An introduction to Warrants

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Daniele Caporaletti – Bloomberg
caporaletti@bloomberg.net
+44 207 330 7132
An introduction to warrants – part I

Options

Warrants

Covered warrants

Certificates
Definition of option

- A derivative security that gives the holder the right to purchase (call option) or sell (put option) a certain underlying at a fixed price on a certain date (European option) or before a certain date (American Option);
- Vanilla - Exotics
- Listed - OTC
- When an investor exercises his right, he receives underlying that is already on secondary market;
- Usually short term;
- Used by professional investors
Options terminology

- Underlying Asset;
- Option type (Call/Put);
- Option Style (American – European);
- Strike price (Moneyness);
- Number of Underlying Shares
- Expiry;
- Delivery or cash settlement;
**Listed vs. OTC**

<table>
<thead>
<tr>
<th>LISTED</th>
<th>OTC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardized strikes and maturities</td>
<td>Fully customized</td>
</tr>
<tr>
<td>No counterpart risk</td>
<td>Presence of counterpart risk</td>
</tr>
<tr>
<td>Limited set of strikes / maturities</td>
<td>Virtually no limits of mat/strikes</td>
</tr>
<tr>
<td>Liquid ?</td>
<td>Less liquid ?</td>
</tr>
<tr>
<td>Large deals ?</td>
<td>Large deals ?</td>
</tr>
</tbody>
</table>
Options payoff profile: long call option

- Long Call Option on XU030 Index, strike 45.000
Options payoff profile: short call option

- Short Call Option on XU030 Index, strike 45.000
Options payoff profile: long put option

- Long Put Option on XU030 Index, strike 40.000
Options payoff profile: short put option

- Short Put Option on XU030 Index, strike 45.000
**Option price: intrinsic and time value**

- Intrinsic value = difference between current price of underlying and strike price (value as if option is exercised now)
- Time value = value of likelihood of option to terminate in the money
Options: leverage

Example: Call on GARAN TI Equity, strike 5.00, expiry 1Y

Underlying price: 3.90
Option price: 0.74

Underlying price: 3.90 → 4.29 (+10%)
Option price: 0.74 → 0.96 (+30%)

Underlying price: 3.90 → 3.51 (-10%)
Option price: 0.74 → 0.55 (-25%)

Investing 1M TRY in shares: 256,410 shares
equivalent of investing TRY 358'003 in options

Gearing: underlying price / warrant price
Effective gearing: gearing * delta
Why using options

- Investment
- Hedging
- Arbitrage
Definition of warrant

- A derivative security that gives the holder the right to purchase a specific number of shares at a fixed price on or before a certain date;
- Warrants are issued directly by the company;
- When an investor exercises his right, he receives newly issued stocks;
- Warrants are often included in a new debt issue as a component of a hybrid security. Sometimes is detachable and has a separate market;
- Usually listed
- Long dated
Warrant terminology

- Underlying Asset;
- Conversion Ratio;
- Exercise price;
- Expiry;
- Exercise period;
Why companies issues warrants

- Deferred equity capital issue, provides financing;
- Can increase attractiveness of new capital issues;
- Offered with debt issues, can lower the cost of debt;
- Offered as employees stock options;
- Cheap, low servicing costs;
- No voting rights;
- Potentially attractive for foreign shareholders.
Why companies issues warrants: Japanese warrants

- In late 1980/early 1990s Japanese corporations used debt with equity warrants issues to raise low cost funding;
- Significant cost saving compared to conventional debt;
- Strong demand from domestic and international investors;
- Demand driven by strong performance of equity market limited range of equity instruments available and high transaction cost of equity trading;
- Significant undervaluation of the warrants using theoretical option pricing models, potential profit generated by trading activity;
Why investing in warrants

- Investment
  - Leverage – gearing
  - Aid to diversification

- Arbitrage
Disadvantages of warrants

- Complexity
- Risk – leverage – time decay
- Low Accessibility
- Low Liquidity
- Growth product: no income
- No shareholder rights
- Limited range: number of warrants is far smaller than number of shares
- Dilution effect
Definition of Covered Warrants

- A derivative security that gives the holder the right to purchase (call option) or sell (put option) a certain underlying at a fixed price on a certain date (European option) or before a certain date (American Option);
- Issued by financial intermediaries;
- When an investor exercises his right, he receives underlying that is already on secondary market;
- Short term or long term;
- Used in retail market;
- May be issued on a different currency;
- May be issued on virtually all underlyings;
- Vanillas or exotics
Covered warrants

- Calls and puts
- American style or European Styles
- Vanilla or exotics
- On stocks or indexes
- On currencies and commodities
- On baskets
- Designed for private investors
- Priced according to fair value models
- Usually listed, market maker is the issuer
Covered warrants types

- Vanilla calls and puts
- Barrier (Capped Warrants)
- Corridor warrants
Advantages of covered warrants

- Accessibility;
- Transparency;
- Liquidity;
- Low transaction costs;
- Suits bullish and bearish investors;
- Presence of different issuers;
- Available on a range of strikes and maturities;
- Can be used for hedging;
Disadvantages of covered warrants

- Complexity;
- Risk – leverage – time decay;
- Issuer is the sole market maker;
- Short term investment;
- Growth product: no income;
- No shareholder rights;
- Limited range;
Covered warrant: example

<table>
<thead>
<tr>
<th>Security</th>
<th>Price</th>
<th>Strike</th>
<th>Underlying</th>
<th>Expiration Date</th>
<th>1st Exercise Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covered Warrant</td>
<td>EUR</td>
<td>0.034</td>
<td>EUR</td>
<td>12/18/09</td>
<td>07/29/08</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conversion</th>
<th>Underlying</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strike</td>
<td>EUR</td>
</tr>
<tr>
<td>Underlying/WRNT</td>
<td>.1</td>
</tr>
<tr>
<td>Min Exercise</td>
<td>100</td>
</tr>
<tr>
<td>Board Lot</td>
<td>100</td>
</tr>
<tr>
<td>Settle</td>
<td>EUR</td>
</tr>
<tr>
<td>Timeline</td>
<td></td>
</tr>
<tr>
<td>Days to Exp</td>
<td>207</td>
</tr>
<tr>
<td>Issue Date</td>
<td>07/29/08</td>
</tr>
<tr>
<td>Issue Price</td>
<td>EUR</td>
</tr>
<tr>
<td>Issue Amount</td>
<td>30,000 K</td>
</tr>
<tr>
<td>Outstanding</td>
<td>07/29</td>
</tr>
<tr>
<td>Out 1 Day Chg</td>
<td>0 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liquidity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Warrants Available</td>
<td>251</td>
</tr>
<tr>
<td>Total Warrants Out</td>
<td>1,562.03 M</td>
</tr>
<tr>
<td>WRNTs Out 1 Day Chg</td>
<td>+.00 M</td>
</tr>
<tr>
<td>Total Turnover</td>
<td>2.87 M</td>
</tr>
<tr>
<td>Total Volume</td>
<td>34.63 M</td>
</tr>
<tr>
<td>Volume 5 Day Avg</td>
<td>53.12 M</td>
</tr>
</tbody>
</table>
**Covered warrant: example**

<table>
<thead>
<tr>
<th>Underlying</th>
<th>Option Valuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIM Equity</td>
<td>89) Matrix Pricing</td>
</tr>
<tr>
<td>Price</td>
<td>90) Refresh</td>
</tr>
<tr>
<td>7.66</td>
<td></td>
</tr>
<tr>
<td>7.655</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Net Option Values</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Price (Total)</td>
<td>0.035491</td>
</tr>
<tr>
<td>Currency</td>
<td>EUR</td>
</tr>
<tr>
<td>Vega</td>
<td>0.001714</td>
</tr>
<tr>
<td>Price (W/Int)</td>
<td>0.035491</td>
</tr>
<tr>
<td>Delta (%)</td>
<td>2.233418</td>
</tr>
<tr>
<td>Theta</td>
<td>0.000250</td>
</tr>
<tr>
<td>Price (%)</td>
<td>463.93054</td>
</tr>
<tr>
<td>Gamma (%)</td>
<td>0.066703</td>
</tr>
<tr>
<td>Rho</td>
<td>0.000761</td>
</tr>
<tr>
<td>Break-Even (%)</td>
<td>57.22</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Single Leg</th>
<th>Leg 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Style</td>
<td>Warrant</td>
</tr>
<tr>
<td>Warrant type</td>
<td>Regular</td>
</tr>
<tr>
<td>Exercise</td>
<td>American</td>
</tr>
<tr>
<td>Cal/Put</td>
<td>Call</td>
</tr>
<tr>
<td>Direction</td>
<td>Buy</td>
</tr>
<tr>
<td>Strike</td>
<td>12.00</td>
</tr>
<tr>
<td>Strike &amp; Money</td>
<td>56.76% OTHI</td>
</tr>
<tr>
<td>First exercise</td>
<td>07/28/08</td>
</tr>
<tr>
<td>Dilutive?</td>
<td>Non-dilutive</td>
</tr>
<tr>
<td>Warrants out (K)</td>
<td>30000.00</td>
</tr>
<tr>
<td>Shares/Warrant</td>
<td>0.1000</td>
</tr>
<tr>
<td>Position</td>
<td>1.00</td>
</tr>
<tr>
<td>Expiry</td>
<td>12/18/09</td>
</tr>
<tr>
<td>Time to expiry</td>
<td>207</td>
</tr>
</tbody>
</table>

| Delivery delay     | 0                             |
| Price type         | Absolute                      |
| Model              | BS - continuous               |
| Volatility         | Market                        |
| EUR Race           | 1.465%                        |
| Dividend yield     | 0.000%                        |
| Forward implied    | 7.7188                        |
Definition of certificates

- Investment products consisting of securitized derivatives
- Similar conceptually to Covered Warrants
- Offering a large variety of risk / return profiles
- Can be capital protected
- Listed or OTC
- Designed for retail investors
- Diffused in private banking
Certificates types

- Reverse Convertibles
- Discount Certificates
- Bonus Certificates
- Twin Win certificates
- Outperformance Certificates
- Express Certificates (Autocallable notes)
- Capital protected certificates on single underlying and baskets
Example of certificates: twin win certificate

- Allows investor to benefit both from increase and of (limited) decrease in price of the underlying

- Consist in a position in a long call, plus long down and out put on double the notional
Example of certificates: twin win certificate
Return profile of a twin win certificate
An introduction to warrants – part II

Analysis of warrants: pricing

Analysis of warrants: Greeks

Warrant markets

Bloomberg solutions for warrants
Pricing warrants: Black Sholes model

\[ dS_t = \mu S_t \, dt + \sigma S_t \, dW_t \]

\[ C(S, t) = SN(d_1) - Ke^{-r(T-t)}N(d_2) \]

\[ P(S, t) = Ke^{-r(T-t)}N(-d_2) - SN(-d_1). \]

\[ d_1 = \frac{\ln(S/K) + (r + \sigma^2/2)(T-t)}{\sigma \sqrt{T-t}} \]

\[ d_2 = d_1 - \sigma \sqrt{T-t}. \]
Pricing warrants: assumptions

- Hedging is continuous
- No transaction costs
- No costs for going short
- Volatility is constant
Pricing warrants: key inputs

- Underlying price
- Time to expiry
- Underlying forward – dividends – free risk rate
- Volatility
Pricing warrants: volatility

- Implied volatility
- Volatility term structure
- Volatility Skew
- Volatility surfaces
- Historical volatility
Pricing warrants: implied volatility

- Volatility surface of DAX Index
Pricing warrants: historical volatility

- Historical volatility of ISE 30 Index in the last 10 years
Pricing warrants: dividends

- Implied dividends
- Forecasted dividends
Pricing warrants: dividend forecasts

- Dividend forecast for IBM US Equity
Pricing warrants: free risk rates

- Construction of Turkish Lira Curve
Pricing warrants: Greeks

- Delta: increase in the price of the warrant given a 1% increase in the price of underlying
  - unit delta
  - delta in shares (hedging delta)
  - delta in money terms (money delta)

- Gamma: increase in delta given a 1% increase in the price of underlying
  - long gamma positions
  - short gamma positions

- Vega: increase in the price of the warrant given a 100 bp increase in volatility
Pricing warrants: Greeks

- **Theta**: decrease in the price of the warrant given by reduction of 1 day in time to expiry (time decay)

- **Rho**: increase (decrease) in the price of the warrant given a 100bp increase in free risk rate
Pricing warrants: Dilution effect

- Stock price is replaced by \( S + (M/N)W \)
- Volatility \( \sigma \) is volatility of the equity of the company (shares + warrants)
  \[
  \sigma_c = \sigma \times \frac{(1 + M/N \times \frac{dW}{sS})}{(1 + N/M \times \frac{W}{S})}
  \]
- BS formula is multiplied by \( N \frac{\lambda}{(N + M \lambda)} \)

where:

- \( N \) = number of outstanding shares
- \( M \) = number of outstanding warrants
- \( \lambda \) = number of shares purchase by each warrant
- \( \sigma_c \) = company volatility
- \( W \) = warrant price
- \( S \) = share price
Starting from the end of 2004, private banks, in Switzerland and continental Europe, started to increase the percentage of clients deposits invested in structured products.

Looking at Switzerland, the percentage of clients deposits invested in structured products increased from 3.75% in March 05 to 6.75% in August 08. Total amount invested in structured notes is over 400 billion USD.

Structured notes are considered by many private banking players and investors as substitute to investments in equity or funds.

In unstable market conditions, structured products are guaranteeing an attractive source of return for issuing banks and distributors.
Warrants markets: Europe

- Investment and global asset management institutions are prospectively moving towards the same business model, involving a higher usage of securitized derivatives. Swiss model is becoming a benchmark for private banking worldwide;

- Increased competition is creating pricing pressure and reducing marginal revenues;

- Market crisis is affecting volumes of new issues. Last figures of end of March show a decrease of around 30% in number of products listed on Swiss Exchange.
Warrants markets: Europe

- Private banking Structured Notes are usually designed to be simple and easy to understand. Majority of them are in form of certificates, i.e. securitized derivatives usually linked to equity underlyings;

- Majority of equity linked structured products have a maturity shorter than 2 years and average commissions in the range 0.5% to 1.5% of issued notional. They guarantee fast turnover and comparatively high fees;

- Switzerland and Germany are the biggest markets for certificates worldwide. Certificates are OTC or listed (in Swiss market otc accounts for around 75% of the market, exchange traded for around 25%).
Deutsche Bourse is active with two local divisions in Frankfurt and Zurich (Scoach Market – biggest European marketplace for Certificates);

Boerse Stuttgart is European biggest market for Warrants (Euwax);

Turnover on exchange listed certificates in Swiss exchanges was over 75 billion CHF in 2007, with more than 2.5M trades on the 25,000 certificates quoted. Average volume of each trade is around 30 thousand CHF;

In the Swiss market a product classification is done and maintained by Swiss Structured Products Association. List of products is updated monthly and accepted as sort of “official” classification by majority of banks in Switzerland, Germany and other European countries.
Warrants markets: Swiss Derivatives Map
Warrants markets: Asian markets

- Largest markets is Hong Kong where they contributes for around 15% of exchange volumes;
- Offering is limited to particular products (Reverse convertibles, CBBCs);
- Majority of warrants are on HSI Index (more than 70%)
- Subject to trends;
- Diffused between retail investors and private banking clients.
Warrants markets: US market

- Warrants fairly diffused;
- No listed market for covered warrants;
- Diffused only for private banking clients, particularly used by financial institutions and private banks serving South American clients;
- Offer is concentrated on particular products, like reverse convertibles;
- Large diffusion of listed options on a large number of equities.
Bloomberg solutions for warrants: warrant search

WSRC<GO> : The new Bloomberg warrant search allows you to generate a list of warrants based on selected criteria, visualize results on a dedicated panel, export to Excel or to a Bloomberg Launchpad monitor.
Bloomberg solutions for warrants: warrant monitor

WMON<GO>: WMON to display real-time information for covered warrants on an underlying equity with the ability to customize multiple templates according to the warrant information you need.
Bloomberg solutions for warrants: pricing

OMON<GO>: price and analyse risk of listed or OTC warrants with state of the art pricing models:
- market implied volatility;
- includes effect of dilution;
- Scenario graphs and tables

![Bloomberg Warrants Pricing Interface](image)
Bloomberg solutions for warrants: derivatives portfolios

OSA<GO>: option portfolio monitor and risk analysis tool
- portfolios of equity shares, futures, listed and OTC options, warrants
- real time portfolio performance and risks;
- analysis of hedging;
- scenario analysis graphs and tables
Literature

- S. Das – Structured Products, Vol 2 – Wiley Finance
- J. Hull - Options, Futures and other derivatives – Prentice Hall
- S. Natenberg – Options Volatility and pricing

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