

## Warrant Education (Part I)

### Warrants market

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## Warrants market

- **A brief history of warrants in Hong Kong**
- How investment banks make/loss money from warrants?
- Other markets and market development
- Different types of warrants
- The basic analytics (premium, gearing and implied volatility)
- Volatility trading

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## Warrant markets Development the beginning: 92- 7/95

- In the beginning of 90s, warrants were issued by listed companies as an alternative way to raise capital
- Company warrants give the right
  - to subscribe for newly issued equity securities.
  - to buy stock from their holdings in other companies
    - E.g. CITIC warrants on HK Telecom
- Starting from 92, a few foreign investment banks issued warrants on blue chips companies

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## Phase I (8/1995-8/1997)

- Investment banks honor (cover) the option contracts by paying the underlying stocks in the market for settlement.(cover warrants)
- The early players include Peregrine and Robert Fleming, SBC Warburg.
- A slump in the market after the Fall of 94.
- In 1996, other investment banks jumped into warrant business on the back of the bullish local market. Basket warrants debuted in the second half that year.
- In August 1997, we have a total 89 issues in that month including 38 baskets.
- Red chips stocks and baskets are favorite underlyings

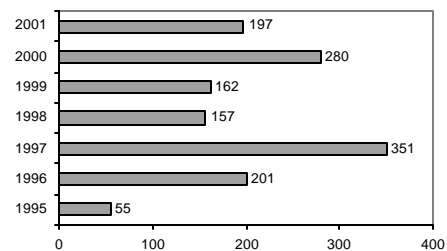
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## Phase II (9/1997-)

- After HSI reaches its high point in the summer of 1997, warrant market took a downturn as warrants are primary bullish instruments.
- New breed of warrants, in particular, put warrants were in vogue to allow retail investors to “bet” on the downside.
- Hang Seng Index is a popular underlying
- The underlying extends to indices and currencies outside HK. We can easily implement our bearish view on foreign markets through, for example, DJI put warrants.

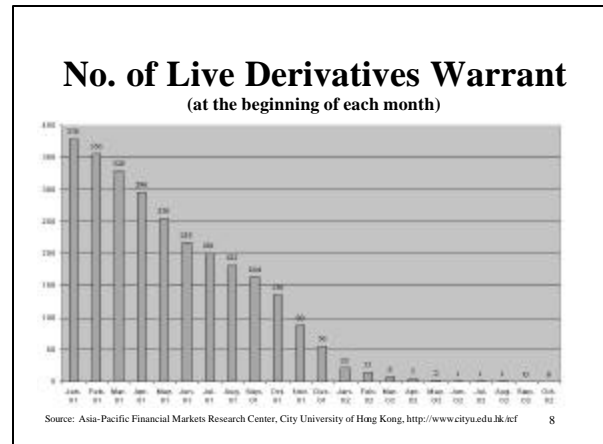
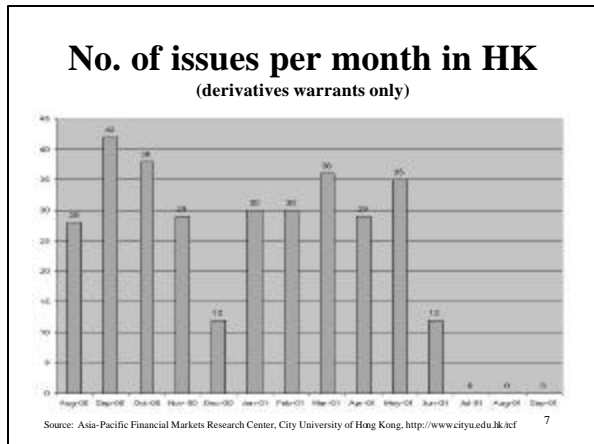
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## No. of issues per year in HK (both equity and derivatives warrants)



Source: Asia-Pacific Financial Markets Research Center, City University of Hong Kong, <http://www.cityu.edu.hk/afm>

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- No new covered warrant issued since 13-Jun-01
- All covered warrants will expire after 28-Aug-02,

- ### A snapshot on Sept 21, 01
- 147 live single underlying warrants from 13 issuers
  - SG has 24 issues, ML has 13 issues, MACQ has 23 issues and CSFB has 26 issues
  - 32 of them are put warrants, 115 are calls
  - 7 are based on indices like DJI, HSI, SP500, NDX
  - More European (exercise only at maturity) than American (exercise anytime on or before maturity)

- ### This year 2001
- 177 Derivatives Warrants, 148 Call, 29 Put
  - 13 issuers
  - No of issues for each underlying:
  - 0001-13, 0005-22, 0008-8, 0011-2, 0012-5, 0013-11, 0016-5, 0017-3, 0019-2, 0023-2, 0066-7, 0083-1, 0267-6, 0291-8, 0293-1, 0363-1, 0494-1, 0762-2, 0883-3, 0941-1, 0992-2

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### How to issue an warrant?

- Demand from investors
- Bull/Bear, underlying, special feature (basket)
- Pricing (at what volatility?)
- Initial hedging (at what volatility) so that they are market neutral (more or less)
- Maintain the neutral position through dynamic hedging

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### How much can they make?

- For a long period of time, the minimum total premium of an issue is 50 million HKD. After all the cost(?) of running the warrant, assume they can take an average of 10% of the total, that is, 5 million HKD.
- Lets take Peregrine, for example, the total premium from warrant is 1,579 million in 1997. So assume 10% margin, it made 157 million that year from warrants alone.

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### How do they make money?

- Common myth:
  - I buy call warrants and I will make money if the stock goes up.
  - Investment banks will loss money as a result, so they must have insider information that the stock price will not rise.
  - How can I bet against those big investment banks?

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### How do they make money?

- The truth is both investment banks and retail investors can make (loss) money at the same time.
- Anyone who bought warrants in 96 and first half of 97 must have the experience of making some handsome return. At the same time, investment banks were having the best of their time and fat bonus was paid. So there is a win-win experience.

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### Classic lose-lose example

- On Aug 27, 1997, Beijing Enterprise (392) was around the historical high of \$65 and the date was the end of the 90 days post-IPO lock-out period for warrant issuance. There were 16 issues all together on stock 392.
- On Oct 15, 1997, 392 tumbled down to 27.75. Most of BE warrants prices dropped more than 80%! The investment banks also suffered as the loss could not be covered by the premium they received originally and they were not sensitive enough in response to the drops when doing hedging.

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### Why investment banks loss money?

- According to Black-Scholes theory, if option writers (warrant issuers) don't want to expose (win/loss money) to the underlying stock movement, they can "delta hedge" the option. That translates to buying a certain portion of the total number of stock obligations.
- That ratio is called delta (between 0 and 1)
- For the case of BE, we calculated that the delta was 0.6 .

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### An example calculations

- Issue 34.75 million warrants and it has 10:1 conversion ratio, hence no. of stocks it represented 3.475 million.
- Delta hedge by buying  $0.6 \times 3.475 = 2.085$  million of stocks.
- Premium received =  $34.75 \times 1.9 = 66.03$
- Stock price depreciation: =  $2.085 \times (63 - 27.75) = 122.49$
- Net loss =  $122.49 - 66.03 = 56.46$

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### Why did they lose?

- The main income source of warrant issuers is the “volatility margin”.
- In order to calculate a fair warrant(option) price, Black-Scholes requires an input of the stock volatility
- Volatility = Standard Deviation in statistics, it is a measure of wide is the dispersion of the stock prices
- A typical blue chips has a vol of 30-50% with red chips being much higher.

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### More volatile than they expected

- In the 392 warrant cases, the volatility input was around 60-70%. It turned out that up to Oct 15, the “realized” volatility is higher than 80%. They lost 20 vol points on a mark to market basis.
- In short, investment banks will usually sell “expensive” volatility and expect the market to move within its estimation. Investors on the other hand just care about the upward direction of the stock.

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### Where to buy cheap vol?

- While investor sell expensive vol to general public, they look for ways to buy cheap vol so that they can buy low and sell high (on volatility) to make a profit.
- Sources on cheap vol:
  - the underlying is really not that volatile (dynamic hedging).
  - OTC professional market, some players don't have the access to short vol to the retail markets.
  - Ask the corporation (CK, Hopewell) to sell option to you in form of ELN.

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### Dynamic hedging

- With more professionals and corporations are knowing the vol has a price from the warrant market, investment banks are going back to the first principle: dynamic hedging.
- The name dynamic comes from the fact that the delta, hedge ratio will change with the stock price.
- In case of call option, the hedge ratio will increase with stock prices. Hence as a warrant issuer, it has to buy more stock when the price is up. Or buy high, sell low.

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### Problems in Dynamic Hedging

- As you buy high sell low, you will losing money on the price difference. That is precisely what the premium is supposed to cover you for.
- However the real market also has friction like transaction cost, bid-offer spread (liquidity), market experience tells that 1-2 Vol point should cover this “noise”.
- Research are still being conducted to find a better hedging method in light of all these market imperfection.

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### Warrants in other parts of the world

- Besides HK, Taiwan has been developing a warrant market in SE Asia.
- Australia is another big warrant markets, with number of issues from 319(97) to 423(98). The total premium was 5.9 billion USD in 98 (compared with HK having 13.2)
- The biggest warrant market is in Europe with Germany and Switzerland totaled more than 120 billion in premium in 98.

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### Summary of Warrants in Different Stock Exchanges

The warrants are issued by a total of 50 issuers and are traded on 15 markets.

In total 17 different indices are covered and 513 stocks are used as the underlying asset of these warrants.

WarrantLab Summary	Single Warrants	Stock Warrants	Index Warrants
AMSTERDAM STOCK EXCHANGE	1	--	--
BRUSSELS EXCHANGE T-3	30	4	--
EURONEXT AMSTERDAM	50	--	--
EURONEXT BRUSSELS	427	56	--
EURONEXT PARIS	53	--	--
FRANKFURT STOCK EXCHANGE	62	2	--
HONG KONG STOCK EXCHANGE	123	4	--
LISABON STOCK EXCHANGE	6	--	--
MADRID STOCK EXCHANGE	11	1	--
MILAN STOCK EXCHANGE	26	--	--
PARIS STOCK EXCHANGE T-3	1	--	--
STOCKHOLM STOCK EXCHANGE	21	--	--
SWISS STOCK EXCHANGE	2851	277	--

Source: KBC Financial Products, <http://www.warrantlab.com/warrantlab/warrantlab.cfm>

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### Taiwan Market Outlook

- 42 live covered warrants, Issue Size: 781.5mln
- 3 livebasket warrant

編號代碼	發行商	標的股	標的股本	類別	到期日	最新價	收盤價	最高價	最低價	成交量
9006.TW	元大	1685.TW	華新	美式/認購	1/30/2001	21.58	1.14		0	
9007.TW	廣華	2524.TW	仁寶	美式/認購	1/30/2001	45.12	1.2430		0 117.23%	
9008.TW	富邦	1685.TW	華新	美式/認購	1/19/2001	17.15	1.14		0	
9009.TW	富邦	3163.TW	聯電	美式/認購	1/10/2001	64.08	1.16		0	
9010.TW	遠流	1584.TW	華元	美式/認購	1/10/2001	26.08	1.00		0 155.05%	
9011.TW	廣華	2583.TW	聯華	美式/認購	1/10/2001	64.17	1.16		0 109.1%	
9012.TW	大華	2015.TW	中環	美式/認購	0/10/2002	20.55	1.04		82,400 86.93%	
9013.TW	大華	2189.TW	遠傳	美式/認購	0/10/2002	108.24	1.2350		10,400 184.21%	
9014.TW	倍利	2124.TW	仁寶	美式/認購	0/10/2002	44.02	1.25		124,400 84.16%	
9015.TW	中環	2824.TW	宏遠銀行	美式/認購	0/11/2002	29.38	1.11		0 55.69%	
9016.TW	元大	2360.TW	台積電	美式/認購	0/11/2002	75.38	1.40		3,406,400 47.27%	

Source: Merrill Lynch Taiwan Warrants, <http://www.taiwanwarrants.ml.com>

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### Factors affecting the warrant markets

- Listing regulations tend to be more complicated in Asia than Europe. Hence the higher cost of listing in Asia.
- Do not encourage market-making in the secondary market. In Germany, liquidity is guaranteed by continuous commitment to quoting bid/offer prices by the issuers.
- Investor education is still lacking in Asia.

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### Consultation paper of warrants issuance

- 31st May, 2001, issued by **Hong Kong Exchanges and Clearing**
- Arrangements for the eligibility, placing and trading of warrants. eg. abolition of 100 places or 50 places + min HK\$100,000 worth of warrants.
- Disclosure requirements for listing documents. eg. abolition of 15% limit on the amount of warrants that may be retained by an issuer.

Source: Proposed Hong Kong Warrant Reform, 6/17/2001, Derivatives Week, <http://www.derivativesweek.com>

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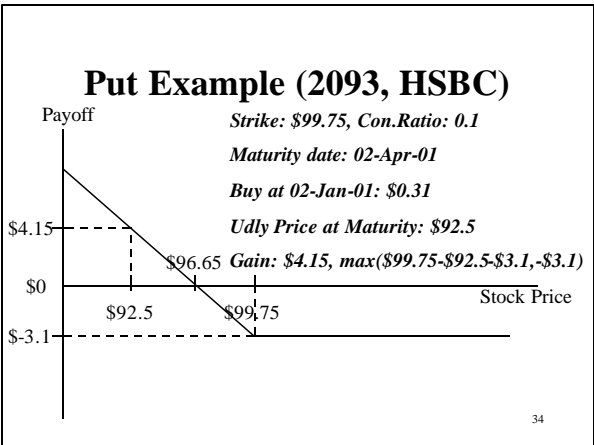
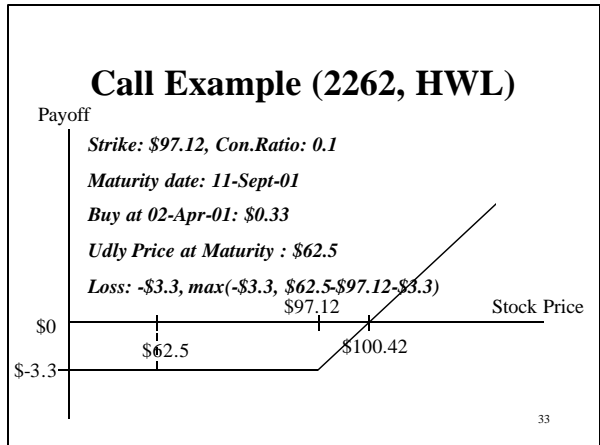
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### Basic feature of a warrant

- Underlying stock
- Maturity
- Call / Put
- Strike price
- Conversion ratio
- European / American

Examples of HWL and HSBC---->

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### Index call/put example

- NASDAQ, 2167, Put Quanto Warrant
- S & P, 2157, Put Quanto Warrant, Settlement: (Strike - Closing Index Level) x HKD 1
- DJI, 1717, Put Quanto Warrant, (HK:USD=1:1)
- note: A fixed exchange rate foreign warrant in which the face amount of the currency coverage expands or contracts to cover changes in the foreign currency value of a designated underlying security or package of securities. Quantos are used to adjust the investor's base currency protection on an underlying position which varies in value in the non-base currency.

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### Example

- Payoff of Put Warrant  
 = (Strike - Spot) x Conversion Ratio x FX
- 1717, Strike= 9800, Conversion Ratio = 0.00019
- If Spot is 9000,  
 Payoff = HKD[(9800- 9000) x 0.00019 x 1]  
 = HKD 0.152

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### Simple Analytics

- Premium
- Delta
- Gearing
- Moneyness
- Effective gearing
- Implied Volatility

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### Premium

- How much extra you pay today compared with buying the stock today
- **Call Premium =**  
$$\frac{[\text{Strike price} + (\text{Warrant Price} / \text{Conversion Ratio}) - \text{Spot Price}]}{\text{Spot Price}} \times 100\%$$
- **Put Premium =**  
$$\frac{[\text{Spot Price} - \text{Strike Price} + (\text{Warrant Price} / \text{Conversion Ratio})]}{\text{Spot Price}} \times 100\%$$

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### Example, 1722, 24-Oct

- 1722, HSBC Put Warrant
- Spot: \$86.5
- Strike: \$84.6
- Warrant Price: \$0.275
- Conversion Ratio: 0.1
- Premium  
$$= \frac{[\$86.5 + (\$0.275 / 0.1) - \$84.6]}{\$86.5} \times 100\%$$
  
$$= 5.376\%$$

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### Delta

- Delta is used in measuring a warrant's sensitivity with respect to changes in the price of the underlying asset.
- A warrant with a delta of 0.5 will increase 0.5 for every dollar increase in the underlying stock, vice versa.

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### Delta

- Call Delta can be interpreted as the probability that a warrant will finish in-the-money. So, a deep in-the-money warrant will usually have a delta close to + 1, while a far out-of-the-money warrant will have a delta close to zero.
- $\text{Delta} = \Delta \text{ Warrant Price} / \Delta \text{ Underlying Price}$

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### Example, 1722, 24-Oct

- 1722, HSBC Put Warrant
- Spot: \$86.5 (\$85.25, 23-Oct)
- Strike: \$84.6
- Warrant Price: \$0.275 (\$0.335, 23-Oct)
- Delta =  $\Delta$  Warrant Price /  $\Delta$  Underlying Price  
=  $(0.335 - 0.275) / (85.25 - 86.5)$   
= 4.8%

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### Gearing

- The gearing of a warrant represents the sensitivity of a warrant's price given its underlying stock.
- It also represents the number of warrants that can be purchased for one underlying share price. In other words, it means leverage
- Gearing  
= Spot Price / (Warrant Price / Conversion Ratio)

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### Example, 1765, 24-Oct

- 1765, HWL Call Warrant
- Spot: \$64.75
- Warrant Price: \$0.265
- Conversion Ratio: 0.1
- Gearing = spot price / (warrant price / conversion ratio)  
=  $\$64.75 / (\$0.265 / 0.1)$   
= 24.43x
- In the example above, a 24.43x gearing means that the warrant would cost 24.43 times less than the underlying share.

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### Effective Gearing

- It gives an idea of the extent that a warrant would outperform or underperform its underlying shares over a short period of time
- Effective gearing = Gearing x Delta  
= %  $\Delta$  Warrant Price / %  $\Delta$  Underlying Price
- If effective gearing is 10, then \$1.00 change in warrant means underlying will change \$10.00
- Effective Gearing is more useful than Gearing as the latter is just a ratio without telling how warrant price changes with underlying price, unlike Effective Gearing

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### Moneyness

- Moneyness = stock price / strike
- In the money (not interesting)
- Most interest around the money
- Out of the money → cheap

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### Implied volatility

- The volatility assumption that will give current warrant price using one of the standard models (BS or binomial)
- Main indicator of cheap or dear for a warrant
- Not always in sync with historical volatility

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(HELP) For explanation. DOTS Equity HVT

**HISTORICAL PRICE VOLATILITY**

HK Equity HSBC HOLDINGS PLC (HK REG) PRICE 69.50

Period: Daily

Date	Prices	N-DAY VOLATILITY of Historical Closing Prices		OPTIONS Implied Volatility	
		N	Trade	Calls	Puts
9/27/07	68.50	71.12	46.30	31.81	45.93
9/27/07	68.50	68.86	46.24	31.86	47.61
9/28/07	74.50	69.56	48.02	35.94	44.95
9/29/07	77.75	59.92	38.83	31.68	46.99
9/29/07	75.75	54.56	37.56	31.58	46.51
9/30/07	75.25	52.63	38.24	31.53	46.99
9/30/07	75.75	52.23	34.70	29.97	38.60
9/30/07	75.00	50.60	34.54	29.11	35.42
9/30/07	80.00	50.74	34.46	29.03	47.12
9/30/07	87.50	28.30	21.98	20.73	22.63
9/30/07	87.50	28.30	22.40	20.91	23.02
9/7/07	87.50	28.57	22.97	21.04	23.13



**Volatility trading**

- Buy cheap vol warrant and sell expensive one
- This will force the “vol” to converge
- It makes profit right away unlike the delta hedging.
- One has to maintain a delta flat position
- The vol are different according to maturity, strike, ... See the table of HSBC

**HSBC warrants as of Sep 21**

WARRANTS MONITOR @ 21-Sep-01

Underlier	Warrant	Rate	Yield	Yield Conv.	Strike	Expiry	Implied Vol.	Historical Vol.	Delta	Gamma	Theta	Rho	Conv. Ratio	Call/Put
HSBC	HSBC plc	74500	1722 HK	0.58	25.50	22.12	20-Sep-01	42.02%	122.82%	25.04%	0.0	0.00	C	
HSBC	HSBC plc	74500	1756 HK	0.18	1,500,000	92.113	25-Feb-02	45.92%	130.281%	39.281%	85	0.00	C	
HSBC	HSBC plc	74500	1757 HK	0.87	1,200,000	97.800	12-Sep-01	42.02%	130.281%	39.281%	85	0.00	C	
HSBC	HSBC plc	74500	1778 HK	1.87	2,700,000	92.396	19-Feb-02	41.29%	124.811%	2.482%	4	0.00	P	
HSBC	HSBC plc	74500	2081 HK	1.88	35,245,000	94.600	04-Oct-09	37.502%	104.836%	0.650%	8	0.00	P	
HSBC	HSBC plc	74500	2081 HK	0.918	0	193,800	04-Oct-09	57.038%	187.851%	41.786%	746	0.00	C	
HSBC	HSBC plc	74500	2081 HK	0.918	0	30,800	05-Oct-09	51.121%	125.480%	23.824%	746	0.00	C	
HSBC	HSBC plc	74500	2091 HK	0.918	0	30,800	12-Oct-09	45.248%	125.480%	23.824%	746	0.00	C	
HSBC	HSBC plc	74500	1770 HK	0.188	0	302,300	28-Sep-01	41.154%	148.899%	37.818%	36	0.00	C	
HSBC	HSBC plc	74500	1784 HK	0.184	10,990,000	98.600	25-Jan-02	42.798%	135.544%	30.745%	45	0.00	C	
HSBC	HSBC plc	74500	2078 HK	0.912	0	98,600	11-Oct-09	51.086%	152.276%	30.376%	629	0.00	C	
HSBC	HSBC plc	74500	2078 HK	0.912	0	3,382,000	08-Sep-01	52.288%	152.276%	1.216%	2	0.00	P	
HSBC	HSBC plc	74500	2072 HK	0.949	1,502,800	93.920	11-Sep-01	42.987%	130.836%	39.483%	89	0.00	C	
HSBC	HSBC plc	74500	2080 HK	0.880	0	937,625	08-Sep-01	57.757%	144.483%	45.871%	85	0.00	C	
HSBC	HSBC plc	74500	1778 HK	1.88	46,412,000	97.400	07-Sep-01	47.342%	117.278%	2.895%	5	0.00	P	
HSBC	HSBC plc	74500	2381 HK	0.296	49,363,000	98.200	25-Mar-09	53.779%	114.876%	16.688%	25	0.00	C	
HSBC	HSBC plc	74500	2170 HK	0.263	9,800	93.826	27-Sep-01	56.267%	148.712%	0.283%	2	0.00	P	
HSBC	HSBC plc	74500	2294 HK	0.880	0	132,250	02-Oct-09	202.287%	177.810%	79.328%	85	0.00	C	
HSBC	HSBC plc	74500	2293 HK	0.916	0	132,000	30-Oct-09	30.084%	177.810%	77.316%	746	0.00	C	
HSBC	HSBC plc	74500	1722 HK	1.28	178,790,000	94.800	12-Mar-09	40.987%	113.974%	2.260%	6	0.00	P	
HSBC	HSBC plc	74500	1718 HK	0.931	90,800	92.400	01-Mar-09	47.564%	136.747%	36.288%	240	0.00	C	
HSBC	HSBC plc	74500	2028 HK	0.918	0	127,800	28-Sep-01	171.862%	170.617%	30.671%	746	0.00	C	
HSBC	HSBC plc	74500	1741 HK	1.828	133,200,000	98.600	05-Nov-09	56.026%	106.607%	0.184%	7	0.00	P	

**The End**

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