

# Credit Default Swap Index Options

Evaluating the viability of a new product for the CBOE

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## **Executive Summary**

The credit default swap (CDS) market is a large and fast-growing market that allows investors to trade credit risk. Multiple derivatives on CDS currently trade over the counter including CDO-like tranches and options. The rise of standardized, liquid, and high-volume CDS indexes has created the possibility of exchange-traded CDS index options. Exchange-traded options would increase liquidity in the CDS option market and allow retail and smaller investors to trade credit risk much more easily than with current products. The primary users of the exchange-traded options will be speculators as existing products, such as individual CDS or the CDS indexes, are cost-effective hedges for most players.

CDS index options could be an attractive new product for the CBOE but there are several major issues to overcome before exchange-traded CDS index options are viable. The most significant barrier to offering exchange-traded CDS index options is the risk that the CDS trading infrastructure will fail during a credit crisis. The CBOE can mitigate, but not eliminate, this risk by carefully drafting contract provisions. The easy hedgability of CDS index options should be attractive to market-makers but current OTC CDS option dealers might be unwilling to support a competitive exchange-traded product. There are also practical barriers to the product such as SEC and index licensing issues.

The proposed contract is a European option on the current on-the-run series of the North American Investment Grade CDX. The size of the contract is one hundred times the current spread of the underlying CDX index and the contract is settled based on the

CDX spread. In order to lessen competition with the OTC market, the contract is sized to appeal to smaller players and the retail market, a new customer base for CDS options.

## **Evolution of the Credit Default Swap Market**

### ***The Rise of the Credit Default Swap Market***

A credit default swap (CDS) is a contract between two parties where a protection buyer pays a premium to the protection seller in exchange for a payment if a credit event occurs to a reference entity. CDS are customizable, over-the-counter products and can be written to trigger in the event of bankruptcy, default, failure to pay, restructuring, or any other credit event of the reference entity. Despite the potential to customize CDS, most of the contracts are standardized to increase the tradability of the contract. The contracts are often written to trigger in the case of the specified credit event for any of the debt of the entity, even subordinated debt.<sup>1</sup> In addition, CDS are typically 5 year contracts, although 3, 7, and 10 year contracts are also traded. CDS can be physically settled or cash settled. If a physically-settled CDS is triggered, the protection seller pays the face value of the debt (or another pre-specified amount) to the protection buyer in exchange for the debt itself, which would be worth less than face value given the recent credit event. Triggering a cash-settled CDS would require the protection seller to make a payment to the protection buyer of the difference between the original value of the debt (typically the face value) and the current value of the debt based on a specified valuation method. Unlike hedging with less risky bonds which requires a cash outlay upfront, CDS do not subject the buyer to interest rate risk or funding risk. CDS allow hedgers or speculators to take an unfunded position solely on credit risk.

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<sup>1</sup> Handbook of Fixed Income, Fabozzi, pg 699

The CDS market is an important market that has grown dramatically over a short period of time. The market originally started as an inter-bank market to exchange credit risk without selling the underlying loans but now involves financial institutions from insurance companies to hedge funds. The British Bankers Association (BBA) and the International Swaps and Derivatives Association (ISDA) estimate that the market has grown from \$180 billion in notional amount in 1997 to \$5 trillion by 2004 and the Economist estimates that the market is currently \$17 trillion in notional amount.<sup>2</sup> This rapid growth was spurred by the ISDA creating a set of standardized documentation. This standardized industry standards and benchmarks which greatly lowered the transactions costs to trading CDS.

### ***Credit Default Swap Indexes***

As the CDS market increased in importance, tradable CDS indexes arose to allow players to trade a broader spectrum of credits at a lower cost. There are two primary tradable index families: the Dow Jones CDX and the International Index Company Itraxx. Both of the companies have indexes for various types of debt including US investment grade, US high volatility investment grade, US high yield, European bonds, and even emerging market bonds.<sup>3</sup> The composition of each index is determined by member banks and a particular name remains in the index until the CDS is triggered due to a credit event.<sup>4</sup> A new index is formed periodically but each incarnation of the index shares the majority of its names with the previous index. The Dow Jones US Investment

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<sup>2</sup> “On Top of the World”, Economist, April 27, 2006, [http://www.economist.com/opinion/displaystory.cfm?story\\_id=6855910](http://www.economist.com/opinion/displaystory.cfm?story_id=6855910)

<sup>3</sup> [www.itraxx.com](http://www.itraxx.com) , [www.dowjones.com](http://www.dowjones.com)

<sup>4</sup> “Guide to the Dow Jones CDX Rules”, September 2005, available at [http://www.djindexes.com/mdsidx/downloads/credit\\_derivative/rules.pdf](http://www.djindexes.com/mdsidx/downloads/credit_derivative/rules.pdf)

Grade CDX, for example, is recreated every six months with 125 CDS.<sup>5</sup> The member banks that help compose and price the index include sixteen major international banks.<sup>6</sup> Each of the member banks makes a market in the CDS index and it is freely tradable with low bid-ask spreads of ½ to ¼ of a basis point.<sup>7</sup> CDS indexes are important innovations that allow financial players to trade a broader spectrum of credits at lower cost and in a more liquid market. For the purposes of this paper, I will hereafter use the Dow Jones Investment Grade CDX index as the example and that index will serve as the underlying of the proposed options.

The Dow Jones Investment Grade CDX is intended to trade exposure to the credit risk of North American investment grade firms. The index is made up of 125 of the most liquid investment grade credits and composition is determined by Dow Jones and the member banks.<sup>8</sup> Initial credits are all investment grade but names are not removed from a given series if the quality of a credit decreases over time as long as the CDS protection event has not been triggered. Albertson's remains in the Series 5 Investment Grade CDX, for example, because the company was investment grade when the index was composed but has since been excluded from Series 6 due to its BBB- rating.<sup>9</sup> The CDX is an equally-weighted index with each credit initially making up 0.8% of the index

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<sup>5</sup>A list of the current components of the index can be found at <http://www.markit.com/marketing/news/DJ%20CDX.NA.IG.6.pdf>

<sup>6</sup> ABN AMRO, Bank of America, Barclays Capital, Bear Sterns, BNP Paribas, Citigroup, Credit Suisse First Boston, Deutsche Bank, Goldman Sachs, HSBC, JP Morgan, Lehman Brothers, Merrill Lynch, Morgan Stanley, UBS, and Wachovia

<sup>7</sup>“Credit Markets in 2005”, Deutsche Bank presentation

<sup>8</sup>“Guide to the Dow Jones CDX Rules”, September 2005, available at [http://www.djindexes.com/mdsidx/downloads/credit\\_derivative/rules.pdf](http://www.djindexes.com/mdsidx/downloads/credit_derivative/rules.pdf)

<sup>9</sup>“Credit Derivatives Insights, Pick and Roll: CDX March Madness”, Morgan Stanley research, March 17, 2006

although that weighting changes when a CDS is removed due to a credit event.<sup>10</sup> The index is intended to reflect multiple industry sectors and provide a broad exposure to North American investment grade credits

The mechanics of the CDX index are fairly simple.<sup>11</sup> Each year, the protection buyer pays the protection seller the initial price of the index (for example 45 basis points) on a given notional amount of the index. If the index value changes over the next 90 days, the protection buyer will make a payment to the protection seller equal to the present value of change in the value of the index over the remaining life of the contract. As a result, entering into the CDX after inception requires the exchange of an up-front payment representing the probability weighted present value difference between the current market value of the CDX and the initial deal value of the CDX. In addition, upon entering the CDX the seller pays the accrued premium from the last payment date to the settlement date in order to receive a full 90 days of premium on the next payment date. In the event of a triggering credit event, the index is typically physically settled. The protection buyer will deliver to the protection seller a face amount of the defaulted<sup>12</sup> debt equal to 1/125 of the original notional value of the index purchased and the protection seller will deliver an equal amount of cash. After the default, the notional value of the index held is lowered by the amount of cash delivered by the seller to the buyer.

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<sup>10</sup> “An Overview of Credit Derivatives and Structured Credit Investment Themes”, Morgan Stanley presentation, March 2, 2006

<sup>11</sup> Same

<sup>12</sup> For the sake of simplicity, defaulted is used here to refer to any credit event that triggered protection on the given CDS.

## ***OTC Credit Default Swap Index Derivatives***

Since the CDS indexes were introduced, an array of over-the-counter derivatives have arisen which permit trading of specific portions of risk. CDS indexes work very well for hedging or gaining exposure to certain specific areas of the credit market. There are now tradable CDS indexes that cover specific sectors, points on the credit curve, geographies, and credit qualities.<sup>13</sup> In addition, banks offer both CDS index tranches and index options to allow speculators to tailor their exposure to credit risk. Banks use CDX tranches to subdivide the credit risk of the 125 companies in the index and sell off the pieces to different customers. Each tranche holds a certain priority in providing insurance on the basket of CDS and, thus, carries a much different risk profile. For example, the equity tranche will typically cover the first 3% of defaults while the junior mezzanine tranche would cover the next 4% of defaults.<sup>14</sup> This structure allows investors to leverage (invest in the equity tranche) or delever (invest in the senior tranche) their exposure to the credit risk of the index. The tranches are standardized and liquid and banks quote bid-ask spreads daily. Trading CDX tranches allows traders to take positions on correlation between credit events within a CDX index or across different CDX indexes.<sup>15</sup>

Similarly, over-the-counter CDX options allow speculators to take a position on the volatility of CDS market spreads. The size of the over-the-counter CDX option market is unclear. A Risk Magazine survey found that the market was only \$1.5 billion

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<sup>13</sup> [www.djindexes.com](http://www.djindexes.com)

<sup>14</sup> “An Overview of Credit Derivatives and Structured Credit Investment Themes”, Morgan Stanley Presentation, March 2, 2006, Pg. 18-24

<sup>15</sup> For example see “Structured Credit Ideas: CDX S4 Equity Butterfly”, Morgan Stanley Research, February 7, 2006

in 2003, although the magazine suggests that that is “a significant underestimate.”<sup>16</sup> A more recent survey by Fitch (cited by Nomura) indicates that the median major dealer trades \$2 billion in CDS index options per month, which is double the volume from last year.<sup>17</sup> These numbers indicate a CDS index options market of at least \$400 billion doubling year over year.<sup>18</sup> Research suggests that CDS options are effective for short-lived tactical hedges and for insurance on downside negative moves on CDS spreads.<sup>19</sup> Most of the volume of CDS options (57%) is used by hedge funds and 50% of the trading is for short term speculation.<sup>20</sup> These CDS and CDS derivative markets are very profitable for banks. The Economist attributes much of Goldman Sachs’ record profits to trading derivatives including CDS and CDS derivatives.<sup>21</sup>

## **The Next Step in the Credit Default Swap Market**

This paper will discuss the pros and cons of offering an exchange-traded option on the Dow Jones Investment Grade CDX index from the CBOE perspective. I will also discuss the benefits and costs of CDX options for users to enlighten the discussion of pricing, volume, and liquidity. I will not include an in-depth discussion or analysis of specific trading or portfolio strategies using the CDX options. The intent of the paper is to inform the CBOE’s decision on whether to offer CDX options.

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<sup>16</sup> “Credit Guide: Future of CDOs”, Credit, August 2004,

<http://www.creditmag.com/public/showPage.html?page=168585>

<sup>17</sup> “CDO/CDS Update 3/29/05”, Nomura Securities, [http://www.securitization.net/pdf/Nomura/CDO-CDS\\_29Mar05.pdf](http://www.securitization.net/pdf/Nomura/CDO-CDS_29Mar05.pdf)

<sup>18</sup> Assuming 16 major banks each trade \$2 billion per month on average

<sup>19</sup> “Credit Derivatives Strategy, Tranches and CDS Options: Preparing for Big Moves”, Morgan Stanley Research, March 13, 2006

<sup>20</sup> Nomura Securities, quoting Fitch survey

<sup>21</sup> “On Top of the World”, Economist, April 27, 2006

## ***Exchange Traded Options***

Exchange-traded options offer multiple benefits over over-the-counter options. Exchanges greatly enhance the liquidity of the option and lower the transactions costs of trading an option. This increased liquidity frequently results in improved price discovery. Additionally, exchange-trading can allow new parties to trade an option because the exchange absorbs the counter-party risk of trading the options which lowers transactions costs of smaller trades.

Exchange-traded options have many benefits but not all options can or should be exchange traded. Exchange traded options must be traded in order for the exchange to make profits. If an option is not expected to trade in a minimal volume an exchange like the CBOE cannot profitably offer the option. In order to generate this trading volume and liquidity, exchange traded options must be standardized but must also attract a wide range of potential users. Hedgers are an important user of options but are not necessary to create a successful exchange traded option. Large hedgers greatly increase the dollar volume outstanding of an option but frequently-trading speculators such as hedge funds are usually much more profitable for an exchange.

Exchange traded options require both end users and market makers to generate the required liquidity. To attract the market makers required to facilitate exchange-traded option transactions, it is important that the price of the underlying asset is a transparent price and that the option is hedgeable. In this case, a transparent price is a price that reflects the actual price from a liquid market without significant delays or manipulation. Illiquidity or settlement lags with the underlying asset can create significant risk for option market makers. Likewise, the market maker must be able to hedge their position

to make a market. Market makers are not in the business of taking bearing price risk and prefer to make their money on the bid-ask spread. Market makers are attracted to options that are both hedgeable and based on an underlying with a reliable market price.

In derivatives with a robust OTC market, it can be difficult for exchange-traded options to succeed. Exchanges depend on dealers to generate or attract a large portion of the volume in a new product. A new product that appeals to the dealers' existing customer base, however, is a direct competitor and a threat to the dealers' profits. Despite assuring the exchange before a new product offering, historically dealers have not supported exchange-traded products that competed with their robust and profitable OTC products. Due to this, successful exchange-traded products are frequently tailored to attract a different customer base than the OTC market.

## ***Exchange-Traded CDX Options***

### **Market and Customers**

CDX options are a strong new product candidate for the CBOE but it is not clear that the market in the underlying is mature enough right now. As discussed above, the CDS market is one of the hottest financial product markets and is expected to continue its growth in the future. Given the historical growth rate of the OTC CDS index options market, the current market size is estimated at between \$1 trillion and \$800 million in notational amount.<sup>22</sup> The Dow Jones North America Investment Grade CDX, the underlying for the proposed options, has a volume of several times the option market. In the very near future, the market for CDX options will clearly be large enough to create an attractive product for the CBOE. In addition, successfully introducing the first exchange-

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<sup>22</sup> Estimated by doubling the 2005 estimate derived above from the Fitch survey

traded options based on CDS will give the CBOE a significant first-mover advantage in introducing the next generation of CDX or other CDS options.

While the attractive size of the market is apparent, the composition of the users of the CDX options is a bit murky. The options will certainly attract speculators who want to take a position on the volatility of credit risk but it is not clear whether a significant hedger market will develop. CDS are themselves a derivative which are used to hedge credit risk. CDS options could also be used to hedge credit risk although the options would not be as useful for hedging as the underlying swap. As an exchange-traded option, the CDX option would necessarily be more standardized than the custom products available in the OTC market. Therefore, CDX options will not be as close of a hedge for the credit risk of the vast majority of bond portfolios as a customized OTC product. In addition, most CDS are five year contracts which can provide a long-term hedge. In order to maintain high liquidity exchange-traded CDX options will likely have a maximum maturity of six months. Considering rollover and transactions costs, the cost of a long-term options hedge is, therefore, unlikely to be competitive with the cost of a CDS swap-based hedge. With the lower transactions cost of the exchange-traded option, however, the CDX option may be an attractive “disaster insurance” option for shorter term hedges on portfolios that are similar to the underlying CDX portfolio. For example, the credit risk of a diversified portfolio of North American investment grade credits would tie closely to movements in the CDX index. (Note that the actual bond spreads may not tie closely due to embedded options). The correlation of credit events across companies works in favor of hedging using a CDX option as increases in the price of credit insurance are likely to be systemic, rather than fully idiosyncratic. Therefore, the

CDX options will be a better hedge for portfolios that do not perfectly match the underlying credits in the CDX because the credit risks are correlated across bonds.

## **Pricing and Liquidity Issues of CDS**

The lack of a larger hedger base of users is a minor consideration but the quality of CDS prices is a much more significant issue. The explosive growth of the CDS market has led to well-publicized issues with trade settlement as the infrastructure has not kept up with the growth of the market. According to the ISDA, credit derivatives as a group experienced 128% growth from 2004 to 2005<sup>23</sup>. Recent improvements, spearheaded by the International Swap and Derivatives Association (ISDA), have improved settlement efficiency. The bankruptcies of companies such as Collins & Aikman, Delta, Northwest, Delphi, and Calpine still caused a significant settlement lag and the settlement system has not been tested by a closely-timed string of triggering events since the explosion in market growth. More recently, settlement in the CDS market has improved from 17.8 business days in 2004 to 11.6 business days in 2005 according to an ISDA survey.<sup>24</sup> According to the same survey, the trade processing error rate has fallen from 18% in 2004 but remains at an unacceptably high 9% in 2005. Much of the improvement is due to an increase in automated trade generation from 24% to 40%. Historically trades have been done by the error-prone process of phone calls and manual order confirmations described by Alan Greenspan as a “19<sup>th</sup> century technology.”<sup>25</sup> Given the state of CDS trade settlement, there is a significant risk that the price of the ultimate underlying asset

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<sup>23</sup> ISDA 2006 Letter of the Executive Director, [www.isda.org](http://www.isda.org)

<sup>24</sup> “Battle of the Bulge: The E-trading Offensive”, Credit, July 1, 2005, <http://db.riskwaters.com/public/showPage.html?page=285981>

<sup>25</sup> “Greenspan Expresses Concerns on Derivatives, Medicare Costs”, Wall Street Journal, Hudson, Michael and Ng, Serena, May 19, 2006.

of the CDX options, the CDS and the CDX index, would not reflect accurate market prices during a shock to the credit markets. Pricing the CDX indexes depends on a LIBOR-like survey of the member banks and requires that these banks can produce accurate prices for the individual CDS.<sup>26</sup> The risk of poor price transparency in the CDS market and the risk that it would cause liquidity in the CDX option market to dry up are both significant risks for market makers and potential deterrents for CDX option users.

The difference in liquidity between on-the-run and off-the-run CDX indexes creates a similar but less significant liquidity issue. As discussed above, every six months Dow Jones and the member banks choose a new index of 125 CDS to make up the North American investment grade index. Each index is given a new series number (i.e. Series 5 for the fifth new index) while the old series continue trading. Ninety-plus percent of the names are carried over from series to series of the index but new names are brought in to the new series replace names that are no longer investment grade credits. The “on-the-run” series is the most current series while all other series are termed “off-the-run.” Historically, when a series goes off-the-run the volume drops after a few months as speculators switch to the more liquid on-the-run series.<sup>27</sup> This drop in the volume of the underlying creates additional risk that the price of the off-the-run index is not a true market price.

The CBOE could avoid this risk by initially limiting options to on-the-run CDX. Given the six month time between series of the index, this limitation would cut the potential maturity of the options down to only six months. This maturity limitation is not significant as about 70% of the current OTC CDS index option trading is for three month

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<sup>26</sup> “Guide to the Dow Jones CDX Rules”, September 2005

<sup>27</sup> “Correlation Trading: Facts and Challenges”, Financial Workshop Ulm presentation, September 2005, Dr. Mohamed El Morsalani

or shorter options. On the other hand, this limitation would not allow CBOE option traders to take an option position including multiple CDX series. Only one CDX series is on the run at any time so options on only one series of CDX would trade on the CBOE at a time under the limitation. Traders often take positions in one series of CDX versus another series<sup>28</sup> and limiting CDX options to the on-the-run index would keep that volume off the exchange. While limiting exchange-traded CDX options to the on-the-run index will lower trading volume, it is a good initial step to temper the CBOE's risk and ensure liquidity.

### **Pricing of Exchange-Traded CDX Options**

Despite these risks to the CDX options, under normal market conditions pricing and hedging the options for market makers and users is not difficult. There are several academic models to price options on individual CDS options including a SSRD model and a Black's-like model.<sup>29</sup> These models require the user to estimate two unobservable variables: credit spread volatility and the recovery rate on the reference asset. Options on CDS indexes would also require the user to estimate the correlation between the CDS in the index using historical data or current CDX tranche prices.<sup>30</sup> While there is no single accepted model for pricing CDX options, there are enough decent models to allow players to price and trade the CDX options. In fact there are already software packages, such as FinCAD, that have functions for pricing CDS index options.<sup>31</sup> Any model of

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<sup>28</sup> For example see "Credit Derivatives Insights, Pick and Roll: CDX March Madness", Morgan Stanley Research, March 17, 2006

<sup>29</sup> For example see "Credit Default Swap Calibration and Derivatives Pricing with the SSRD stochastic Intensity Model", Finance and Stochastics, Brigo, Damaino and Alfonsi, Aurelien, March 2004; see also "The Valuation of Credit Default Swap Options", Hull, John and White, Alan, January 2003

<sup>30</sup> See for example "An Overview of Credit Derivatives and Structured Credit Investment Themes", Morgan Stanley presentation, March 2, 2006, Pg 27

<sup>31</sup> For example see [www.fincad.com](http://www.fincad.com)

CDX options will generate an option delta that will allow a user to delta hedge the CDX options with the frequently-traded CDX index. In general, exchanges are agnostic to pricing models. Contracts currently trade on the VIX volatility index, options for which there is no agreed-upon pricing model and for which traders use different models.<sup>32</sup> Pricing and hedging the CDX options will not be a limiting factor on the exchange-traded CDX option market.

### **Structure of Exchange-Traded CDX Options**

The mechanics of exchange-traded CDX options will be different from a regular swaption, although the pricing will be similar. Settlement of a typical swaption gives the exerciser a position in a swap if the option is exercised. The exchange-traded CDX, on the other hand, will settle in cash based on the current spread of the CDX index. The value of the two methods of settlement will be exactly the same because the CDX index price is based on the market price of the basket of swaps in the CDX at any point.

Given the potential pricing issues with CDS, another possible option is a binary contract which would deliver a predetermined value upon the occurrence of a stated event. One possible example of a stated event would be the downgrade of a certain number of names in the CDX index. While this binary option would abstract away from CDS pricing issues, it would not be as effective as a hedge, nor would it be as hedgable as an option based on the CDX spread.

Every CBOE contract has provisions that determine settlement in the event that there is no market price for the underlying and these provisions would be critical for a CDX option contract. One example of such a provision is to use the closing price on the

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<sup>32</sup> Discussion with Catherine Shalen, CBOE

underlying from the previous day in the event that there is no current market price. Another option is to accelerate the expiration of the contract in the case of pricing issues. Accelerated expiration is not an attractive option given that it would break the market maker's hedge at precisely the time that the liquidity in the market has dried up. After researching existing contracts, none of the currently traded contracts on the CBOE present the same type of risk in the pricing of the underlying as would the CDX-based options. Carefully writing the contracts for pricing contingencies will be crucial to mitigate the risks of the exchange and the market makers in the event of a CDS pricing crisis.

The sizing of the CDX options contracts is also critical to driving volume to the exchange. Individual trades of the CDX traded on the OTC market can be very large, up to and over a hundred million dollars in notional value. The exchange, however, would prefer a much smaller contract in order to enhance volume and liquidity. There is a balance in sizing because larger contracts are more attractive to institutional players while smaller contracts will appeal more to the retail market. The CBOT's experience with pricing the Dow contracts shows that sizing greatly affects the market for a contract. The initial Dow contracts were unsuccessful because they were too large for the retail market, \$25, while the "baby-Dow" contracts at \$5 have traded at a much higher volume.<sup>33</sup>

It will be difficult for the exchange to compete with the well-established OTC market for large institutional buyers. Retail investors, on the other hand, are not currently able to access the CDS option market. These two factors argue for sizing the CDX option contracts on the smaller side if you believe that there will be a significant retail market for the CDX options. In addition, attracting a retail market will encourage the

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<sup>33</sup> Chicago Board of Trade website, [www.cbot.com](http://www.cbot.com)

dealers to cooperate with the launching of the new product. If the exchange-traded product is tailored to a different customer base, the dealers will not see the new product as directly competitive with their OTC offerings and are more likely to trade the product. With the CDX recently trading around 40 to 60 basis points and including the 100X unit multiplier for all CBOE options, an option based directly on the CDX would have a contract size of about \$4,000 to \$6,000. Using simplified valuation assumptions<sup>34</sup>, the premium on this contract would be about \$4.50, right in line with the below \$10 premiums preferred by the retail market.<sup>35</sup> A contract sized directly on the CDX spread would generate a premium that would be attractive to the target retail market.

While the notional value of a position in the CDX changes as a name is removed due to a triggering credit event, the contract value of the exchange-traded CDX contract will not change. While this will require market players to rebalance their hedges after a triggering credit event and creates some basis risk, the added complexity in the option would likely confuse retail consumers. The difficulty and cost of trading the liquid CDX index does not outweigh the increased difficulty in modeling and valuing the basis-changing option. The CBOE should discuss this issue with market makers to evaluate their tolerance for handling this basis risk.

## **Practical Considerations**

There are several other practical issues that the CBOE should consider in deciding whether to offer CDX options. Dow Jones and the member banks have not yet licensed the CDX index to any exchange. In order to exchange-trade CDS index options, the

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<sup>34</sup> Used Black model and assumed constant CDX spread of 50 bp, risk-free rate of 6%, and 6 month maturity; also used volatility of 33% estimated from CDX actual and reconstructed historical data from 11/30/01 to 7/29/05. Simplified model used to only to roughly estimate the value of a contract.

<sup>35</sup> Joe Levin presentation from class

CBOE would have to license or create a liquid index to underlie the option. Basing the options on a well-known and liquid index is the easiest and best option but it may be difficult to convince Dow Jones to license the index. Another potential practical issue is the regulatory hurdles that the SEC might impose. CDX options have different risks than other exchange traded products and it is likely that the review process by the SEC could take months, if not years. With such a different risk profile from other products, there is no guarantee that the SEC would be willing to approve a CDS option product at all, especially a product partially targeted to retail customers. The trading method of the contracts is another practical consideration. Electronic trading is likely to work fine with the lower-priced contracts described in the paper but many constituents prefer floor trading for larger contracts. The systems requirements for a CDX contract are not likely to be a significant roadblock as the CDX contract could probably use the CBOE's existing systems. While it is beyond the scope of this paper, the CBOE should also do a break-even study to determine the minimum volume required to break-even on the CDX contracts. This break-even study, along with review of pricing and risk considerations reviewed above, could help determine whether and when to introduce options based on CDX other than the North American Investment Grade index.

## **Conclusion**

Options on the CDX index could be an exciting new product for the CBOE if several issues are worked out. The primary barrier to introducing the options is the risk of price failure in the underlying CDS market. The CBOE should keep a close watch on the improvements in the CDS trading infrastructure in order to assess changes in this risk. Meanwhile, the CBOE should begin initial discussions with Dow Jones on licensing and

seek input from market makers, potential customers, and regulators in order to further refine the design of the product.