Warrants

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Contents

What are Warrants[1]?

Warrants are capital markets instruments that entitle the holders to buy or sell the underlying instrument or indicator at a predetermined price on, or before, a particular date, where such right is exercised by registered delivery or cash settlement.

The holder of a warrant buys not the underlying security itself, but the right to buy or sell such underlying security, against the payment he makes.

Warrants;

- are securitized options;
  - listed on a stock exchange and traded in the relevant market segment.
  - traded in the secondary market.
  - settled in the same way as other securities.
- are financial instruments included in the category of "structured products" and are not issued for financing purposes.
- are solely under the responsibility of the issuer.
- entitle the holder to buy from or sell to the issuer an underlying security, a basket of securities, or an index, on or before a particular date, at a predetermined price, against the premium he pays.
- represent a right, and not an obligation, for the holder.

The basic principles regarding the issue, issuers, registration, and trading of warrants are regulated by the Capital Markets Board of Turkey (CMB) by its Communiqué Series III No: 37 Regarding the Registration with the Capital Markets Board of Turkey and *Trading of Warrants* on the Stock Exchange. According to the said Communiqué, warrants are traded on the Istanbul Stock Exchange (ISE).

The procedures and principles regarding the listing and trading of warrants on the ISE are stipulated by the ISE's Circular No.38, dated Jan 5, 2010.

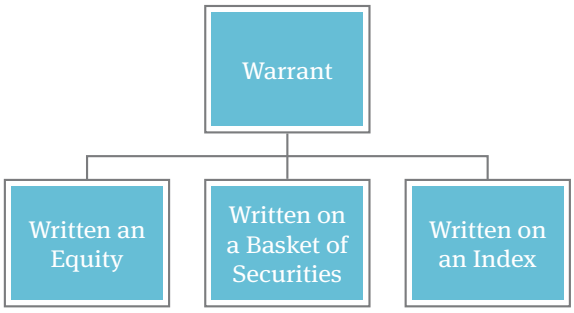
Warrants may be traded on the ISE provided that they are supported through market making activity by their issuers or the brokerage companies contracted by the issuers. In order to provide a liquid and well-regulated market, the market maker is required to continuously give quotations. The benefits of market making are as follows:

Liquidity: Since there is always a buy and sell quotation in the market, investors willing to trade at market prices will be able to do so at any time during the session.
Price Stability: Market makers can curb price fluctuations. This gains much more importance in the case of financial instruments, such as warrants, where the price calculations are based on complicated formulae and numerous constituents.
Balancing of Orders: In the event that an excess occurs in either the demand or supply of the orders, the market maker intervenes in order to maintain the balance of the market.
Rapidness: For order realization, it is not necessary to wait for matching orders to come to the market. Investors may trade at quoted prices even if no orders are given.

1 "Warrant" refers to the warrants subject to the Capital Markets Board of Turkey (CMB) Communiqué Series III No: 37 Regarding the Registration with the Capital Markets Board of Turkey and Trading of Warrants on the Stock Exchange.

Underlying Instruments

Warrants are included in the class of structured products, which carry the qualities of a securitized option. Warrants are written on a financial product or indicator. Such financial products are called “underlying instruments”.



If the underlying instrument of a warrant is a single equity or a basket of equities, we use the term “underlying asset,” whereas in the case of warrants written on an index, the term “underlying indicator” is used.

The “underlying asset” may be a single equity or a basket of equities. Such equities must be traded on the ISE, and included in the ISE 30 Index.

Example: A call warrant issued by Z bank, entitling the holder to **buy** the shares of ABC Incorp. at TL 6.00 on 20.12.2014.

Example: A put warrant issued by Z bank, entitling the holder to **sell** the shares of ABC Incorp. at TL 5.00 on 20.12.2014.

Warrants written on an index, on the other hand, provide cash flow to the holder, on the basis of the value of the underlying index on a particular date. Such indices are equity indices calculated by the ISE.

Example: A call warrant issued by Z bank, which entitles the holder to **buy** the ISE-100 Index at 80,500 points on 20.12.2014.

Example: A put warrant issued by Z bank, which entitles the holder to **sell** the ISE-30 Index at 70,500 points on 20.12.2014.

Rights not Provided by Warrants

In contrast to equities, warrants do not offer the following rights:

- Dividend
- Pre-emptive right
- Share in liquidation
- Taking part in the company management
- Voting and right to information

The buyer of a warrant does not buy the equity itself, but the right to buy or sell such security.

Constituents of a Warrant

Expiry

The expiry date refers to the last date on which the right arising from the warrant can be exercised.

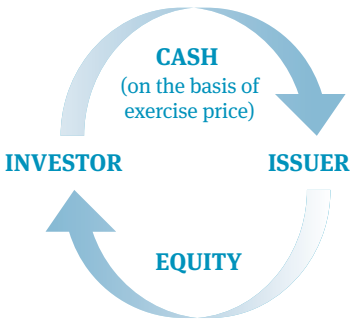
European style means you can only exercise the warrant (conversion) on the expiry date of the warrant, while in the case of American style warrants, you can exercise the warrant at any time on or before the expiry date.

Conversion

Conversion means the exercising of a warrant, that is, using of a right arising from a warrant. Conversion may be realized by registered delivery or cash settlement, as determined by the issuer.

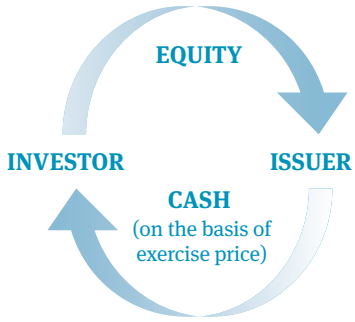
Conversion:
In the case of *call* warrants written on equities and settled by registered delivery, the warrant holder is required to pay the issuer the amount calculated over the price specified in the prospectus, against which, he receives the equities by registered delivery.

Conversion Registered Delivery in Call Warrants



In the case of *put* warrants written on equities and settled by registered delivery, the warrant holder is required to sell the underlying equities to the issuer, against which, he receives the amount calculated over the price specified in the prospectus.

Conversion by Registered Delivery in Put Warrants



Exercise Price

Exercise price is the amount that the investor must pay for each share to buy the underlying asset (equity), in the case of call warrants written on equities. The exercise price is determined by the issuer prior to the issue of the warrant.

Example: The exercise price of a call warrant, issued by Z bank, entitling the holder to buy the shares of ABC Incorp. at TL 6.00 on 20.12.2014 is six TL.

In the case of put warrants written on equities, exercise price refers to the sales price of the underlying asset (equity) to the issuer.

Example: The exercise price of a put warrant, issued by Z bank, entitling the holder to sell the shares of ABC Incorp. at TL 5.00 on 20.12.2014 is five TL.

Exercise Level

Exercise level is used for the warrants written on an index. Exercise level is the index value to which the underlying index is compared, at the time the right arising from the warrant is exercised. The exercise level is determined by the issuer prior to the issue of the warrant.

Example: The exercise level of a call warrant, issued by Z bank, entitling the holder to buy the ISE-100 Index at 80,500 points on 20.12.2014 is 80,500.

Example: The exercise level of a put warrant, issued by Z bank, entitling the holder to sell the ISE-30 Index at 70,500 points on 20.12.2014 is 70,500.

Conversion Ratio

The conversion ratio is the number of underlying equities that one warrant entitles the holder to buy or sell or the number of warrants that must be exercised for the buy or sell one unit of the underlying equity. Conversion ratio is determined by the issuer prior to the issue of the warrant.

Example: A conversion ratio of 1:1 means that 1 warrant entitles the holder to buy or sell 1 equity.

Example: A conversion ratio of 4:1 means that 4 warrants entitle the holder to buy or sell 1 equity.

Example: A conversion ratio of 1:2 means that 1 warrant entitles the holder to buy or sell 2 equities.

Index Multiplier

The amount payable to the investor is calculated by multiplying the difference between the closing value of the underlying index on the conversion date and the exercise price, by a value "x." This value "x" is called "index multiplier," and is determined by the issuer prior to the issue of the warrant.

Comparison: Warrants vs. Options

Similarities

Just like options, warrants offer their holders the opportunity to gain exposure to the price fluctuations of the underlying asset, without owning such asset.

Warrants are financial instruments, which, like options, entitle their holder to buy or sell a certain amount of underlying asset or indicator, at a predetermined price, on or before the expiry date.

Neither warrants nor options provide any control over the underlying asset until exercised. Both represent a right.

Differences

- Options are contracts, whereas warrants are securities.
- Options are traded according to the principles of a futures market, whereas warrants are traded according to the principles of a spot (cash) market.
- Options are standardized contracts, the features of which are determined by the stock exchanges where they are traded. Unlike options, the terms of warrants are set by the issuer and are more flexible than options (for example, warrants have no fixed expiry).
- With options, the selling party writes the option. For each warrant, on the other hand, there is a single issuer. The issuer is solely responsible for the right presented by warrants.
- Unlike options, there are no margin calls or margining associated with warrants since the issuer is entirely responsible for the product.

Issuing Warrants

Therefore, no margin calls or margining is necessary in trading warrants.

Feature	Option	Warrant
Structural	Contract	Security
Trading	Derivative	Spot
Feature	Standardized	Flexible
Writer/Issuer	Investor	Bank-Brokerage House
Margining	Yes	No

All warrants have an issuer. The investor holding a warrant claims any rights arising from such warrant against the issuer. In the case of **put** warrants, the warrant holder sells the underlying asset to the issuer, whereas in the case of **call** warrants, the warrant holder buys the underlying asset from the issuer.

The issuer is expected to be financially sound so that he can fulfill his obligations. Therefore, authorization to issue warrants is restricted.

Banks and brokerage houses failing the minimum requirements but nevertheless intend to issue warrants must find a guarantor that fulfills the necessary requirements. According to the CMB regulations:

- Warrants may be issued by intermediary institutions (banks and brokerage houses) established in Turkey or abroad.
- However, such institutions must receive a rating of no less than top three investment grade long term optional ratings according to the international rating scale.
- Intermediary institutions established in Turkey, but failing the above mentioned rating requirement, may issue warrants provided that their obligations arising from settlement are guaranteed by intermediary institutions that fulfill the above mentioned rating requirement.

Warrant-Trading

Trading of Warrants on the Istanbul Stock Exchange is regulated by a Circular issued by the ISE in accordance with the CMB stipulations.

Trading Method

Warrants are traded on the Warrant Market established within the ISE Collective Products Market by **"market making in multiple price - continuous auction system"**. This system is operated by entry of buy/sell quotations by the market maker member in charge of the warrant and entry of buy/sell orders by members (including the market maker member) for such warrant. A market maker must be assigned for each warrant, without which, warrants may not be traded and no alternative trading method is available.

Market Maker

ISE member intermediary institution, determined by the issuer upon the approval of the CMB, and responsible for giving quotations for the warrants under its responsibility, in order to ensure the fair, orderly, and efficient functioning of the market, and to contribute to the formation of a liquid and continuous market for such warrants.

Quotation

A two-sided order that the market maker enters the ISE Stock Market Automated Trading System (System), which includes information about the price at which and the quantity of the warrant that he is ready to buy or sell.

Main Trading Rules

- Orders are entered into the System according to price and time priority and are matched with the buy/sell orders and/or the quotations within the appropriate quotation interval (including quotation prices).
- The market maker member enters quotations for the relevant warrant. No order entry is accepted for warrants before the market maker member enters a quotation.
- Base price method is not applicable in warrant trading. Therefore, there is no upper or lower limit in price formation (margin is free).
- All trades in the market are realized within the interval of buy/sell quotations given by the market maker (including quotation prices) (the quotations given by the market maker are temporary price limits, in a way). Orders that fall out of the interval are also accepted to the System, but may be matched only when they are within the quotation interval.
- No orders or quotations are entered for warrants during the opening session.
- Orders entered for warrants may be cancelled during the session.

Trading Hours

Warrants are traded during the continuous auction of the Stock Market. The first session is between 09:50-12:30 and the second session takes place between 14:20-17:30 hours.

Trading Code

Two types of codes -one short and one long- are used with warrants. Such codes are determined and announced by the ISE.

Short Code (1)

(For Warrants Written on a Single Equity)

For warrants written on a single equity, the short code is alphanumeric and consists of 5 characters. The first two characters represent the underlying equity. The short code is determined by the ISE Stock Market Department.

Short Code (1) Format:

WARRANT CODE					FEATURES	
1	2	3	4	5	6	7
A	B	X	...	...	V	-

Above is the short code of a warrant on ABCDE.E. Following the letters “A” and “B” representing the underlying equity ABCDE.E, is a letter representing the issuer. The fourth and fifth characters are letters selected from A to Z, and determined separately for each warrant.

Letters between A-O are for call warrants whereas the letters from P to Z are for put warrants.

The last two characters for call warrants are from AA to OO; e.g.; AB, AC, AD, BA, BB, BC,..., OA, OB, OC....OO.

The last two characters for put warrants are from PP to ZZ; e.g.; PP, PR, PS,..., ZP, ZR, ZS....ZZ.

Short Code (2)

(For Warrants Written on a Basket of Equities)

A similar method is used for coding warrants written on a **basket** of equities.

The short code for warrants written on more than one equity is alphanumeric and consists of 5 characters. The first two characters are “SP”, indicating that the warrant is written on a basket of securities.

Short Code (2) Format:

WARRANT CODE					FEATURES	
1	2	3	4	5	6	7
S	P	X	...	...	V	-

Above is the short code of a warrant written on a basket of equities. Following the first two characters “S” and “P”, indicating that the warrant is written on a basket of equities, is a letter representing the issuer. The fourth and fifth characters are letters selected from A to Z, and determined separately for each warrant.

Letters between A-O are for call warrants whereas the letters from P to Z are for put warrants.

The last two characters for call warrants are from AA to OO; e.g.; AB, AC, AD, BA, BB, BC,..., OA, OB, OC....OO. The last two characters for put warrants are from PP to ZZ; e.g.; PP, PR, PS,..., ZP, ZR, ZS....ZZ.

Short Code (3)

(For Warrants Written on an Index)

Similarly, two types of codes -one short and one long- are used with warrants written on an index.

Short Code (3) Format:

WARRANT CODE					FEATURES	
1	**2**	**3**	**4**	**5**	**6**	**7**
A	B	X	...	...	V	-

For warrants written on an index, the short code is alphanumeric and consists of 5 characters.

The first two characters are letters representing the underlying index (for example OZ for XU030; EL for XU050; YZ for XU100 and OB for ISE 10 Banks). One letter representing the issuer follows.

The last two characters are selected from A to Z and are separately determined for each warrant.

Letters between A-O are for call warrants whereas the letters from P to Z are for put warrants.

The last two characters for call warrants are from AA to OO; e.g.; AB, AC, AD, BA, BB, BC,..., OA, OB, OC....OO.

The last two characters for put warrants are from PP to ZZ; e.g.; PP, PR, PS,..., ZP, ZR, ZS....ZZ.

Long Code

Long code incorporates more detailed information about a warrant and consists of 32 characters (excluding spaces). Long code includes the information indicated in the table below, depending on the features of the underlying financial product.

Position	Explanation
1-5	The trading code (if the warrant is written on a single equity) or index code (if the warrant is written on an index). If the underlying asset is a basket of equities, the expression "SEPET" ("basket" in Turkish) is used.
6	Type of Warrant: "C" (call) or "P" (put) is used to indicate the type of warrant.
7-12	Expiry: Numeric, in DDMMYY format.
13-19	Exercise price or level. For warrants written on an index, exercise level shows the level of the index at which the warrant will be exercised.
20-22	3 letters representing the issuer.
23-29	Conversion ratio or index multiplier.
30-32	Reference field (optional). The first character indicates the settlement method (N stands for cash settlement and K stands for registered delivery).

Example: The long code of a warrant, written on an equity:

- On ABCDE.E,
- Call warrant,
- Expires on December 30, 2015,
- Exercise price of TL 30,
- issued by XCH,
- Conversion ratio of 50,
- Settled by registered delivery, is as follows:

"ABCDE C 301215 0030.00 XCH 050:001 K"

Example: The long code of a warrant written on a basket:

- Consisting of the ABCDE, TEST1 and TEST2 equities,
- Call warrant,
- Expires on December 30, 2012,
- Exercise price of TL 40,
- issued by XCH,
- Conversion ratio of 10,
- Cash settled is as follows:

"SEPET C 301212 0040.00 XCH 010:001 N"

Example: The long code of a warrant, written on an index:

- On ISE 30 Index
- Call warrant,
- Expires on December 30, 2012,
- Exercise price of TL 56,890,
- Index multiplier of 0.001,
- issued by XCH
- Cash settled is as follows:

"XU030 C 301212 0056890 XCH 00.0010 N"

Warrant Settlement and Conversion

"Settlement" means the exchange of the warrants traded on the ISE with the corresponding amount of cash in the investors' accounts, while "warrant conversion" expresses the transactions during the exercising of the rights associated with the warrant.

Settlement Period

As in the case of equities, rights coupons, and exchange traded funds, the settlement of warrants is realized on T+2, in accordance with the ISE Stock Market operation and settlement principles.

ISIN

The ISE Settlement and Custody Bank (Takasbank) allocates ISIN codes for the warrants issued in Turkey. For warrants to be issued by the intermediary institutions established abroad, the ISIN codes allocated abroad will be notified to the ISE, Takasbank, and the Central Registry Agency of Turkey, by the issuer.

Conversion

With regard to the conversion of warrants, it is important whether a warrant is

- Written on a single equity, a basket of equities, or an index,
- European or American style,
- Call or put,
- Settled by cash or by registered delivery
- In-the-money, out-of-the-money, or at-the-money.

In-the-money, Out-of-the-money and At-the-money

- Call Warrants: When the exercise price/level is below the spot price/level of the underlying instrument, the warrant is in-the-money; when the exercise price/level is above the spot price/level of the underlying instrument, the warrant is out-of-the-money; when the exercise price/level is equal to the spot price/level of the underlying instrument, the warrant is "at-the-money".
- Put Warrants: When the exercise price/level is above the spot price/level of the underlying instrument, the warrant is in-the-money; when the exercise price/level is below the spot price/level of the underlying instrument, the warrant is out-of-the-money; when the exercise price/level is equal to the spot price/level of the underlying instrument, the warrant is "at-the-money".
- Either of the following four situations may arise at the expiry of the warrant or conversion of American style warrants prior to the date of expiry:
  - Cash settlement, where the issuer transfers money in the in-the-money warrant holder's account.
  - Registered delivery, where the issuer transfers equities in the in-the-money warrant holder's account. On the other hand, the warrant holder transfers the exercise price to the issuer's account (Call).
  - Registered delivery, where the in-themoney warrant holder transfers equities to the issuer's account. On the other hand, the issuer transfers the exercise price to warrant holder's account (Put).
  - No transfer of equities or cash between the accounts of the issuer and the warrant holder (Where the warrant is at-the-money or outof- the-money).

Expiry Date

Expiry date for warrants is the last trading day for warrants. The warrant holder, holding the warrant on the expiry date after the close of the session, undertakes to fulfill the obligations indicated in the conversion conditions on the expiry date. The settlement of the trades realized on the expiry date must be completed (E+2 end of day) in order that the warrant holder's rights are registered with the Central Registry Agency of Turkey. Therefore, the final holders for the warrant are determined on E+2. The associated rights may be used on E+3, the earliest.

Warrant Conversion with Cash Settlement

In the case of warrant conversion with cash settlement, the exercise price and the market price of the underlying instrument are compared (unless otherwise stated in the warrant circular, the market price of the underlying asset is the average weighted price at the end of the second session of the expiry date of the warrant).

- Call Warrants: In the event that the exercise price is equal to or greater than the market price of the underlying asset, there will be no transactions (where the warrant is at-the-money or out-of-the-money). In the event that the exercise price is less than the market price, the difference is transferred to the client's account (where the warrant is in-the-money).
- Put Warrants: In the event that the exercise price is equal to or less than the market price of the underlying instrument, there will be no transactions (where the warrant is at-the-money or out-of-the-money). In the event that the exercise price is greater than the market price, the difference is transferred to the client's account (where the warrant is in-the-money).

Warrant conversion is realized by the Central Registry Agency of Turkey on the expiry date.

On E+2 end of day, the warrant balances in the clients' accounts are deleted automatically and

the payments are made through the transfer of the cash paid by the issuer to the free cash accounts of the intermediary institutions at Takasbank, by the Central Registry Agency of Turkey. Unless otherwise stated in the warrant prospectus, the payment date is the day when the issuer pays the cash in the account of the Central Registry Agency of Turkey (E+3, the earliest).

The conversion of warrants written on a basket of equities or an index is realized by cash settlement only.

In the case of warrants written on an index, unless otherwise stated in the warrant circular, the index value to be used in the calculations (exercise level) is the closing value of the underlying index at the expiry date.

In the case of American style warrants, conversion is realized by the deletion of the warrants upon the client's exercising his rights at pre-determined intervals during the period until the expiry date, and transfer of the cash paid by the issuer to the relevant intermediary institution's free cash account at Takasbank.

Warrant Conversion by Registered Delivery

In the case of warrant conversion by registered delivery, the exercise price is compared to the market price of the underlying asset;

- Call Warrants: In the event that the exercise price is equal to or greater than the market price of the underlying asset, there will be no transactions (where the warrant is at-the-money or out-of-the- money). In the event that the exercise price is less than the market price of the underlying asset (where the warrant is in-the-money), the warrant holder must pay the exercise price before the associated equity/equities are transferred to the investor's account.
- Put Warrants: In the event that the exercise price is equal to or less than the market price of the underlying asset, there will be no transactions (where the warrant is at-the-money or out-of-the-money). In the event that the exercise price is greater than the market price of the underlying asset (where the warrant is in-the-money), the associated equity/equities are transferred to the issuer's account and the issuer transfers the relevant amount to the warrant holder's account.

Factors Influencing the Warrant Price

Price of the Underlying Asset

There is a positive correlation between the price of the underlying instrument and a call warrant, while this correlation is negative in the case of put warrants. As the price of the underlying asset increases, the price of call warrants increases and the price of put warrants decreases.

Exercise Price

There is a negative correlation between the exercise price of a warrant and call warrants, while this correlation is positive in the case of put warrants. As the exercise price increases, the price of call warrants decreases and that of put warrants increases.

Days to Maturity

There is a positive correlation between the days to maturity and both call and put warrants. As the days to maturity increase, the price of both call and put warrants increases.

Volatility

There is a positive correlation between the volatility of the underlying asset and both call and put warrants. As the volatility of the underlying asset increases, the price of both call and put warrants increases.

Market Interest Rate

There is a positive correlation between the interest rate and call warrants, while this correlation is negative in the case of put warrants. As the interest rate increases, the price of call warrants increases and that of put warrants decreases.

Dividend

There is a negative correlation between the dividend distributed by the company on whose equities the warrant is written and the price of call warrants, while this correlation is positive in the case of put warrants. As dividends increase, the price of call warrants decreases and that of put warrants increases.

Factors Influencing the Warrant Price

	Warrant Price (CALL)	**Warrant Price** (PUT)
Price of the Underlying Asset	+	-
Exercise Price	-	+
Days to Maturity	+	+
Volatility	+	+
Market Interest Rate	+	-
Dividend	-	+

Risks of Investing in Warrants

- Warrants have an expiry day and therefore a limited life.
- Due to leverage, buying warrants may be to one's advantage or disadvantage, and therefore it should be taken into consideration that leverage may lead to high return as well as loss.
- As a result of the price fluctuations in the market, the invested money may be entirely lost.
- However, with warrants, the risk is limited to the amount paid for the warrant, the commission and other fees.
- It should be considered that the technical and fundamental analyses for warrant trade are subjective and the anticipations of such analyses may not be realized.

The issuer's risk management policy against the risks associated with issuing warrants must be included in the prospectus. In accordance with the Communiqué, the prospectus is announced in the web sites of the issuer and the market maker. Investors should carefully examine the issuer's risk management policy before making investment decisions.

Responsibility of the ISE and the Guarantee Fund Warrants are securities that are under the full responsibility of the issuing intermediary institutions. The Istanbul Stock Exchange has no responsibility or liability associated with this product. In the case that the issuer faces any financial difficulty in the exercising of the rights associated with the warrant, the risk lies entirely with the investor. Any loss or damage arising from the failure of making payments to the investor while exercising his rights, failure of delivery of the underlying assets, failure of buying the underlying assets from the investors, and so forth, shall not be compensated by the Guarantee Fund. However, in the case of any problems that arise in the settlement of warrant trades realized in the ISE, the investors may have recourse to the Guarantee Fund, as in the case of equity trades.

Expectations from Warrants

- Warrants help investors to get familiar with securitized rights and derivative products.
- As long as the market makers contribute to the formation of a liquid and continuous market, the market making system will be appreciated by investors.
- The competition among the issuers will ensure an efficient market.
- Issuers' transactions on the underlying assets in order to hedge themselves against the risks associated with their warrant positions will contribute to the liquidity of the spot market.

Glossary of Terms

In this section, some fundamental terms concerning warrants are explained. Calculations and examples are based on the data in the following table.

Exercise price (EP)	TL 4.50
Price of the Underlying Asset (PUA)	TL 4.30
Days to Maturity	1 year
Conversion Ratio (CR)	1:1
Warrant Price (PW)	TL 0.50
Volatility	30.50 (%)
Delta	0.546
Vega (including conversion ratio)	0.02
Theta (weekly)	-1.12 (%)
Gamma (including conversion ratio)	0.03

At-the-money

When the Price of the Underlying Asset (PUA) is equal or very close to the Exercise Price (EP):

	Call	**Put**	**Intrinsic Value**
In-the-Money	EP<PUA	EP>PUA	>0
At-the-Money	EP=PUA	EP=PUA	=0
Out-of-the-Money	EP>PUA	EP<PUA	=0

Black & Scholes Pricing Model

The value of warrants is calculated by using the Black & Scholes calculation method, which is widely used in pricing options.

Black and Scholes option price calculation method was developed by Fischer Black and Myron Scholes in 1973 for the purpose of calculating the premiums of European style options that do not distribute dividends. The model is based on the assumption that forming a portfolio consisting of a short position in the cash account of a financial product, and a long position in the call option of that product, and thereby receiving a yield equal to risk-free interest rate. Here are some of the assumptions of the Black-Scholes model:

- The financial product does not pay a dividend or interest.
- The option is European style.
- Risk-free interest rate is fixed during the life of the option.
- Yields of financial products are normally distributed.

The cash market of the financial product is efficient and short selling is allowed. Black and Scholes option price calculation formula is as follows;

$$C = S_0 N(d_1) - Ke^{-rT} N(d_2)$$
$$P = Ke^{-rT} N(-d_2) - S_0 N(-d_1)$$

$$d_1 = \frac{\ln (S_0 / K) + (r + \sigma^2 / 2)\, T}{\sigma\sqrt{T}}$$

$$d_2 = \frac{\ln (S_0 / K) + (r - \sigma^2 / 2)\, T}{\sigma\sqrt{T}}$$

The variables in this formula stand for the following concepts;

C: Call
P: Put option (warrant) premium
S_0: Cash market price of the underlying asset
K: Exercise price of the option (warrant)
r: Risk free interest rate
T: Days to maturity of the option (warrant) (in annualized terms)
σ: Volatility of the underlying asset
$N(d_1)$ and $N(d_2)$: Standard normal cumulative distribution function (in other words, the probability that a standard normally distributed probability variable (0.1) is less than d_1 or d_2.
ln: Natural logarithm

Delta

Delta expresses the ratio, which, one unit of change in the price of the underlying asset is expected to create in the warrant price. In the event that the price of the equity in the example increases from TL 4.30 to TL 4.50, the warrant price is expected to increase to 0.55. The calculation is as below:

Delta x conversion ratio x change in the price of the underlying asset = 0.546 x 1 x 0.10 = 0.055

The new warrant price = 0.50 + 0.05 = TL 0.55

If the price of the underlying equity falls to TL 4.20, then the new warrant price will be TL 0.45.

Delta is between 0 and 1 in call options, and -1 to 0 in put options. In put warrants, delta is shown as (-) because in put warrants, as the price of the underlying asset increases, the warrant price is expected to fall.

Gamma

Gamma shows the effect of the fluctuations in the price of the underlying asset on delta.

If there is a change (increase or decrease) in the price of the equity in the example above, delta will change, too. If the price of the equity increases to TL 4.40, (assuming that gamma is 0.03) delta will increase from 0.546 to 0.576. If the price of the equity falls to TL 4.30, delta will decrease by 0.03 to 0.516.

Leverage

There is a leverage in warrants. Leverage means the potential to gain a larger profit or incur a larger loss with a relatively small investment. The leverage for warrants is equal to the division of the price of the underlying asset by the warrant price.

The conversion ratio should also be considered in this calculation.

$$L = \frac{\text{Price of the Underlying Asset}}{\text{Warrant Price}} \times \text{Conversion Ratio}$$

$$L = \frac{4.30}{0.50} \times 1 = 8.60$$

Break-even Point

Break-even point shows the price of the underlying asset at which the investor starts to gain profits. Transaction costs are not taken into consideration in the calculation.

$$\text{Call} : \frac{\text{Warrant Price}}{\text{Conversion Ratio}} + \text{Exercise Price}$$

$$\text{Example} : \frac{0.50}{1} + 4.50 = \text{TL } 5.00$$

$$\text{Put: Exercise Price} - \frac{\text{Warrant Price}}{\text{Conversion Ratio}}$$

$$\text{Example} : \text{TL } 4.50 - \frac{0.50}{1} = \text{TL } 4.00$$

In-the-money

Shows the situations where the warrant has an intrinsic value. For call warrants, in-the-money means that the price of the underlying asset is greater than the exercise price, and for put warrants, it means that the price of the underlying asset is less than the exercise price.

Origination Fee

Origination fee means the difference that arises from buying the underlying asset through a warrant instead of buying it directly from the spot market (for put warrants, selling the underlying asset through a warrant instead of selling it directly in the spot market).

For Call=

$$\frac{\text{Warrant Price}}{\text{Conversion Ratio}} + \text{Exercise Price} - \text{PUA}$$

$$\text{Example} : \frac{0.50}{1} + 4.50 - 4.30 = \text{TL } 0.70$$

For Put=

$$\frac{\text{Warrant Price}}{\text{Conversion Ratio}} + \text{PUA} - \text{Exercise Price}$$

$$\text{Example} : \frac{0.50}{1} + 4.30 - 4.50 = \text{TL } 0.30$$

Percentage Fee

For Call=

$$\frac{\left[\frac{\text{Warrant Price}}{\text{Conversion Ratio}} + \text{EP} - \text{PUA}\right]}{\text{PUA}} \times 100$$

Example :

= (((0.50 / 1) + (4.50 – 4.30)) / 4.30) x 100

= 16.28 %

For Put=

$$\frac{\left[\frac{\text{Warrant Price}}{\text{Conversion Ratio}} + \text{PUA} - \text{EP}\right]}{\text{PUA}} \times 100$$

= (((0.50 / 1) + (4.30 – 4.50)) / 4.30) x 100

= 6.98 %

Omega

Omega, also known as elasticity, is named as refined leverage since it also takes delta into consideration. The result is called "gearing." Omega is the percent change that a change of 1% causes in the warrant price. A negative delta leads to negative omega.

Omega = Leverage x Delta

Omega = 8.60 x 0.546 = 4.7

If the price of the underlying asset increases by 1% to TL 4.34, the warrant price is expected to increase by 4.7% to TL 0.52. In consideration of the fact that delta changes with each change of the price of the underlying asset, omega will change as well.

Rho

Rho shows the effect of the changes in risk-free interest rates on the warrant price. Interest rate is assumed to have a positive correlation with call warrants and a negative correlation with put warrants.

Theta

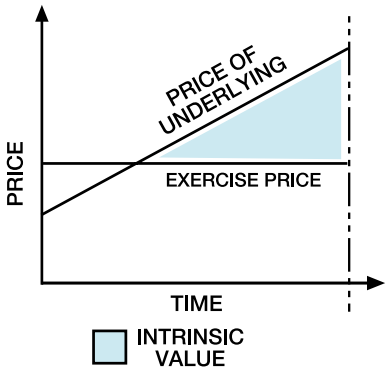
Theta is the relationship between the days to maturity and the warrant price. In other words, theta shows the effect of time on the warrant.

Theta value may be shown daily or weekly. A theta value of 1.12% weekly means that the warrant will lose a value of 1.12% in a week.

Warrant Price

Warrant price consists of two fundamental constituents; i.e., intrinsic value and time value.

Warrant Price = Intrinsic Value + Time Value



Intrinsic value

Intrinsic value is the difference between the price of the underlying asset and the exercise price of the warrant. Since the warrant holder is not required to use his option, intrinsic value is never negative.

For call:
(Price of the Underlying Asset- Exercise Price) x Conversion Ratio = (4.30 - 4.50) x 1 = 0 (never negative)

For put:
(Exercise Price - Price of the Underlying Asset) x Conversion Ratio = (4.50 - 4.30) x 1 = 0.20

Time Value

The difference between the current warrant price and its intrinsic value is time value or speculative value.

Time value is the amount that the warrant holder is ready to pay for the probability that the price of the underlying asset is suitable for him during the days to maturity of the warrant. In other words, time value is the price paid for the uncertainty of the price of the underlying equity.

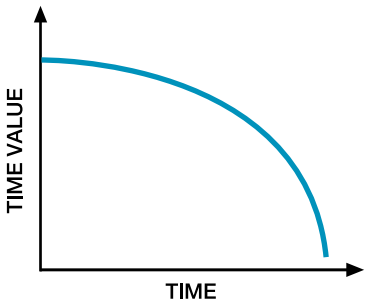
The time value of the warrant increases in proportion to the days to maturity. At maturity, time value is equal to "0." In general, warrants lose 60% of their value in the last 30% portion of their life.

Time value is the difference between the current warrant price and its intrinsic value.

Time Value = Warrant Price - Intrinsic Value

For call: 0.50 - 0 = TL 0.50 (the intrinsic value is "0" since the price of the underlying asset is less than the exercise price of the warrant).

For put: 0.50 - 0.20 = TL 0.30



Vega

Vega shows the extent to which the warrant price will change in the event that the volatility of the underlying asset changes. In other words, Vega shows the sensitivity of the warrant towards the changes in volatility.

If the volatility increases from 30.50% to 31.50%, with a Vega value of 0.02, the warrant price increases by TL 0.04 to TL 0.52.

Volatility

Expected Volatility

Expected volatility is the market's expectation for the price fluctuation interval for a certain period of time in the future for the price of the underlying asset. Such interval mostly covers the time until the maturity of the warrant.

Historical Volatility

Historical volatility is the price fluctuation interval for the underlying asset in a certain period of time in the past.

Implied Volatility

Implied volatility is one of the most significant factors in determining the current warrant price.

Implied volatility is the market expectations for the future volatility of the security. Any changes in implied volatility directly influence the warrant price.

Example:
Let us assume that the ISE Index is at 60,000 points and a volatility of 1.5% (900 points) is expected.

The implied volatility of the warrant for a certain period of time is calculated as follows:

Daily volatility (in terms of points) x √ trading day = 900 x √ 256 = 14,400 points

Under such assumptions, the total future volatility is calculated as 14,400 points annually (24% on the basis of 60,000, which was taken as basis) (the number of trading days is 256).

Out-of-the-money

Out-of-the-money is used for cases where the warrant has no intrinsic value. For call warrants, out-of-the-money expresses cases where the price of the underlying asset is less than the exercise price, and for put warrants, it means that the price of the underlying asset is greater than the exercise price.

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