FIA EPTA

EUROPEAN PRINCIPAL TRADERS ASSOCIATION

Higher cost, higher risk.

The impact of the closed market structure on the European warrants market: price analysis and recommendations

November 2020

FIA EPTA Insights 4 (2020)

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FIA EPTA Insights provide data driven analysis and factual perspectives on topical issues in European financial markets.

EXECUTIVE SUMMARY

In June 2020, FIA EPTA conducted research on the impact of the single liquidity provider structure on the European warrants market and compared it with the listed options market. We examined the pricing of comparable warrants and options products with matching risk/reward profiles and the impact of differing market conditions on investors' ability to trade in both markets.

The conclusions of this research are clear: investors trading on Europe's warrants markets are losing millions of euros a year because of its 'closed-shop' structure which inflates prices compared to comparable products on more open and competitive markets.

Our new analysis, completed over the summer, finds that investors trading warrants are significantly worse off compared to those trading options. In Switzerland, our study finds investors would be on average up to €198 per trade worse off and in Italy, the loss per trade was €24. In addition to losing money, investors trading on the warrants markets also face more risk as the trades are not handled by a central clearing counterparty.

Our new analysis finds that investors trading warrants are significantly worse off compared to those trading options.

Trading in warrants has increased significantly since the onset of the COVID-19 crisis, with 1.82 billion standard warrants traded (up 71%) and 3.67 billion knock-out warrants traded (up 93.5%) in March alone on the Frankfurt exchange which is representative of the trend in volumes seen across all European warrants markets[1]. Most of the activity takes place on smaller exchanges in Germany, Italy and Switzerland.

FIA EPTA concludes that warrants markets operate as a closed shop with many investment firms prevented from trading and bringing more liquidity, price transparency and competition to the markets.

This means retail investors, who trade extensively on the warrants markets, have to pay above the odds and face increased risk due to the lack of transparency and central clearing involved.

Our research findings are significant enough for us to warn retail investors to avoid warrants markets until exchanges enable greater competition and improve liquidity and more competitive pricing, especially during periods of high volatility such as recently experienced during the COVID-19 pandemic.

INTRODUCTION AND BACKGROUND

Over the years, there have been concerns raised through multiple academic studies about the functioning of the warrants market, including overpricing, and whether retail investors should invest in these and other structured products[2]. Given the similarities in payoff profile of warrants and listed options, this study takes a side-by-side look at both markets to determine the validity of the concerns surrounding warrants and how the difference in their market structure impacts on order book efficiency.

Warrants are one of a wide variety of structured products that are available to trade in Europe[3]. The structured products market is large and extensively traded particularly by retail investors, with warrants being leveraged products which can be listed on regulated venues. Warrants are very similar to options in that both give the holder the right, but not the obligation, to buy or sell the underlying instrument at a set price on, or before, a set date in the future[4].

There are both put and call warrants, which can either be American or European in exercise type, with a predetermined strike and expiry date. Warrants tend to be long dated (i.e. they have a longer time to expiration than options) and if they are issued by the underlying listed company can result in dilution of the shares outstanding when exercised. In general, however, they are issued by a bank or third party (i.e., there is no dilution factor) and will have the same strike price and expiry date, making their payoff profile to be identical to that of options.

One slight difference when it comes to the contract specifications is the exercise ratio, which is similar to an options multiplier although with warrants these are typically far smaller representing fractions of the underlying security. Given this, in order to fairly compare the price of the warrant to that of the option, one needs to divide it by the exercise ratio to determine the like-for-like price for 1 share/unit of the underlying instrument.

MARKET STRUCTURE

Warrants and options are both listed and traded on regulated markets. However, there are a several key differences in how their market structure functions, with warrants markets having a more closed and options markets having a more open structure. Table 1 outlines some of the typical market structure differences between options exchanges and warrant exchanges.

A key difference is that the warrants market operates as a single market maker model where there is only one market maker, who is typically the issuer of the affiliated warrants, to provide liquidity in the order book. Alongside, there can also be multiple warrants on the same underlying with identical pay off profiles with the

only difference being the issuer.

Warrant investors can in theory purchase warrants from other investors exiting long positions. However, historical data shows this only occurs on very rare occasions and investors are prohibited from short selling limiting their ability to manage risk. In practice, this means that retail investors' orders are matched and settled bilaterally against the one market maker who is the exclusive counterparty to the retail orders, meaning in effect that the issuer has a monopoly on all liquidity provision.

By contrast, the options market is an open market that is centrally cleared and where multiple market makers can register to provide liquidity and where there is diverse selling and buying interest in a transparent market environment.

A key difference is that warrants have a closed, and options an open, market structure.

As regards product parameters, both options and warrants can have varying characteristics which are set by the exchange for options and by the issuer for warrants. Physically settled warrants can also be exercised to receive stock which is typically done before ex-dividend date to receive the dividends. For warrants, the process to exercise (elect) for stock has to be instructed days before ex-date rather than the evening before for options. Another difference between warrants and options is that warrants can have a last trading day which lies a number of days before the warrant expiry; this is not the case for options, where the last trading day and exercise date are the same.

Table: 1

Market feature	Options Exchanges	Warrants Exchanges
Counterparty	Central clearing	Bilaterally settled
Market-making	Several competing market makers	Issuer as sole predominant market maker
Short-selling	Possible	Not possible
Market making parameters	Same for all market makers	Vary by issuer
Contract design	Standardized	Chosen by issuer
Creation of new contracts	Mandated by exchange rules	At issuers' discretion
Corporate Action Adjustments	Mandated by Exchange Rules	At issuers' discretion

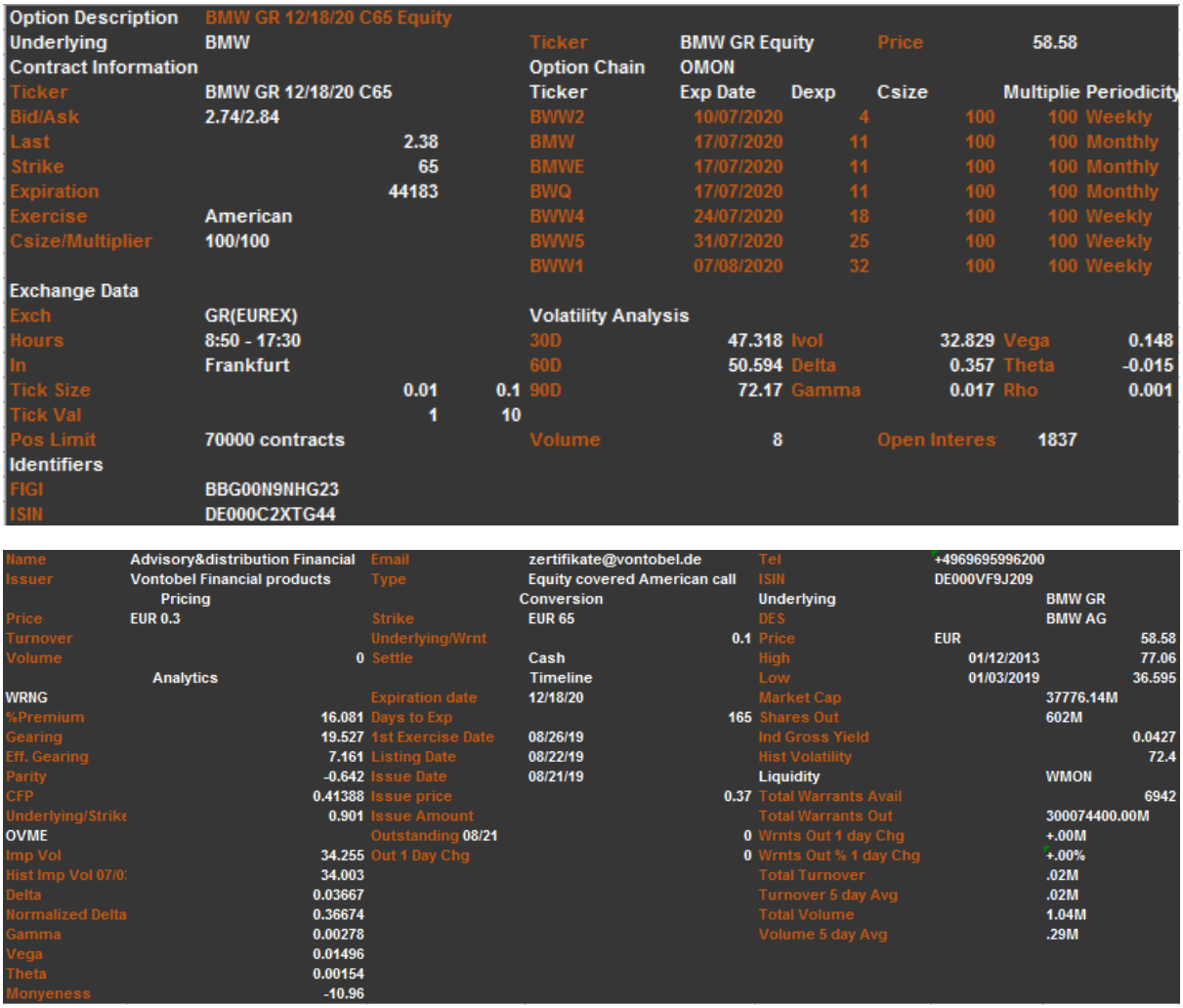
Example of a matching warrant and option

The following is an example which outlines the similarities of a warrant listed on Boerse Frankfurt[5] and an option listed on Eurex. The warrant and option both have the same underlying which is BMW AG. They are calls with a strike price of €65 and expire on the same date in December 2020. The one difference between the instruments is that the warrant represents an exposure of 0.1 of a share in BMW and the option represents an exposure of 100 shares via its multiplier. In order to fairly compare the price of the warrant to that of the option it is therefore divided by the exercise ratio to indicate the price for 1 share in BMW.

Per the below pricing information taken from Bloomberg (Figures 1 and 2), the price for the warrant is €0.3 or €3 when comparing it to the options premium. The corresponding option on Eurex was quoted 2.74/2.84 and the price of BMW at the time was €58.58. This represents a 5.6% higher price to get the same exposure in BMW when you trade the warrant over the options. This difference in pricing is reflected in the values for implied volatility resulting in the option having an implied volatility level of 32.8 and the warrant has an implied volatility of 34.3.

This example shows that there is a direct arbitrage opportunity between the warrant and options market where theoretically you could sell the warrant and buy the option in equivalent quantities (1000 warrants for every 1 option) and lock in the spread. However, due to the close market structure, only the issuer could do this which is why prices remain misaligned.

Figure: 1/2



Option Description	BMW GR 12/18/20 C65 Equity								
Underlying	BMW			Ticker	BMW GR Equity		Price	58.58	
Contract Information				Option Chain	OMON				
Ticker	BMW GR 12/18/20 C65			Ticker	Exp Date	Dexp	Csize	Multiplie	Periodicity
Bid/Ask	2.74/2.84			BWW2	10/07/2020	4	100	100	Weekly
Last		2.38		BMW	17/07/2020	11	100	100	Monthly
Strike		65		BMWE	17/07/2020	11	100	100	Monthly
Expiration		44183		BWQ	17/07/2020	11	100	100	Monthly
Exercise	American			BWW4	24/07/2020	18	100	100	Weekly
Csize/Multiplier	100/100			BWW5	31/07/2020	25	100	100	Weekly
				BWW1	07/08/2020	32	100	100	Weekly
Exchange Data									
Exch	GR(EUREX)			Volatility Analysis					
Hours	8:50 - 17:30			30D	47.318	Ivol	32.829	Vega	0.148
In	Frankfurt			60D	50.594	Delta	0.357	Theta	-0.015
Tick Size		0.01	0.1	90D	72.17	Gamma	0.017	Rho	0.001
Tick Val		1	10						
Pos Limit	70000 contracts			Volume	8		Open Interes	1837	
Identifiers									
FIGI	BBG00N9NHG23								
ISIN	DE000C2XTG44								

Name	Advisory&distribution Financial	Email	zertifikate@vontobel.de	Tel	+4969695996200				
Issuer	Vontobel Financial products	Type	Equity covered American call	ISIN	DE000VF9J209				
	Pricing		Conversion	Underlying		BMW GR			
Price	EUR 0.3	Strike	EUR 65	DES		BMW AG			
Turnover		Underlying/Wrnt	0.1	Price	EUR	58.58			
Volume	0	Settle	Cash	High	01/12/2013	77.06			
	Analytics		Timeline	Low	01/03/2019	36.595			
WRNG		Expiration date	12/18/20	Market Cap	37776.14M				
%Premium	16.081	Days to Exp	165	Shares Out	602M				
Gearing	19.527	1st Exercise Date	08/26/19	Ind Gross Yield	0.0427				
Eff. Gearing	7.161	Listing Date	08/22/19	Hist Volatility	72.4				
Parity	-0.642	Issue Date	08/21/19	Liquidity	WMON				
CFP	0.41388	Issue price	0.37	Total Warrants Avail	6942				
Underlying/Strike	0.901	Issue Amount		Total Warrants Out	300074400.00M				
OVME		Outstanding	08/21	0 Wrnts Out 1 day Chg	+.00M				
Imp Vol	34.255	Out 1 Day Chg	0	Wrnts Out % 1 day Chg	+.00%				
Hist Imp Vol 07/0	34.003			Total Turnover	.02M				
Delta	0.03667			Turnover 5 day Avg	.02M				
Normalized Delta	0.36674			Total Volume	1.04M				
Gamma	0.00278			Volume 5 day Avg	.29M				
Vega	0.01496								
Theta	0.00154								
Monyeness	-10.96								

PRICING REVIEW

The above example shows how prices between the warrants market and the options market can be misaligned. The question is whether this is systemic across the entire warrants market, leading to warrants investors being detrimentally affected by receiving adverse pricing.

We set out below FIA EPTA's analysis of how investors faired when they traded warrants vs. the comparable listed options market. The first step in this analysis was to identify if there were any direct arbitrage opportunities between the listed options market and the warrants market.

We used a combination of data sets from January 2020 to the end of March 2020 (i.e., including the COVID-19 volatility) which contained warrants trading data from the SIX Swiss, Borsa Italiana, Boerse Stuttgart and Euronext warrants markets and the quote data of comparable options listed on Eurex, Euronext and IDEM for the period. Warrants with an equity underlying were compared to equivalent equity options with the warrants' traded price compared to the bid/offer price in the lit option book at the exact time of the execution of the warrant trade.

Tables 2 and 3 outline the results which break down the trading by primary options exchange and country of underlying security where the amounts are in USD. If the average loss number is positive this shows that there is a direct arbitrage between the warrant and the corresponding bid or offer on the options market. For example, where [Loss > 0], the warrant price to buy traded above the options market offer; or, in the case of a sell, traded below the options bid.

The question is whether warrants investors are systematically receiving adverse pricing.

What differentiates the "All warrants" data vs. "Same expiry" is that some warrants expire earlier than the standard third Friday of the month for the options market. We still compared these warrant trades to the bid and offer of the further dated Friday expiry for the corresponding option even though they have additional optionality. Warrants expiring < 5 days near a listed options' expiration ('all warrants') were mapped together for comparison and, also, separately warrants with the exact same expiry date to the listed equity options ('same expiry') were compared. In addition, outlier cases and, for instance, stale bid/offer prices were suspended from the data set to ensure that the price difference could not be accounted for by a price feed lag or inaccuracy.

We conclude that warrants investors in the Swiss market performed the worst, where these investors lost on average $198 for every trade which was a direct arbitrage to the listed options market on Eurex. The cumulative value of this arbitrage between the Swiss warrants market and Eurex options was $8.45 million over this period. The Italian warrants investors also performed poorly losing an average of $24 per warrant trade which represents a saving of $950k had they traded options instead on IDEM during the sample period. This was not the case, however, for the French and German warrants where on average they did not have a direct arbitrage with the options market.

Table: 2

	All warrants			Same expiry		
Exchange	Money lost (mio$)	Avg loss/trade ($)	# trades	Money lost (mio$)	Avg loss/trade ($)	# trades
All trades	6.64	54	123k	7.4	67	110k
EUREX	6.69	104	64k	7.29	134	54k
Euronext	-0.98	-52	19k	-0.83	-53	16k
IDEM	0.94	23	40k	0.95	24	40k

Table: 3

	All warrants			Same expiry		
Country	Money lost (mio$)	Avg loss/trade ($)	# trades	Money lost (mio$)	Avg loss/trade ($)	# trades
Swiss	8.45	198	43k	8.45	198	43k
German	-1.76	-82	22k	-1.16	-97	12k
French	-0.98	-52	19k	-0.83	-53	16k
Italian	0.94	23	40k	0.95	24	40k

We then looked at the price warrants traded at versus the mid prices in the options market to see if the prices available in the warrants market are fair for investors and compared it with the same measure for options (comparing active mid prices at the exact time the warrant trades were executed and, again, excluding any ambiguous/ stale quotes giving the benefit of the doubt to the warrant issuers to ensure the results were as conservative as possible).

In order to standardise the comparison, we looked at the number of volatility points (VP) from the mid-price at which the warrants and the options traded, by way of quantifying the cost of trading and capturing the volatility premium issuers and market makers were charging.

The VP calculation for warrants is as follows, if buy: (warrant price – mid option market)/vega; if sell: (mid option market – warrant price)/vega. The same holds for the options trades where you replace warrant price with option price. For the sample set we only included options which were greater than 10 delta and less than 90 delta. The reason for this is that, as vega is the measure of an option's price sensitivity to changes in the volatility of the underlying, options with very low or high delta have a vega approaching 0 and including those would lead to less robust results.

In parallel, we looked at a subset of the most active underlyings that trade on the SIX Swiss, Borsa Italiana, Boerse Stuttgart and Euronext warrants markets. During the sample period the trading of 49 out of 197 underlyings analysed represented 81% of the total warrant trades. The reason we analysed this subset is that the largest most active warrants should theoretically be the most efficient when it comes to pricing.

Table 4 outlines the results of the volatility premium that warrant investors are paying vs. the volatility premiums that options investors are paying. This represents essentially the effective spread both of these types of participants are paying in terms of volatility. We conclude that warrant investors pay more of a spread in vega terms to trade warrants vs. the spreads that are paid in the options market. Also, the results showed that this is occurring on both sides of the order book demonstrating that warrant investors pay a relatively higher price to buy and receive a lower price to sell compared to the listed options market.

The data makes clear that warrants are significantly overpriced vs. listed options.

This implies that warrant issuers elevate their pricing when it is more likely warrant investors will open positions (and buy) then reduce when they expect warrant investors to close their positions (and sell). The indicators for this are where there is already large open interest or the price moves such that the position becomes in the money. The paper Entrop et al. (2014) describes how this overpricing of structured products by issuers is a factor that leads to negative returns for retail investors and it is clear from the data in the below tables that warrants are indeed significantly overpriced vs. listed options.

This comparison again shows that warrant investors have the biggest systematic disadvantage on the Swiss market. These investors overpay on average 5.77 times the volatility premium against the listed options market on Eurex. Along with this, warrant investors for products with German underlying's paid 2.5 times more in volatility premium compared to the listed options market on Eurex. Similar results are apparent for French and Italian warrants where issuers charge over double the volatility premium to the listed options market. This additional effective spread that warrant investors have to pay over the comparable option market represents a substantial cost to warrant investors who are typically retail participants.

Given the fact that there are multiple issuers providing prices for identical warrants, some may argue that this competition should lead to efficient pricing within the warrants market. Based on the analysis conducted below which looks at actual trades executed by warrant investors this competition is not leading to better pricing over the listed options market.

The results below are looking at the most actively traded warrants in Europe over this period, which would have the highest degree of competition amongst issuers. This leads us to conclude that either warrant investors are not trading the most competitively priced warrants, or they are acting rationally and selecting the best available warrant which is still multiple times the volatility premium of the listed options equivalent. If they are not selecting the best available warrant, then from an investor protection point of view the market structure of how warrants are

marketed and sold to investors needs to be reviewed.

This would imply there are structural issues in the market which are causing retail investors to be disadvantaged, as they do not have a clear view on better alternatives. Also, regardless of whether warrant investors are selecting the best available warrant or not, the actual prices warrant investors are interacting with and trading against shows that the existence of identical warrants does not lead to efficient pricing.

Based on these findings we would suggest that new market structure measures and regulation need to be introduced to enable independent liquidity provision, which would increase the competitiveness of individual warrants and allow for fair and reasonable pricing in the warrants market. The available alternative to warrants, which is the listed options market, should be more accessible to retail investors over warrants given the superior pricing it offers.

Table: 4

	Warrants with same expiry as listed options		All options trades on the 49 underlyings		VP premium warrants vs. options
Country	**VP above mids**	**# trades**	**VP above mids**	**# trades**	**(VP vs mids warrants) / (VP vs mids options)**
All Trades	3.936	92k	1.076	213k	3.66
Swiss	4.123	36k	0.715	65k	5.77
German	1.9	6k	0.759	75k	2.5
French	1.904	10k	0.921	27k	2.07
Italian	5.246	40k	2.208	46k	2.38

RISK REVIEW

While warrants and options have the same payoff profile, their risk profiles differ. There are some additional risk factors for warrants which are not present in the options market, the first being credit risk. When investors trade warrants they are trading them back to back vs the issuer and as a result have credit risk to that institution. This risk is not present in the listed option market as all contracts are centrally cleared and there is a greater degree of safety as they are backed by the Central Counterparty (CCP). There is also the potential for warrant investors to have decreased optionality when investing in warrants in comparison to options. This occurs in the case of warrants that have the same expiration date as the listed option expiration but a shorter tradable lifetime because the last trading day is a number of days in advance of expiry day.

A second risk that warrants have over options is liquidity risk. As the liquidity in the warrants market is only provided by the issuer it creates the risk that the liquidity picture could change over the life of the warrant and investors may not be able

to unwind their positions and are at the mercy of that one provider. This risk is substantially reduced on the listed options market.

On Eurex, for example, there are typically more than ten market makers in the order book at any one time for any major index or equity option. These market makers are in competition on both sides of the book and should one firm withdraw their quotes other firms can step in to allow investors to close or hedge existing positions. Options market makers also have regulatory requirements on their presence in the orderbook.

There are structural issues in the market which are causing retail investors to be disadvantaged.

During extreme volatility scenarios, the liquidity risk issues with warrants are very apparent. For example, on the 17 June 2020 the share price of Wirecard AG (Symbol: WDI GY, ISIN: DE0007472060) fell ~65% and in the subsequent days there were no quotes available in the warrants market which had WDI as its underlying. When quotes did appear there was only one side present in the order book on the bid side which meant that no investor could purchase a warrant and they could only close their position. In comparison, while liquidity did deteriorate in the options market where spreads became wider, there were at least prices on both sides of the book for the majority of the day which allowed investors to better manage their positions and risk.

Even in times of normal market conditions, warrant investors are exposed to these adverse liquidity risks. For example, on 7 July 2020 the prices of LU2013107177 and LU2013107334 were misaligned (see Figures 3/4 below). The first is a call warrant with a strike of 10 and the other a call warrant with a strike of 11 on CNH industrial (ISIN: NL0010545661) respectively. Even though the 11 strike (mid-price 0.0115) warrant was further from being in the money it was actually priced higher than the 10 strike (mid-price 0.00625) and priced in greater size. The reason for this was due to the fact that the 10 call warrant had considerable open interest and, therefore, the issuer was expecting sellers as well as buyers.

During extreme volatility scenarios, the liquidity risk issues with warrants are very apparent.

Substantially less liquidity was provided for this warrant, which is an example of the increased liquidity risk warrant investors are exposed to once they open a position. For the 11 call there was very little open interest relative to the 10 call and therefore, because of the closed market structure, there was a far higher likelihood of only seeing buyers of this warrant.

In this case, the higher price implies that the firm market-making these warrants

was charging a far higher volatility premium and, also, providing a greater level of liquidity at the elevated levels given the fact that they only expect buyers. This behaviour is described by and reflects the results of Wilkens et al. (2006)[6] where they analysed the effect of order flow on warrants and found strong evidence of this "order flow hypothesis".

Figure: 3/4

CNHI warrant call 10 (ISIN: LU2013107177)

S22030 IM	€0.0018			-0.001	M.0035	
At	16:30	Vol		7500		
S22030 IM Equity		O		0.105M	H	0.0105M
Range	07/07/2020	04:46:01		-	07/07/2020	16:50:00
Quote Recap						
High	0.0095	Low		0.0035		
Time	Bid/Trd/Ask	Size				
16:30:00	.004/.0085	10k x 70.4k				
16:30:00	0.009					
16:30:00	0.0035					
16:30:00	.004 / .0085	10k x 70.4k				
16:23:49	.004/.0085	10k x 70.4k				
15:19:09	.004/.009	10k x 114.7k				

CNHI warrant call 11 (ISIN: LU2013107334)

S22031 IM	€0.0090			-0.002		
At	16:30	Vol		0		
S22031 IM Equity		O		0.009M	H	.009M
Range	07/07/2020	04:46:01		-	07/07/2020	16:50:00
Quote Recap						
High	0.0115	Low		0.0115		
Time	Bid/Trd/Ask	Size				
16:30:00	.0085/.0145	500k x 500k				
16:30:00	0.0115					
16:30:00	.0085/.0145	500k x 500k				
16:28:00	.0085/.0145	500k x 500k				
16:11:24	.0105/.0125	1M x 1M				
16:11:21	.011/.013	1M x 1M				
15:33:15	.0105/.0125	1M x 1M				

CONCLUSION

We looked at a comparison of pricing between the warrants and the listed options markets in Europe and found clear evidence that investors would receive better pricing in the options market. This is in line with prior academic research that has shown that overpricing is prevalent across the warrants market. In addition, reviewing the market structure, risk profile and performance, including during the COVID-19 pandemic, we found that warrants performed sub-optimally in comparison with equivalent options.

Bilateral matching masking as multilateral trading is an area of concern.

For European options exchanges there is a market structure which fosters increased competition from the supply side. This leads to high levels of competition which creates tighter spreads and therefore reduces cost for end investors. As warrants are only quoted by either the issuers or single affiliated market makers it allows for charging excessive premiums as they have a complete monopoly of liquidity provision. We believe this is due to the absence of competition from the supply side as issuers are at an advantage by having more time and full discretion to set spreads and pricing rules.

While this paper primarily focuses on pricing and (liquidity) risk issues in the warrants vs. the listed options market, the wider topic of bilateral matching masking as multilateral trading is a further area of concern – especially the lack of competition in such a single market maker model. FIA EPTA is aware that in Germany a significant number of smaller retail focused exchanges (regulated markets and MTFs) operate a single-market maker trading model, whereby only one market maker per product segment is responsible for the entire order book. While order execution ostensibly takes place within a multilateral system, in practice retail orders are matched bilaterally against only the one market maker who is at all times the exclusive counterparty to the retail orders. Hence, these systems appear to be a de-facto broker crossing networks (BCNs) or informal systematic internalisers (SIs) masquerading as regulated markets or MTFs. Such systems are further oftentimes characterised by payment-for-orderflow (PFOF) practices[8]. This means that the retail broker, in exchange for steering its clients' orderflow to a specific system, receives a monetary inducement from the relevant single market maker on that system who will be the exclusive counterparty to the retail investors' orders. In other instances, the retail broker passes on the trades exclusively to a market maker which is part of the same group as the broker, suggesting de-facto internalisation. These practices appear to not be in line with MiFID II requirements in relation to multilateral systems,

These practices appear to not be in line with MiFID II requirements.

non-discriminatory access to trading venues, best execution and inducements.

In light of the above we would, therefore, caution against trading warrants where comparable options contracts exist offering greater transparency and more competitive pricing for all investors. We would recommend a change in market structure for warrants to allow for independent liquidity provision. From an investor protection point of view, warrants investors are receiving disadvantageous pricing for warrants which we strongly believe needs to be addressed.

We caution against trading warrants where comparable options contracts exist offering greater transparency and more competitive pricing for all investors.

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