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The Warrants Market: Size, Trends & Market Impact

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Overview

- Global Warrant Activity
- Trends
- Participants
- Interesting Characteristics
- Market Impact
- Case Study – Samsung Elec.

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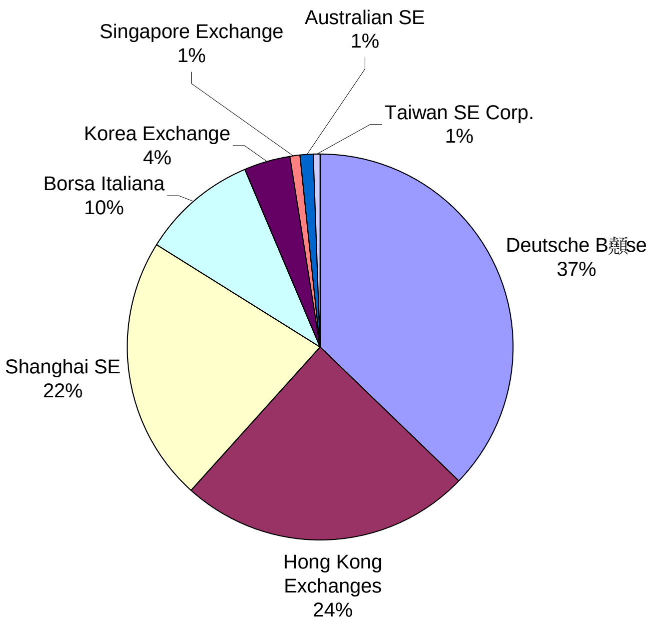
Global Warrant Activity

- **Significant equity market activity, but concentrated in selected markets**
  - Covered warrant turnover $520.6 bil YTD July; 80% yoy growth in ‘05-’04
  - Warrant activity in Korea and Shanghai showing highest growth YTD.



Trading Value of Covered Warrants (USD bils)				
	2004	2005	2006 YTD	% of ‘06
Exchange				
Deutsche B鐽se	107.6	170.5	172.6	33.2%
Hong Kong Exchanges	67.3	110.2	112.8	21.7%
Shanghai SE	-	21.5	103.2	19.8%
Borsa Italiana	20.9	62.2	44.6	8.6%
Euronext	5.7	16.4	27.2	5.2%
Swiss Exchange	20.2	25.9	22.0	4.2%
Korea Exchange	0.0	0.0	17.6	3.4%
Singapore Exchange	0.9	6.5	4.5	0.9%
Australian SE	2.8	5.0	4.2	0.8%
Taiwan SE Corp.	6.3	4.4	3.1	0.6%
Rest of the World	6.3	7.4	8.8	1.7%
Total Global	238.2	430.0	520.6	

Source: WFE

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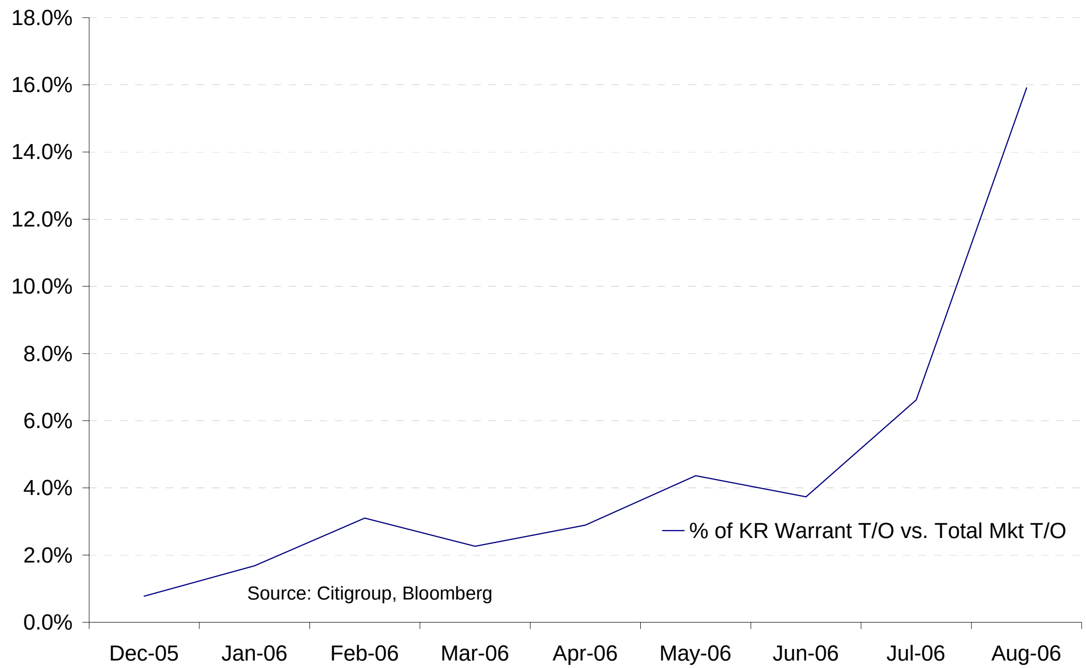
Korea Warrant Market - Trends

- **Korea Warrant market has grown at fastest pace in Asia YTD**
  - Warrant T/O % of Market T/O from < 1% to 16% since Dec-05

Korea Warrant Turnover as % of Market*



**Statistics do not include associated stock hedging*

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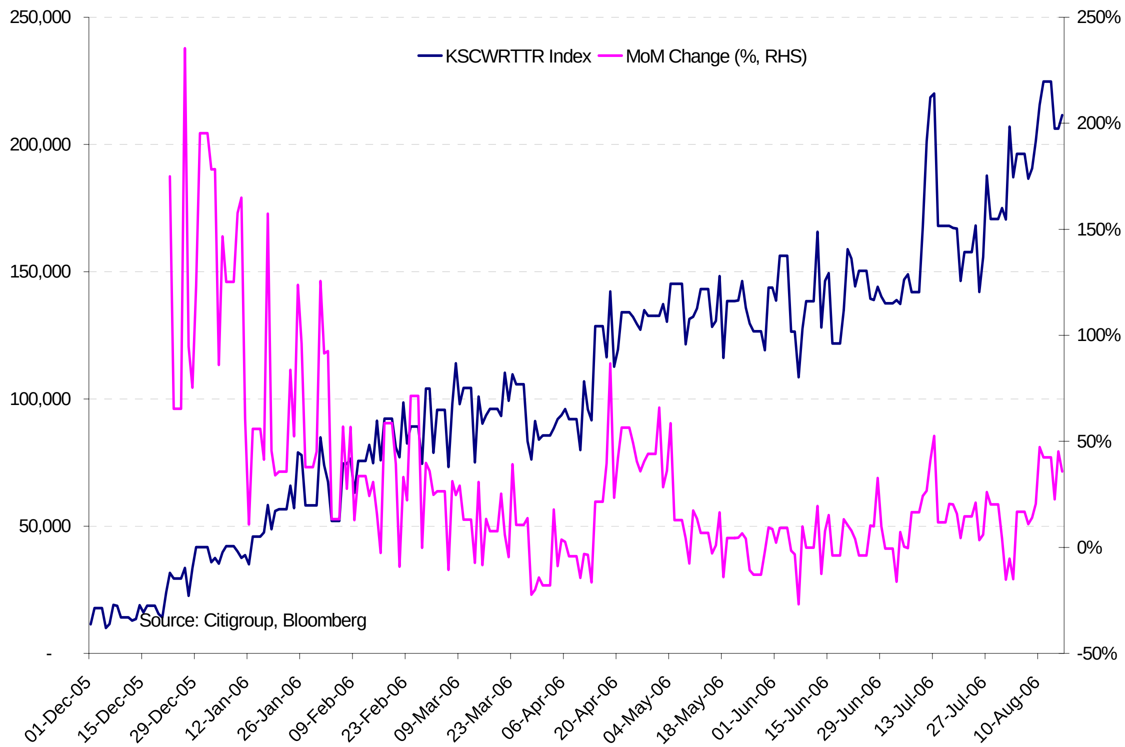
Korea Warrant Market - Trends

- **Korea Warrant market has grown at fastest pace in Asia YTD**
  - Daily T/O has increased from <USD 50mil in Dec 05 to > USD 200 mil

Korea Warrant Daily Turnover*



*Statistics do not include associated stock hedging

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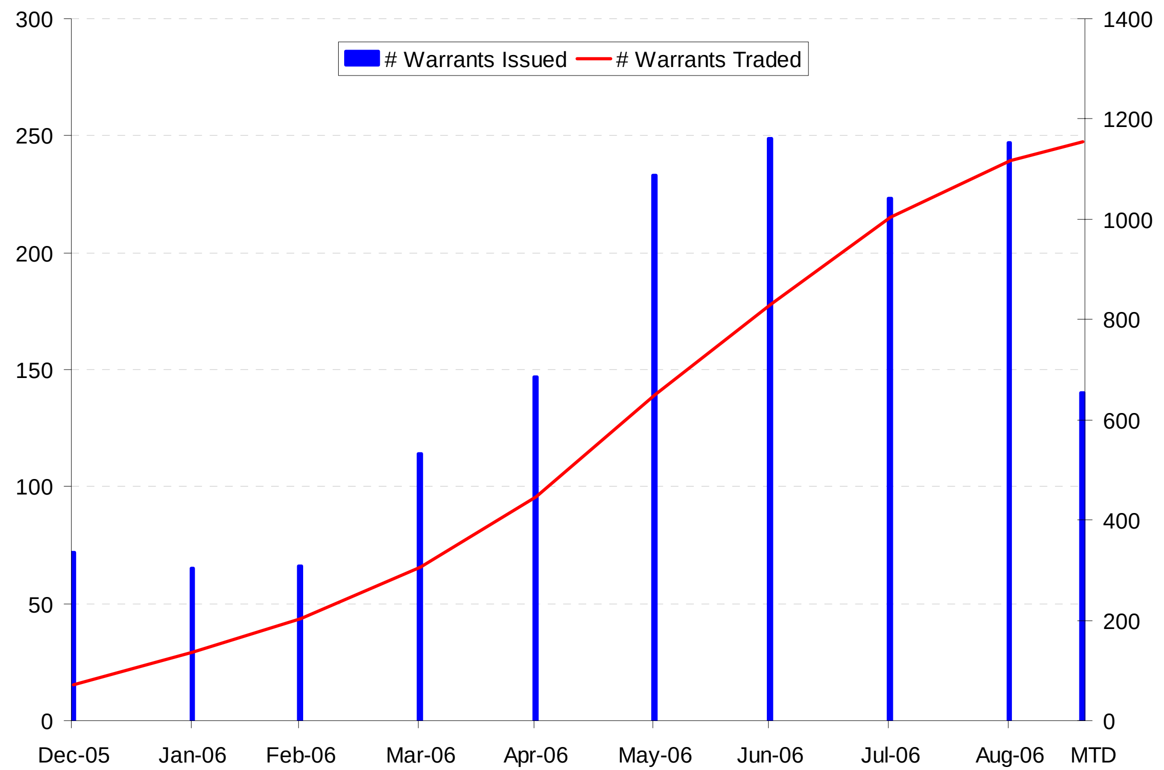
Korea Warrant Market - Trends

- **Korea Warrant market has grown at fastest pace in Asia YTD**
  - Monthly issuance has increased from 72 in Dec 05 to 247 in Aug 06

Korea Warrant Monthly Issuance



Source: Citigroup, BASE21 & CHECK Terminal

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Warrant Market Participants

- **Korea Warrant market mostly dominated by local issuers**
  - Retail investors and day traders dominate trading activity
  - International banks only participate as Liquidity providers
  - Both as an Issuer and LP, Korea Investment & Securities is the dominant player

Korea Warrant Issuer Information

Issuer	Number of Warrants	Percentage Issued
GMS	335	26.2%
Daeshin	46	3.6%
Daewoo Securities	268	21.0%
Samsung Securities	26	2.0%
Shinyoung	19	1.5%
Woori Securities	163	12.7%
Hana Securities	83	6.5%
Korea Securities	350	27.4%
Hyundai Securities	119	9.3%
Mirae Securities	7	0.6%

Korea Warrant Liquidity Provider Information

LP	Number of Warrants	Percentage
Credit Suisse	149	13.32%
Daewoo	218	19.48%
GMS	231	20.64%
Hyundai Securities	37	3.31%
Korea Securities	272	24.31%
Merrill Lynch	50	4.47%
Morgan Stanley	3	0.27%
Samsung Securities	24	2.14%
UBS	14	1.25%
Woori Securities	121	10.81%

Source: Citigroup, BASE21 & CHECK Terminal

Note: This information is only for the warrants which have not expired as of Aug 31

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Korea Warrant Market vs. Other Markets

➢ Korea Warrant market has relatively higher warrant turnover

- Except HK, Korea has higher turnover compared to other markets. Suggests need for more issuers/issuance.
- HK's high turnover likely due to day trading. According to SFC study[1], turnover ratio in HSI warrants in Oct 2005 was about 329%; possibly because of short-term views on the market, while the average was 78%.

Korea Warrant Market vs. Other Markets

	# of listed Warrants (as of Aug 06)	YTD Warrant T/O (USD Mil) (as of Aug 06)	YTD Share Trading (USD Mil) As of Aug 06	Warrant T/O % Share T/O	T/O Ratio
Korea	1,119	22,558	237,448	9.5%	11.5%
Hong Kong	1,505	132,126	501,561	26.3%	49.9%
Singapore	489	5,161	116,413	4.4%	6.0%
Australia	3,202	4,738	545,922	0.9%	0.8%
Taiwan	504	3,626	497,478	0.7%	4.1%
Deutsche Borse	111,710	193,731	1,822,720	10.6%	1.0%
Borsa Italiana	4,606	50,457	1,013,883	5.0%	6.2%
Swiss Exchange	2,445	24,663	980,139	2.5%	5.7%

Source: WFE, Bloomberg

Note: Singapore Exchange includes main Board, Sesdaq & CLOB International; Swiss Exchange includes shares traded on Virt-x; Korea excludes KOSDAQ

Note: T/O ratio is defined as Avg. Daily Warrant T/O (USD Mil) as % of # of listed warrants

1. Report on Derivative Warrant Markets, Nov 2005

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Korea Warrant Market Characteristics

- **KOSPI 200 index warrant accounts approx 25% of all listed warrants and over 60% of total warrants T/O**
  - Trading in index warrants does not require investors to understand the fundamental and firm-specific factors
- **Other popular warrant underlying names include Hyundai Motor (005380 KS), Samsung Elec. (005930 KS) & Hynix (000660 KS)**
- **90% of warrants have maturity between 4-6 months**
- **# of call warrants approximately 4x # of put warrants**
  - However, call & put warrants on KOSPI2 are balanced
- **Warrants currently trading at average 49% premium to 90 day realized volatility of the underlyings**

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Market Impact of Warrants

- **Hedging by issuers of warrants tends to add directional pressure on market; thereby increasing volatility**
- **However, hedging of equity linked securities (ELS) offsets the above**
- **Impact of unwinding activities at expiry is driven by settlement price calculation method, investors' sell-back activities and money-ness of the warrants**

	Issuer has sold Call Warrants	**Issuer has sold Put Warrants**
Initial Hedge	Buy delta-adjusted amount of underlying stock.	Short delta adjusted amount of stock
If underlying moves up 1%	**Buy Underlying Stock**: Calls become more in-the-money and hedge ratio rises requiring hedger to buy more underlying stock to rehedge.	**Buy Underlying Stock**: Puts become more out-of-the-money and hedge ratio falls requiring hedger to buy back some of the exiting stock to rehedge.
If underlying moves down 1%	**Sell Underlying Stock**: Calls become more out-the-money and hedge ratio falls requiring hedger to sell some of the existing stock to rehedge.	**Sell Underlying Stock**: Puts become more in-the-money and hedge ratio rises requiring hedger to sell more underlying stock to rehedge.
Impact of Gamma	Delta hedging short warrant positions results in hedger buying when the market is up and selling when the market is down and so increasing the realized/observed volatility of the underlying stock.	

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Market Impact of Warrants: Korea

- According to our estimate, approximately USD 2.8 bil. notional of Korean warrants are outstanding in the market; equal to gamma of USD 54 mil.
- On other hand, we estimate total notional of ELS issued yearly is USD 12-15 bil. amounting to vega-adjusted notional of USD 75 mil.
- Theoretical market impact from warrant hedging can be large for certain stocks, however actual hedging unlikely to lead to any significant T/O

Theoretical Warrant Hedge Requirement per 1% Stock Move as % of Average Daily Turnover

Underlying	Name	Gamma in '000 Shares for 1% change share price	Delta Adj. Notional (000 KRW)	Avg. Daily T/O in Mil Shares	% Daily T/O
000270 KS	Kia Motors	327	53,809,423	2.1	15.6%
009150 KS	Samsung Electro-Mechanics	163	5,564,423	0.68	24.0%
000660 KS	Hynix Semi	88	14,467,466	6.4	1.4%
010140 KS	Samsung Heavy Industries	115	3,410,625	2.3	5.0%
000700 KS	Hanjin Shipping	77	3,644,829	0.84	9.2%
034220 KS	LG Phillips	67	14,467,466	1.0	6.7%
015760 KS	KEPCO	53	7,141,877	1.2	4.5%
042100 KS	Hyundai Autonet	25	2,225,318	3.1	0.8%
000240 KS	Hankook Tire Co	20	1,375,561	0.66	3.1%
005380 KS	Hyundai Motors	13	61,299,357	1.07	1.2%

Source: Citigroup

Market Impact of Warrants: Korea

- KOSPI 200 index warrant accounts for c. 62% of total warrant T/O and 70% of delta-adjusted notional
- Theoretical number of KOSPI2 futures held to maintain delta hedged position for all index warrants is less than 1% of open interest
- Index warrant activity not likely to lead to any significant turnover in the KOSPI2 futures

Source: Citigroup

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Case Study: Samsung Warrants

- **79 warrants issued on the name as of Sep 15 amounting to delta adjusted notional of USD 193 mil; total gamma of USD 1.7 mil**
- **Citigroup estimates the total notional of ELS issued yearly is USD 3.6 - 4.5 bil. amounting to vega-adjusted notional of USD 20 mil.**
- **Long term volatility negatively impacted by ELS issuance while while warrant activity is unlikely to pose systemic risk to market**

Warrat Ticker	Wrt Issue Amount ('000)	Wrt Gamma (USD)
556085 KS Equity	4,000	191,780
556105 KS Equity	5,000	175,409
556106 KS Equity	5,000	168,546
586106 KS Equity	3,600	96,644
586089 KS Equity	4,500	85,725
576273 KS Equity	1,800	62,432
516020 KS Equity	4,300	58,312
576332 KS Equity	1,800	48,504
576340 KS Equity	2,100	46,171
All Samsung Warrants	352,481	1,773,237

Source: Bloomberg, Date - 14 Sep 2006

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