Derivative Warrant Market Developments

Parit Ngaobenjakul Chatchai Thisadoldilok, CFA, FRM Polpatt Vinaibodee, CFA, CIPM

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Please send comments to polpatt@sec.or.th or parit@sec.or.th



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Growing significance of DWs in Thailand



	DW Trading Value (Mil. THB)	YoY growth (%)	% of total market
2013	244,961.21		2.08%
2014	204,556.74	-16.49%	2.01%
2015	332,137.90	62.37%	3.32%
2016	652,844.84	96.56%	5.33%
2017 (extrapolated)	511,089.77	-21.71%	4.93%

Source : SETSMART

Recall: Option price consists of 2 components. Intrinsic value + Time (betting) value





The Black-Scholes-Merton (BSM):

ราคาของ Call DW = $ER[S_0N(d_1) - Ke^{-rT}N(d_2)]$ ราคาของ Put DW = $ER[Ke^{-rT}N(-d_2) - S_0N(-d_1)]$



 $d_2 = d_1 - \sigma \sqrt{T}$

ER = อัตราการใช้สิทธิต่อ 1 DW

S₀ = ราคาปัจจุบันของหุ้นอ้างอิง (บาท)

K = ราคาใช้สิทธิ (บาท)

T = อายุคงเหลือของ DW (ปี)

 $\sigma=$ ความผันผวนของหุ้นอ้างอิง (%)

r = อัตราดอกเบี้ย (%)

N() = ค่าความน่าจะเป็นจาก Normal Distribution Function

Direction of BSM European option prices for a change in the model inputs

Factor	Calls	Puts	Note
Asset price (S)	Positively related	Negatively related	
Exercise price (K)	Negatively related	Positively related	Observable factors
Time to expiration (T)	Positively related	Positively related*	
Volatility (σ)	Positively related	Positively related	Subjective (as future volatility cannot be known)
Risk-free rate (r)	Positively related	Negatively related	Low impact on option price

Unlike the other Greeks, implied volatility was unknown.

25th Anniversary 1992-2017

- It was calculated by reverse engineer process from the option price at time t.
- Implied volatility is a measure of how much the marketplace expects asset price to move for an option price.
- In other words, it is the volatility that the market implies.



Realized volatility is the actual volatility over the observation period.



All else being equal (no movement in share price, interest rates and no passage of time), option prices will

- <u>increase</u> if there is an increase in volatility
- <u>decrease</u> if there is a decrease in volatility

ی م	DW pi	rice increased if	there is an increa	ise in volatility
วนท	30.9%	31.9%	32.9%	33.9%
28 Aug 15	0.317	0.339	0.361	0.383
29 Aug 15	0.314	0.336	0.357	0.379
30 Aug 15	0.311	0.333	0.354	0.376
31 Aug 15	0.309	0.330	0.351	0.373
01 Sep 15	0.306	0.327	0.348	0.369
02 Sep 15	0.303	0.323	0.345	0.366

Selected case: a naive investors misperceive option value; only intrinsic value is recognized. The higher the implied volatility, the higher the option price.





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- Chan and Pinder (2000) examined warrants on the Australian Stock Exchange, and found that they were overpriced around 10% compared to the exchange options on the same underlyings.
- Mixon (2009) found that the implied volatility in Chicago option, which traded OTC, was higher than the realized volatility. The interesting finding was the surplus implied volatility significantly decreased after the opening of the Chicago Board Options Exchange (CBOE).
- Sriyanong (2012) studied the effect of the turnover list on the implied volatility of Thai derivative warrants. The researcher found excess implied volatilities in DWs, the average excess was 4.30.
- Dalad Sae-ue (2015) studied Thai derivative warrants and found that the average implied volatility from the derivative warrant price was 66.15%, while the average realized volatility was 34.39%.

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Economic function of derivative markets

- Market structures & practices
- Conduct of complex products
- Behavioral finance & investor education

The excess implied volatilities could deter the price discovery function.



Underlying: SET50 Index



DW: S50XXCXXXA, Underlying: SET50 Index Selection criteria: Most active DW (highest turnover)



Implied volatilities calculated by using at-the-money option with time-to-expiration 3 months.

*The benefits of derivatives are risk management, price discovery, and enhancement of liquidity.

Historical volatilities presented by using 3-month rolling volatility.

Note: we've checked for robustness by changing the calculation windows and option features (moneyness, time-to-expiration), the results are not significantly different.

Source: Bloomberg

Towards healthier market, investor education & information dissemination are enhanced by SFC.

- > The trading activities in the DW market grew significantly in
 - 2005, raised various concerns on DW market.
- > Responded by SFC, a comprehensive review of the DW market
 - was issued, and followed by a series of reform.
- > One of the key findings was "the practices in the market might

be inappropriate and not in the best interests of investors."





SFC proposed to enhance investor education and effective disclosures.

- > Survey on the profile, trading experience and knowledge level of investors
- Investor education on SFC's website www.InvestEd.hk.
- Better effective disclosure on HKEX and issuers' website.







For making more informed decision, implied volatilities are shown and compared with its realized/ historical volatilities in HKEX & issuers' website.



Realized and historical volatilities are

presented for easing comparison with

implied volatilities.

• Issuers (Macquarie HK)

Underlying	30-day historical volatility (%)	Туре	3-month or below warrant average implied volatility(%)	different from last week	above 3-month warrrant average implied volatility(%)	different from last week
HANG SENG INDEX	23.904 %	►Call ►Put	26.55% 35.31%	-5.25 ↓ -6.05 ↓	25.06% 30.02%	-1.82 ↓ +0.76 ↑
TENCENT	37.878 %	▶Call ▶Put	43.57% 40.70%	-2.45 ↓ +1.12 ↑	40.81% 41.78%	-0.70 ↓ +0.91 ↑
HKEX	37.124 %	►Call ►Put	44.97% 38.69%	+1.78 ↑ -16.57 ↓	46.58% 45.19%	+2.02 ↑ -2.02 ↓

• Issuers (JPM HK)

Comparison of Warrants' Implied Volatility



Source: KRX

Reform in Korean market: FSS & KRX worried about large losses of individual investors & growing significance of Equity-Linked Warrants (ELWs) trading value.

The ELW market is speculative and that only a limited number of investors make money from it; thus the FSS will strengthen [ELW-related] regulation¹." Kwon Hyouk-se, FSS governor (2011)



Evaluation of ELW market reform in Korea.



- 1. Eliminates ELW premiums (closer to KRX option).
 - Before 2011, the index ELWs were traded at a price 16% higher than that of the index options.
 - After 2011, ELWs are traded without any premium rate applied thereto.
- 2. Improves the comparability among different ELWs.
 - Due to the standardization of the issuance terms of ELWs, the number of ELWs has decreased, and the comparability among different ELWs has improved.

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- 3. Better serves the function of risk management.
 - The majority of the exercise amount is attributable to the ELWs held by institutional investors until majority.
- 4. Diversifies participants in the ELW market.
 - The proportion of trading by foreigners and institutional investors has increased.

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SEC Thailand: thematic review on DW market

- Issuance
- Risk Management
- Disclosures
- Investor consultations
- Investors' understandings
- Compliance





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Other speculative products for retails. Daily leverage certificates (DLCs), a 25th new SGX leveraged & complex product for retail investors.

5X

Leverage

Enable investors to take a fixed leverage exposure to an underlying asset, such as an equity index.



Transparency

Price transparency as it tracks the price of the underlying asset.



Compounding Effect

Each day the previous day's value plus the previous day's gains are again invested with a leverage factor.



Cost and Fees

Brokerage & Spread, Management fee Gap premium, Funding cost and Rebalancing cost



DLCs is designed to track daily performance of the underlying asset, and will reset daily based on that trading day.



Airbag Mechanism

An airbag is built into the DLC to slow the rate of loss in the value of the DLC in extreme market conditions.

DLCs firstly introduced in Singapore on Monday 3rd of July 2017.



- The performance of the DLC can be calculated more simply as a function of:
 - Underlying Asset Performance
 - Leverage Factor Applied
 - Cost and Fees to be deducted



• In the case of options, part of its value is time dependent, the value change of the warrant is determined by the change in volatility.

SIPs was introduced by MAS to safeguard the interests of retail investors investing in complex products.







Accessment Required

Intermediaries are required to assess customers before selling a SIP to the customer.



SIPs Qualification

To qualified to trade SIP, investors have to fulfill criteria in one of the following areas: Education Qualification, Investment Experience, Work Experience and SGX online education program.

Example of SIPs

Derivative Warrants, DLCs

Source: MAS, Moneysense

Thai DW Market Developments

Increasing competitions:

- New underlyings/ products
- Market makings
- Various gearing offered to investors
- Lower implied volatilities
- Lower time decay
- Services
- Investor educations and disclosures



