.08	32.33	F_ARCL0721	32.39	0.12	22.06	0.95	0	50	200	0	0.28	21.63	0.02	9.73	F_SAH0721	9.76	0.03	23.15	0.30	0	200
100	0	0.16	18.94	0.00	15.58	F_ASH150621	15.62	0.03	21.28	0.18	0	100	50	0	0.43	23.09	0.09	34.41	F_SAS0621	34.48	0.13	24.68	0.46	0	50
100	0	0.44	20.83	0.00	15.86	F_ASH150721	15.91	0.04	22.22	0.47	0	100	50	0	0.91	19.55	0.06	34.89	F_SAS0721	34.99	0.11	20.81	0.97	0	50
20	0	0.76	22.16	0.07	63.36	F_BIMAS0621	63.5	0.20	23.29	0.80	0	20	300	0	0.09	20.10	0.01	8.26	F_SISE0621	8.29	0.03	24.54	0.11	0	300
20	0	1.64	19.12	0.01	64.24	F_BIMAS0721	64.54	0.27	21.42	1.84	0	20	300	0	0.23	20.55	0.01	8.4	F_SISE0721	8.43	0.02	22.31	0.25	0	300
500	0	0.02	12.33	-0.01	2.98	F_DOW0621	3.01	0.01	24.58	0.04	0	500	50	0	0.11	18.27	0.06	11.1	F_SOW0621	11.14	0.03	23.23	0.14	0	50
500	0	0.07	17.26	-0.01	3.03	F_DOW0721	3.06	0.00	22.12	0.09	0	500	50	0	0.17	20.17	0.01	11.16	F_SOW0721	11.21	0.03	22.83	0.21	0	50
100	0	0.13	22.15	0.01	10.84	F_ENH50621	10.88	0.04	25.51	0.15	0	100	50	0	0.31	21.27	0.02	26.91	F_TAVH0621	26.99	0.08	23.98	0.35	0	50
100	0	0.31	21.13	0.01	11.02	F_ENH50721	11.07	0.04	23.13	0.34	0	100	50	0	0.73	20.03	0.00	27.33	F_TAVH0721	27.45	0.07	22.20	0.81	0	50
200	0	0.21	20.11	0.00	19.27	F_EREG0621	19.32	0.04	21.99	0.23	0	200	100	0	0.18	19.95	0.02	16.63	F_TCL150621	16.69	0.05	22.13	0.20	0	100
200	0	0.51	19.52	0.00	19.57	F_EREG0721	19.63	0.03	20.65	0.54	0	200	100	0	0.07	20.88	0.02	16.54	F_TCL150721	16.59	0.05	22.22	0.10	0	100
5	0	1.80	18.17	-0.22	182.6	F_FROTO0621	183.2	0.26	22.18	2.20	0	5	500	0	0.16	20.17	0.01	14.64	F_THYA0621	14.67	0.03	22.67	0.18	0	500
5	0	4.11	16.59	-0.65	184.91	F_FROTO0721	186.01	0.19	20.21	5.01	0	5	200	0	0.40	20.17	0.02	14.88	F_THYA0721	14.91	0.02	21.16	0.42	0	200
500	0	0.09	19.62	0.01	8.46	F_GARAH0621	8.49	0.02	23.96	0.11	0	500	100	0	0.18	21.32	0.01	15.59	F_TNFE0621	15.64	0.05	23.64	0.20	0	100
500	0	0.22	19.19	-0.01	8.59	F_GARAH0721	8.62	0.01	20.91	0.24	0	500	100	0	0.45	21.32	0.02	15.86	F_TNFE0721	15.92	0.05	22.69	0.48	0	100
20	0	0.68	20.98	0.07	59.83	F_GUBRF0621	60.06	0.29	23.39	0.76	0	20	50	0	0.11	22.45	0.39	0.07	20.96	0.91	0	50	0	50	
20	0	1.64	20.24	-0.02	60.79	F_GUBRF0721	61.09	0.26	22.04	1.79	0	20	50	0	0.02	25.21	0.10	0.02	23.78	0.05	0	100	0	100	
50	0	0.11	23.32	0.02	8.72	F_HEXT50621	8.76	0.04	27.49	0.13	0	50	100	0	0.37	23.50	0.00	0.49	23.18	0.328	0	20	0	20	
50	0	0.25	21.20	0.00	8.86	F_HEXT50721	8.92	0.02	24.53	0.29	0	50	100	0	0.09	24.86	0.30	0.07	23.21	0.70	0	50	0	50	
500	0	0.05	17.28	-0.01	5.33	F_ISCTR0621	5.36	0.01	24.15	0.07	0	500	20	0	0.02	24.80	0.05	0.02	23.80	0.12	0	500	0	500	
500	0	0.15	20.74	0.00	5.43	F_ISCTR0721	5.46	0.02	23.46	0.17	0	500	20	0	0.05	16.81	0.29	0.05	16.81	0.29	0	20	0	20	
100	0	0.03	17.38	0.01	3.18	F_KWH0621	3.21	0.03	28.88	0.05	0	100	50	0	0.06	24.05	-1.38	0.00	24.12	0.03	0	500	0	500	
100	0	0.08	18.54	0.02	3.23	F_KWH0721	3.26	0.02	23.10	0.10	0	100	50	0	0.00	22.51	0.07	0.00	22.51	0.07	0	500	0	500	
50	0	0.23	21.68	0.05	19.59	F_KCH0621	19.62	0.07	23.55	0.25	0	50	500	0	0.02	24.80	0.05	0.02	23.80	0.12	0	500	0	500	
20	0	0.57	21.49	0.06	19.93	F_KCH0721	19.96	0.06	22.24	0.59	0	20	500	0	0.05	16.81	0.29	0.05	16.81	0.29	0	20	0	20	
20	0	0.38	20.22	0.04	34.68	F_MOR0621	34.74	0.07	22.33	0.42	0	20	20	0	0.06	24.05	-1.38	0.00	24.12	0.03	0	500	0	500	
20	0	0.84	17.88	0.06	35.14	F_MOR0721	35.26	0.16	19.99	0.94	0	20	20	0	0.00	22.51	0.07	0.00	22.51	0.07	0	500	0	500	
500	0	0.07	20.64	0.00	6.26	F_PETK0621	6.29	0.02	26.49	0.09	0	500	500	0	0.02	24.80	0.05	0.02	23.80	0.12	0	500	0	500	
500	0	0.18	21.23	0.01	6.37	F_PETK0721	6.4	0.02	23.55	0.20	0	500	500	0	0.02	24.80	0.05	0.02	23.80	0.12	0	500	0	500	

**F\_BIMAS0621**

Bid Qty :  10 : Ask Qty :  10

Min Qty :  10 : Quotes :  1

Hedge Active : ☒ : Static Spread : ☒

Equity Acc :  67 : Derivatives Acc :  67

Ask Spread BOUND : ☒ 0.04 : BOUND Spread :

Depth Limit :  4 : Dividend :

Bid Transaction Qty :  0 : Ask Transaction Qty :  0

Ask Hedge Order Qty :  0 : Bid Hedge Order Qty :  0

Ask Hedge Transaction Qty :  0 : Bid Hedge Transaction Qty :  0

Avg Bid Price :  0.0000 : Avg Ask Price :  0.0000

Avg Hedge Ask Price :  0.0000 : Avg Hedge Bid Price :  0.0000

Bid Hedge Rate :  0.00 : Ask Hedge Rate :  0.00

SAVE

It is the screen where general definitions of market making can be made, order submission can be opened/closed, new contracts can be defined, window settings can be made and market making module can be viewed in general.

On this screen, you can change the size of the window with the blue square button in the upper-left corner (thick left and upper corners with gray frames). If you move the mouse to the right by pressing the left button on the key, you increase the width, if you move the mouse to the left, it decreases the width, if you move the mouse down, it increases the height, if you move the mouse up, you decrease the height.

You can activate/deactivate the order submission with the button on the left of the label with the text "FUTURES" on the upper left side. It is inactive at first boot.

## MARKET MAKING SCREEN

When you add a new underlying asset to the market maker, select the underlying asset from the "Underlying Symbol" box on the top panel, select "Equity Acc and Derivatives Acc Accounts" in the lower boxes, which you will use in the contracts you will add, and press the "+" sign button to the right of these boxes. You can easily add the underlying asset, it will automatically add the 2 closest maturity contracts of the underlying asset. The box containing the "1-2-3" options above the "+" key indicates on which panel in the window you will add the new agreements. Normally there are 3 panels on the window. These are the left, middle and right panels. If you choose 1 it will add new contracts to the left panel, if you choose 2 to the middle panel, if you choose 3 to the right panel it will add new contracts.

The box to the right of the "+" button, whose default is 1, can be increased/decreased by 0.05 with left and right arrows; Specifies the scale ratio of panels to which market making contracts are attached. You can decrease the scale of these panels with the left button, and increase the scale of these panels with the right button. As the scale decreases, you can fit more contracts on the screen, as the scale increases, the contracts will not fit on the screen, but you will be able to watch in clearer and larger fonts. In this way, you will be able to make the most ideal scaling according to your intended use and the number of contracts you will make market maker.

In the table containing the Market Maker contract definitions;

To the right of the contract column, there is a selection box that activates/deactivates the "Order Submission". This box is for the contract it is on and if it is active in the box to the left of the "FUTURES" label on the main screen, it will send an order.

There are definitions going left and right starting from the contract column. To the left of the contract column are the definitions for "Bid Quotations", and to the right are the definitions for "Ask Quotations".

These are respectively; Theoretical Price (Theo P), Difference (Diff), Interest Rate (Int R), Spread (Spr), Transaction Amount (Tran), Max Transaction Amount (Max Tran) columns.

## MARKET MAKING SCREEN

Underlying :

Symbol :

Equity Acc :

Derivatives Acc :

◀ 1 ▶

+

◀ 1.00 ▶

TY	Wrk Qty	Mrk Qty	Spr	Int R	Mrk R	Spot	Market	Diff	Theo P	SYMBOL		Dvd	Theo P	Diff	Market	Spot	Mrk R	Int R	Spr	Mrk Qty	Wrk Qty	QTY	
0	0	0	0.00	+	0.00	1.790...	53.00	50.40	2.60	53	F_AEPES1022		0.00	53.05	2.64	50.41	53.05	1.781...	0.00	0.00	+	0	0
0	0	0	0.00	+	0.00	1.710...	14.30	13.63	0.67	14.3	F_AKBNC1022		0.00	14.31	0.67	13.64	14.31	1.683...	0.00	0.00	+	0	0
0	0	0	0.00	+	0.00	791.25	14.30	13.99	0.31	14.3	F_AKBNC1122		0.00	14.31	0.31	14.00	14.31	765.19	0.00	0.00	+	0	0
0	0	0	0.00	+	0.00	14.59	14.30	14.34	-0.04	14.3	F_AKBNC1222		0.00	14.31	-0.04	14.35	14.31	18.22	0.00	0.00	+	0	0
0	0	0	0.00	+	0.00	583.80	35.28	39.23	-3.95	35.28	F_ALKIN1222		0.00	35.3	-3.94	39.24	35.30	584.95	0.00	0.00	+	0	0
0	0	0	0.00	+	0.00	473.03	23.92	23.61	0.31	23.92	F_TCELL1022		0.00	23.94	0.32	23.62	23.94	457.39	0.00	0.00	+	0	0

There is the "Futures" screen, as above, prepared specifically for the institution.

- i. **QTY** : It is the QTY value (order amount) entered in the depth screen opened with the right button.
- ii. **Wrk QTY** : It is the order amount sent to the board at that moment. As the number of executed orders increases, the WRK QTY value decreases as the number of executed orders.
- iii. **Mrk QTY** : It is the order amount entered in Futures.
- iv. **Mrk R** : It is the futures market interest rate. Spot : Is the stock market price.
- v. **Market** : The price in futures.
- vi. **Theoretical Price (Theo P.)** : It is the price at which the order is sent.

## MARKET MAKING SCREEN

i. **Theoretical Price (Theo P)** : Theoretical price calculated over the spot price (spot bid price for Derivatives Market (VIOP) bid side, spot ask price for Derivatives Market (VIOP) ask side) considering interest/dividend.

*Formula:*

If "fixed spread" is active;

**Spot Price + Spread**

If "fixed spread" is not active;

**$(\text{Spot Price} - \text{Dividend}) * (1 + (\text{Interest Rate} * \text{Day to Maturity} / 365))$**

**Note:** Spot price; The spot bid price for future bid is the spot ask price for future ask. Interest rate; The bid interest rate for forward bid is the ask interest rate for future ask. Spread; The bid spread value for future bid is the ask spread value for future ask. Day to Maturity; is the number of days until maturity of the market maker contract.

ii. **Diff** : It is the difference of the theoretical price of the contract to be quoted on the Derivatives Market (VIOP) side to the best bid/ask price in Derivatives Market (VIOP).

*Formula:*

**Theoretical Price - Future Price**

#### For Future Bid:

If this value is 0, it indicates that orders will be sent to the best buying level, and the back of this area is painted in **ORANGE** color.

If it is less than 0, it is understood that the bid order will be sent to the lower levels and the background is normal.

If it is greater than 0, it indicates that a bid order will be sent on the best bid, and this is indicated by a **RED** background.

#### For Future Ask:

If this value is 0, it indicates that orders will be sent to the best ask level, and the back of this field is painted with **ORANGE** color.

If it is greater than 0, it is understood that the ask order will be sent to the upper levels and the background is normal.

If it is less than 0, it indicates that a ask order will be sent under the best ask, and this is indicated by a **RED** background.

(There are hints in the image about coloring.)



## MARKET MAKING SCREEN

**iii. Interest Rate (Int R) :** It is the annual interest rate value used for theoretical pricing. You can change the interest rate by changing the "Spread" or vice versa, you can change the "Spread" value by changing the interest. If "Fixed Spread" is active, you cannot enter the interest manually for the sale. The interest rate of the theoretical price calculated over the entered fixed spread will be displayed in the Interest field.

The interest rate will change automatically when the spread is changed.

*The formula of the interest rate over the spread;*

**Interest Rate = ((Spread+Dividend)\*365) / (Day to Maturity\*(Spot Price-Dividend))**

**iv. Spread (Spr) :** It is the difference between the theoretical price calculated for the futures and the spot price. If "Fixed Spread" is active, it is the Spread used in the calculation for the theoretical price. Fixed Spread can be used to change the interest rate if it is not active.

*Formula:*

**Theoretical Price - Spot Price**

**v. Transaction Amount (Tran) :** It is the amount of transactions realized on the quotes sent.

If the transaction amount is  $\geq$  max transaction amount, this field is indicated with a **RED** background.

**vi. Max Transaction Amount (Max Tran) :** It is the maximum amount of transactions that are requested to be performed on the quotes sent.

## SPECIAL RULES

There are some special rules about coloring in this table.

- a. If; If there is an error in the pricing, if the orders sent are constantly rejected, if a continuous trading session is exited in any of the contracts/shares valid in the Futures Market or the Equity Market, the line with the contract will be indicated with a completely **RED** background.
- b. If any of the links on the main screen are broken, the order submission will stop and the quotes sent will be withdrawn. You can tell that the connection is broken when the connections on the main screen become passive.
- c. If; If the market making limits of the stock market are defined and these definitions are exceeded, the "Contract" field will be indicated with a **RED** background.
- d. If a disorder is detected in the theoretical bid-ask prices or spot bid-ask prices, the "Theoretical Price" field will be indicated with a **RED** background.
- e. The theoretical purchase price will be indicated with an **ORANGE** background if it is to be sent to the best available (best buy for bid, best sale for ask) price level, and **RED** if an order is to be sent above the best level for bid, below for ask.
- f. If the maximum transaction amount is exceeded, the "Transaction Amount" field will be indicated with a **RED** background.

# STRATEGY SCREEN

Strategy

Buy Sym :

Day

Sell Sym :

Day

Eq - Drv Acc :

Amt-T. Amt :

Spr :

Cond - WFOT :

NAME : Strategy001

First Order : Buy

+

Add New

Settings

AEFES1 0.13 AEFES2

22.47 spr <= 2.99 22.6

Simulation ☒ - + ☒ WFOT

1  2

Strategy001 0 / 2

AKBNK1 0.08 AKBK2

5.3 spr >= 2.99 5.38

Simulation ☒ - + ☐ WFOT

2  3

Strategy002 0 / 3

AEFES1 0.13 AEFES2

22.47 spr <= 0.99 22.6

Simulation ☒ - + ☐ WFOT

1  1

Strategy003 0 / 1

AEFES1 0.13 AEFES2

22.47 spr <= 1.01 22.6

Simulation ☒ - + ☐ WFOT

1  1

Strategy004 0 / 1

AEFES1 0.13 AEFES2

22.47 spr <= 1.01 22.6

Simulation ☒ - + ☐ WFOT

1  1

Strategy005 0 / 1

CCOLA1 0.76 CCOLA2

78.74 spr <= 0 79.5

Simulation ☒ - + ☐ WFOT

1  1

Strategy006 0 / 1

CCOLA1 0.76 CCOLA2

78.74 spr <= 0 79.5

Simulation ☒ - + ☐ WFOT

1  1

Strategy007 0 / 1

CCOLA1 0.76 CCOLA2

78.74 spr <= 0 79.5

Simulation ☒ - + ☐ WFOT

1  1

Strategy008 0 / 1

Strategy

Buy Sym : AKBK1

Day

Sell Sym : AKBK2

Day

Eq - Drv Acc : 10

1907

Amt-T. Amt : 2

3

Spr : 2.9900

Cond - WFOT : >=

NAME : Strategy002

First Order : Sell

✓

Add New

Settings

AEFES1 0.13 AEFES2

22.47 spr <= 2.99 22.6

Simulation ☒ - + ☒ WFOT

1  2

Strategy001 0 / 2

AKBNK1 0.08 AKBK2

5.3 spr >= 2.99 5.38

Simulation ☒ - + ☐ WFOT

2  3

Strategy002 0 / 3

AEFES1 0.13 AEFES2

22.47 spr <= 0.99 22.6

Simulation ☒ - + ☐ WFOT

1  1

Strategy003 0 / 1

AEFES1 0.13 AEFES2

22.47 spr <= 1.01 22.6

Simulation ☒ - + ☐ WFOT

1  1

Strategy004 0 / 1

AEFES1 0.13 AEFES2

22.47 spr <= 1.01 22.6

Simulation ☒ - + ☐ WFOT

1  1

Strategy005 0 / 1

CCOLA1 0.76 CCOLA2

78.74 spr <= 0 79.5

Simulation ☒ - + ☐ WFOT

1  1

Strategy006 0 / 1

CCOLA1 0.76 CCOLA2

78.74 spr <= 0 79.5

Simulation ☒ - + ☐ WFOT

1  1

Strategy007 0 / 1

CCOLA1 0.76 CCOLA2

78.74 spr <= 0 79.5

Simulation ☒ - + ☐ WFOT

1  1

Strategy008 0 / 1

## STRATEGY SCREEN

It is the screen where you can create, edit and run the strategies that you will use to capture the spread between futures or between markets.

You can create and add new strategies to the system from the **Add New Strategy** page in the page control in the **upper left corner**, and you can edit the existing strategies from the **Settings** page in the same page control. The new strategies you will create will be added to the main screen sequentially, from left to right and top to bottom..

The parameters on the **Add New** and **Settings** page are as follows, respectively;

**i. Buy Symbol:** It is a contract to be bought in accordance with the strategy. Selection will be made from the short codes coded according to the maturity in the contract selection list. In share contracts, only the name of the underlying asset can be selected.

*For Example; GARAN is selected for the guarantee share, and GARAN1 is selected for the closest-term Garanti contract.*

**ii. Buy Symbol Order Type :** It is the validity period of the order to be sent while the purchase will be made as per the strategy. You can select **Day**, **IOT** and **FOK** types from the list. While the "**Day**" type order is written as passive, if there is an order at the sent price in the "**FOK**" type, as many orders as possible are executed and the remainder is canceled.

**iii. Sell Symbol :** It is the contract to be sold as per the strategy. Selection will be made from the short codes coded according to the maturity in the contract selection list. In share contracts, only the name of the underlying asset can be selected.

*For Example; GARAN is selected for the Garanti share, and GARAN1 is selected for the closest term Garanti contract.*

**iv. Sell Symbol Order Type :** It is the validity period of the order to be sent while the sale will be made in accordance with the strategy. You can select **Day**, **IOT** and **FOK** types from the list. While the "**Day**" type order is written as passive, if there is an order at the sent price in the "**IOT**" type, as many orders as possible are executed and the rest is cancelled. In "**FOK**" type, if the order is fully realized, the transaction is executed, if not, the order is cancelled.

## STRATEGY SCREEN

- v. Equity Account :** If there is an equity market among the contracts selected for the strategy, the area where the equity account to which the order will be sent for this contract will be selected.
- vi. Derivatives Account :** If there are contracts selected for the strategy in the futures market, the field where the Derivatives Market (VIOP) account to which the order will be sent for this contract will be selected.
- vii. Amount :** It is the order amount to be sent when the condition entered for the strategy is met. An order will be sent as much as the amount entered in the total quantity parameter, and the amount entered in the quantity parameter when each condition is met. In order to send new order pairs (buy-sell), there must be order activity in the levels of the selected contracts and if the parameter is active, the first order must be executed.
- viii. Total Amount :** It is the total amount of orders to be sent for the strategy. After the total amount of orders is sent, the strategy will become passive.
- ix. Spread :** For the strategy, it is the price difference between the two contracts to be traded.

The instant spread formula to be used for spread control is as follows.

*Formula:*

Best Buying Price of the Contract to be Sell  
-  
Best Selling Price of the Convention on the Stage Buying Things

- x. Condition :** The strategy is the desired condition for the determined spread value. Choose the appropriate one among the less equals ( $\leq$ ), equals ( $=$ ) and greater than equals ( $\geq$ ) options.
- xi. Wait for First Order to Fulfill (WFOT) :** While the order pairs will be sent when the strategy condition is met, it is the parameter to be selected to send the second order after the first order is sent, and to wait for the execution of the first sent order.

## STRATEGY SCREEN

**xii. Name :** It is the name that must be entered in order to distinguish the strategy and must not be the same as other strategies. Saved strategies are positioned according to the name order when the application is reopened. Name order is by character order. For this reason, if enumeration is to be used, it is recommended to name it like "Strategy001, Strategy002" rather than "Strategy1, Strategy2".

**xiii. First Order :** It is the parameter to choose which order to send first when the strategy condition is met. Depending on the strategy, a Buy Order or a Sell Order can be selected.

- Strategy Trading Screen



On the strategy trading screen, you can see the detailed information of the strategy you have added and you can change some parameters even when the strategy is active, activate or deactivate the strategy.

## STRATEGY TRADING SCREEN

The following information and parameters are available on the strategy trading screen, respectively;

- i. **Buy Symbol** : It is a contract to be bought in accordance with the strategy.
- ii. **Instant Spread** : For the strategy, it is the instant price difference between the two contracts to be traded. If the instant spread value triggers the entered spread condition, it is indicated with a **GREEN** background.

*Formula:*

**Best Buying Price of the Contract to be Sell**

-

**The Best Selling Price of the Contract to be Purchased**

- iii. **Sell Symbol** : It is the contract to be sold as per the strategy.
- iv. **Buy Symbol Ask Price** : In accordance with the strategy, it is the best selling price of the contract to buying in the market.
- v. **Spread Condition** : It is the field entered for the strategy, where the condition and spread value are shown together as the spread condition.
- vi. **Sell Symbol Bid Price** : In accordance with the strategy, it is the best purchase price of the contract to selling in the market.
- vii. **Simulation** : It is the parameter that is selected by default when the strategy is first opened. It is the parameter you will use to simulate when you activate your strategy. Sending an order to the market does not trigger it. If the simulation is active, it is indicated by a **BROWN** background to be noticeable.
- viii. **Spread INC-DEC** : These are the keys where the spread value determined for the strategy can be increased or decreased by the price tick. Spread reduction-increase can be done while the strategy is active.

## STRATEGY TRADING SCREEN

ix. **Wait for First Order to Fulfill (WFOT)** : While the order pairs will be sent when the strategy condition is met, it is the parameter to be selected to send the second order after the first order is sent, and to wait for the execution of the first sent order. It can be changed while the strategy is active.

x. **Amount** : It is the order amount to be sent when the condition entered for the strategy is met.

xi. **Active** : It is the key that you can set the strategy to active or passive state.

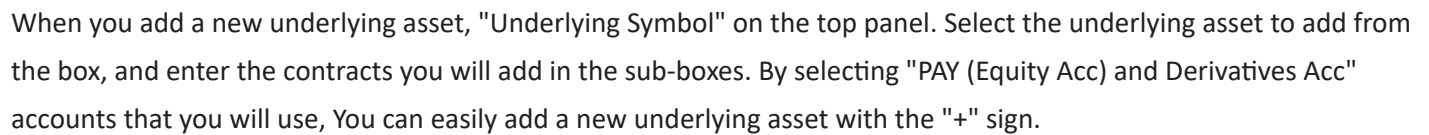
xii. **Total Amount** : It is the total amount of orders to be sent for the strategy.

xiii. **Name** : Strategy is the name.

xiv. **Worked Amount / Total Amount** : It is the area where the triggered amount and the total amount are displayed when the strategy is active.

xv. **Bottom panel**: It is indicated by a **LIGHT BLUE** background when the strategy is inactive, **GREEN** when it is active, and **RED** when it is completed and inactive.





## ETFS SCREEN

- i. **Theo P** : Theoretical pricing is made according to the infrastructure of the institution.
- ii. **Max Tran** : It is the maximum amount of transactions that are requested to be realized on the quotations sent.
- iii. **Tran** : It is the amount of transactions realized on the quotes sent.
- iv. **Spread** : The institution can enter the spread value manually at the desired value.



There are two parts to call and put option contracts, Calls and Puts. Left side calls, right side puts for contracts.

The values indicated in **YELLOW** are the values entered for bid. The values indicated in **RED** are the values entered for ask. The values indicated in **BLACK** are the values entered for t.price. Pricing for the relevant field without entering IntR, ImpV values is not done. The line for which pricing is made becomes **NAVY BLUE**.

## OPTION SCREEN

- i. **Max Tran** : It is the maximum amount of the transaction requested to be realized over the submitted bids.
- ii. **Tran** : It is the amount of transaction realized over the submitted offers.
- iii. **Int R** : It is the interest rate. It is entered manually by the institution.
- iv. **Vol Bid** : The implied volatility value entered for the buy.
- v. **Bid Price** : It is calculated with the Black-Scholes model using the IntR, Vol Bid values entered manually by the Institution and Strike, Days to Maturity and dividend. For call bid price we using spot bid, for put bid price we using spot ask price.
- vi. **Strike** : The usage price is displayed on the screen.
- vii. **T.Price** : It is the theoretical price of the buy/sell contract calculated with the Black-Scholes model using the manually entered IntR, Vol Bid values and Strike, Days to Maturity and dividend (dividend yield). For call t.price we using spot bid, for put t.price we using spot bid price.
- viii. **Ask Price** : It is calculated with the Black-Scholes model using manually entered IntR, Vol Ask values and Strike, Days to Maturity and dividend (dividend yield) entered by the institution. For call ask price we using spot ask, for put ask price we using spot ask price.
- ix. **Rho** : Indicates how much the option's premium will change as a result of a 1% change in the interest rate.
- x. **Vega** : How much is the option premium after the 1% change in the implied fluctuation of the underlying price indicates that it can change. The vega's contribution to the option premium also differs according to the number of days left to the option's expiration date shows. As the number of days to maturity of the option increases, the

## OPTION SCREEN

probability of the option to fluctuate in a wider price range also increases is high.

**xi. Theta :** It measures how much the option price will drop as one day approaches expiration. progress of time it is always expressed in negative values because it reduces the time value of the option.

**xii. Gamma :** The unit change in the price of the underlying asset or economic indicator. Indicates how many units can vary in delta.

**xiii. Delta :** How much the premium of the option will decrease as a result of a one-unit change in the price of the underlying asset, or indicates that it will increase. Delta is expressed as a percentage and can be as high as 100% and as low as 0%.

## USED TECHNOLOGIES

- i. Fast OMS can be installed on a server that is directly connected to the stock market network with a 10G fiber line in the BIST CoLocation environment.
- ii. The data broadcast that triggers the order transmission is received by connecting to the ITCH servers of the exchange and the orders are transmitted through the OUCH channel.
- iii. As a minimum configuration, we recommend at least 4 physical cores and 3 Ghz CPU, 16 GB RAM and SSD disk.
- iv. An example CPU model is as follows:

<https://ark.intel.com/content/www/us/en/ark/products/204097/intel-xeon-platinum-8356h-processor-35-75m-cache-3-90-ghz.html>

## CHANGES

1.0.0	Document created.
1.1.0	Added Strategy Orders, technologies used and purpose-scope.
1.1.1	Purpose and scope adjusted.
1.2.0	Added system topology.
1.2.1	Added new hedge order features. The system topology has been updated.
1.3.0	Added ETFS and Option screens. The Futures screen has been updated.