Why Do Insurance-Linked Exchange-Traded Derivatives Fail?

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Abstract: This paper analyzes the reasons why exchange-traded insurance-linked derivatives like catastrophe insurance futures and options have failed to attract interest from financial market participants. There are various risk components embedded in exchange-traded catastrophe insurance derivatives—namely, basis risk, liquidity risk, and development risk—which may limit their appeal to the hedging and investing communities. Our analysis suggests that the choice of an industry loss index as a trigger for exchange-traded derivatives (and other securitized instruments) may not matter as much as commonly thought, or at least may not be the main reason why insurance-linked exchange-traded derivatives fail. Our research also shows that, when analyzing large storm estimates, a long development period may not be as crucial to the success of exchange-traded derivatives. A few academic papers have cited the lack of standardization in the insurance-linked securities (ILS) market, a steep learning curve for both hedgers and speculators, costs and barriers to entry, and inadequate regulation as reasons for the slow development of exchange-traded insurance-linked derivatives. But we also believe that a penalizing margining system and product design issues like those mentioned above contribute to the lack of liquidity in this market. Futures and options exchanges can easily correct these limitations. [Key words: insurance securitization, derivatives, capital markets]

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INTRODUCTION

This paper analyzes the reasons why exchange-traded catastrophe insurance futures and options have failed to attract interest from financial market participants. Based on our analysis, we suggest some changes that may enhance the effectiveness of these contracts. There are various risk components embedded in exchange-traded catastrophe insurance derivatives—namely, basis risk, liquidity risk, and development risk—which may limit their appeal to the hedging and investing communities. In broad terms, basis risk in financial derivatives markets exists because the payment made to the purchaser of derivatives contracts may not be perfectly correlated to his/her risk. Liquidity risk measures market trading thinness. The development period is defined as the length of time between the end of an exchange-traded derivative contract period and the contract’s settlement date; long development periods risk tying up capital.

Relatively new developments in exchange-traded derivatives motivate this research. Natural catastrophe–linked futures and options instruments have re-emerged after a failed similar attempt by the Chicago Board of Trade (CBOT) in the mid- to end-nineties. In the last few years, the Chicago Mercantile Exchange (CME), the New York Mercantile Exchange (NYMEX), the Insurance Futures Exchange Services (IFEX), and EUREX (the Swiss-German futures and options exchange) have offered exchange-traded catastrophe-linked futures and options contracts, which differ in both the index trigger used to settle the contracts, and each contract’s design. Some of these instruments are no longer listed. We will conduct our analysis using instruments like the CME contracts, which have a payout triggered by a parametric index, versus derivatives like the IFEX and EUREX instruments, which have a payout triggered by an index of industry losses (usually provided by Property Casualty Services, or PCS). We will also hypothetically compare some of these exchange-traded derivatives with an alternative design based on an index of modeled loss, like the Paradex index.

There are three components to this research. We first focus on the importance of the index used as the derivative contract’s underlying trigger (parametric, modeled, or industry loss–based) and suggest that the choice of the index may not matter as much as commonly thought or at least may not be the main reason why insurance-linked exchange-traded derivatives fail. We compare three catastrophe-linked indices and show that under some circumstances, they have a much higher correlation than expected, despite noticeable differences in the methodologies used for their construction. We then analyze the importance of development risk in the choice of triggers underlying exchange-traded futures and options contracts, and
note that, when analyzing large storm estimates, a long development period may not be needed to more accurately settle the contracts and ensure that their payoff accurately compensates for losses incurred. Finally, we provide suggestions on how exchanges may be able to offer more effective risk management tools to the insurance industry.

LITERATURE REVIEW

Much has been said and written about the insurance-linked securities market (ILS) in the last fifteen years, notably about catastrophe bonds (CAT bonds). Government-sponsored organizations (OECD, World Economic Forum) and private firms (Swiss Re, Guy Carpenter, and Benfield Aon) have extensively studied the growth of the market, its attractiveness, and its limitations. More recently, Bouriaux and MacMinn (2009) and Cummins and Weiss (2009) wrote extensive “umbrella” papers on the genesis and growth of the ILS market and document its potential for success and limitations. This paper does not intend to cover the entire spectrum of issues related to the ILS market, but instead highlights a few important points.

Other structures have emerged in the catastrophe risk market as well as in other areas of insurance risk, such as life and health.\(^3\) However, CAT bonds still represent the dominant form of ILS. Longevity and mortality bonds have been issued in the life insurance market but their contribution to the ILS market is now very limited. A number of life transactions took place during 2004 to 2007 that financed reserves for term or universal policies for a variety of insurers. These bond issues were often referred to as XXX or AXXX transactions in reference to the NAIC model regulations that these transactions were designed to address. However, several of these reserve financing–oriented deals incurred specific problems related either to the credit problems of the bond’s financial guarantor or to investment losses.\(^4\) As a result, while life bonds issued represented almost 50% of the ILS market in 2007, their contribution to the ILS market has now dwindled.\(^5\)

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\(^3\)See, for instance, Deng, Brockett, and MacMinn (2012).

\(^4\)For more information on XXX and AXXX bond transactions, see the NAIC Capital Markets Special Report (2012) at [www.naic.org/capital_markets_archive/120504.htm](http://www.naic.org/capital_markets_archive/120504.htm)

\(^5\)Aon Benfield’s 2012 annual report on ILS shows that between June 1, 2011 and June 1, 2012, life and health issuance activity contributed only $330 million to a total issuance of $6.4 billion.
Academic research has essentially focused on three areas: the pricing of ILS, the appeal of such instruments to investors as zero-beta assets, and basis risk.

**Pricing**

At the genesis of the market, the pricing of CAT bonds and other ILS was one of the most debated research issues. Academics discussed the benefits of an actuarial approach versus a financial approach to model the pricing of CAT bonds and other ILS securities. The actuarial approach used to model yields on ILS starts with the recognition that equilibrium models, implying that disaster risks should yield an unbiased actuarial estimate of expected loss, do not explain why yields on CAT bonds consistently exceed actuarially fair levels. Academics differ on the determinants of insurance-linked securities risk premium spreads. Some attribute high yields paid on ILS structures to the uncertainty associated with actuarial probabilities.6 Others, like Froot and Posner (2000), argue that the pricing of risks in ILS structures (and therefore the determination of risk premium spreads) is determined by reinsurers, who, via the creation of special purpose vehicles (SPV), facilitate the issuance of ILS.

Alternative research focused on a financial approach to model the pricing of CAT bonds and other ILS structures. Vaugirard (2003) uses an arbitrage approach to value insurance-linked securities, which accounts for catastrophic events and interest rate randomness, notwithstanding the fact that markets are incomplete. Cox, Pedersen, et al. (2000) recognize that the pricing of CAT bonds requires an incomplete market setting and develop a pricing method based on a model of the term structure of interest rates and a probability structure for the catastrophe risk.

Academic research has also approached the pricing of ILS from an empirical standpoint. Pricing data from Lane and Beckwith (2007) show that CAT bond spreads have significantly declined since 2001, although, as noted by Cummins and Weiss (2009), the CAT bond market is not immune to the underwriting cycle.7 The spreads widened in 2005–2006 as a result of a rough hurricane season. Cummins and Weiss don’t associate the cyclical behavior of CAT bond prices with the shrinking coverage capacity that normally results from heavy losses. Instead, they attribute CAT bond cycles to uncertainty about the accuracy of loss models following the occurrence of a large catastrophe. In other words, investors tend to ques-

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6See, for instance, Major (1999).
7CAT bond spreads are defined here by the ratio of the bond premium over LIBOR to the bond expected loss. The historical information provided by Lane and Beckwith is based on an average of secondary market transactions.
tion their participation in the ILS market. In addition, when demand for ILS protection increases, new fund providers need to acquire expertise in these markets, and time lags occur.

Finally, recent research has addressed the pricing of other ILS structure types, like longevity or mortality bonds. For instance, Deng, Brockett, and MacMinn (2012) developed a pricing methodology for longevity bonds using a stochastic diffusion model that captures both asymmetric up and down rate jumps and cohort effect in mortality trends.

**DIVERSIFICATION BENEFITS AND ZERO BETA ASSETS**

Research has also focused on the diversification benefits of adding insurance-linked securities in investors’ portfolios. In the late 1990s and early 2000s, several papers examined the hypothetical diversification benefits of holding ILS in investor portfolios and have shown that capital markets participants, by allocating a small percentage of their assets in insurance-linked securities, may create a more efficient portfolio.\(^8\) The argument is that, generally, the returns on securities that have a payoff triggered by losses resulting from a natural disaster display a low correlation with stock and bond returns. But at the time, these results were merely suggestive. There was little historical evidence of ILS returns, due to secondary market illiquidity, and these research papers just assumed risk parameters for these investments.

In their 2009 paper, Cummins and Weiss provide information on the correlation between the investment performance of CAT bonds (measured as a composite of returns of CAT bond mutual funds and compiled by Swiss Re) with that of various bond instruments and indices and with that of stock indices. In particular, they compare the Swiss Re overall ILS index and the Swiss Re BB-rated index with that of the Merrill Lynch BBB corporate bond index, the Barclays CMBS index, the S&P 500 stock index, the 3-month LIBOR rate, and three US government bond yield rates. They present two correlation matrices, one for the period preceding the global financial crisis (January 2002 to June 2007) and one encompassing the crisis (July 2007 through early January 2009). Their analysis provides mixed results. The pre-crisis matrix shows almost no correlation between CAT bond returns and alternative investments. But the post-crisis matrix shows significantly higher correlations between the Swiss Re return indices and

three of the total return indices (the BBB corporate bond index, the CMBS index, and the S&P500 stock index), compared to the pre-crisis period. Perhaps these results are not surprising as the financial crisis likely impacted all markets.

Basis Risk in Index-Triggered Financial Structures

The trade-offs between indemnity-triggered bonds and index-triggered (or industry-triggered) bonds have been well documented. Successful securitization of risk generally arises when the product structure meets the needs of both the issuer of the security and the investor in the security. In some instances, these needs don’t match. This partly explains the fragmentation of the ILS market, as some ILS have a payout tied to an index-based or industry-based trigger (a loss, parametric, or modeled trigger) or one tied to a company-specific or indemnity trigger. In 2011, 32% of CAT bonds had a payout tied to an indemnity trigger, 28% tied to an industry loss index (PCS and PERILS indices), and 12% tied to either a parametric or a modeled loss index. Twenty-eight percent of CAT bond transactions are issued with various other trigger types.

Indemnity-triggered instruments appeal to issuers of these securities (i.e., the insurer or the reinsurer) because they reduce or eliminate basis risk. On the other hand, index-based instruments may be more attractive to an investor than indemnity-based instruments, as the use of an industry loss or index trigger minimizes adverse selection and moral hazard costs. Index-triggered products are also likely to lower investors’ costs in evaluating company-specific underwriting and financial results.

Basis risk is inherent in index-based insurance-linked instruments and has been investigated by Zeng (2000), Croson and Kunreuther (2000), Cummins, Lalonde, and Philips (2004), and others. A report from the American Academy of Actuaries (AAA) (1999) argues that it is possible to statistically identify and measure the basis risk embedded in hedging transactions performed with index-based ILS and derivatives. Note, however, that at the time of the AAA analysis, the only index triggers available were industry loss triggers. The introductions of parametric triggers or modeled loss triggers in subsequent years add another layer to the basis risk of ILS and insurance derivatives.

Earlier empirical evidence has supported the hedging effectiveness of index-based derivatives, despite the existence of basis risk. For instance,

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9 Guy Carpenter Securities, Proprietary Database, December 2011. The PERILS Industry Loss Index Service provides industry loss estimates for European windstorms and UK floods.

10 For an extensive analysis of the trade-offs between basis risk and moral hazard, see, for instance, Canabarro, Finkemeier, et al. (2000)
Harrington and Niehaus (1999) assessed basis risk by correlating specific insurers’ loss ratios with loss ratios based on state-specific catastrophe losses and for various regional areas. They conclude that basis risk, while present, is not a deterrent to the hedging effectiveness of derivatives based on PCS industry catastrophe losses.

Recent research has also focused on the benefits of index-triggered bonds over indemnity-triggered bonds. MacMinn and Richter (2006) show that, under some circumstances, reinsurers, who issue bonds to hedge against brevity risk, achieve greater shareholder value by utilizing index-triggered securities over indemnity-based securities. Additional research has addressed the trade-off between moral hazard and basis risk. For instance, Doherty and Richter (2002) show that insurers or reinsurers who would complement an index hedge with gap insurance (like a basis swap) may, under some circumstances, lead to efficiency gains without having to address the moral hazard issue. Golden, Wang, and Yang (2007) examine the effectiveness of using methods involving forwards and futures having linear payoffs and methods using other derivatives such as options. In their paper, basis risk is examined jointly with credit risk.

BACKGROUND AND RESEARCH PROBLEM

There is a common belief that the first attempt at insurance securitization (CBOT catastrophe insurance futures and options contracts) was a response to the occurrence of Hurricane Andrew in 1992. However, in the early 1970s, Goshay and Sandor (1973) investigated the feasibility of a securitized reinsurance market for various lines of business. They argued that the reinsurance market was undercapitalized and regulation in the insurance market was ineffective in that it discouraged market innovations. In the early 1990s, a group of CBOT members and staff first developed homeowner’s insurance futures and options. It became evident that the tail risk associated with catastrophes (large size and low probability) wasn’t well covered by reinsurers who could barely offer enough capital to cover insured losses resulting from large disasters. The design of catastrophe insurance futures was in process by the time Hurricane Andrew hit the U.S., and the CBOT was able to list a first version of catastrophe insurance futures on September 25, 1992.

The CBOT contracts’ payoffs were triggered by indices of loss ratios of the U.S. homeowner insurance lines for various states and regions. The indices were calculated by the Insurance Services Office (ISO) and released on a quarterly basis (with a lag). The CBOT introduced a second version of catastrophe insurance derivatives in 1995 that departed from the original
contracts in two major ways. First, the derivatives changed from a futures contract to a simpler cash option. The futures design seemed to puzzle insurance market participants, while an option design closely resembles that of an insurance contract. Second, the payoff of the option contract was triggered by an index of estimated industry insurance losses provided by PCS, now a division of ISO. The original ISO index proved to have flaws. It was based on a ratio of total quarterly losses reported by a sample of U.S. insurance companies to an estimated industry property premium number. Only 26 companies reported the information to ISO at the time. However, the two major U.S. insurance companies, State Farm and Allstate, never reported loss and premium information to ISO. ISO grossed up the loss ratio numbers to attempt to make them representative of the industry, but the lack of data from State Farm and Allstate made these estimations difficult. This proved to be a major issue when the Northridge earthquake hit in 1994. Consequently, the ISO index grossly underreported losses to the insurance industry.\(^{11}\)

The revised CBOT contracts proved to be somewhat successful, with, at the height of their success, open interest of about 20,000 contracts. But eventually, due to a lack of interest by both CBOT members and outside market participants, the CBOT delisted catastrophe insurance options in 1999.

More recently, other exchanges, such as IFEX, once a subsidiary of the Chicago Climate Exchange, the Chicago Mercantile Exchange, and EUREX, introduced various versions of catastrophe insurance derivatives. None of them were widely utilized and some of these instruments are no longer listed.

It seems that market participants have identified the choice of the index serving as a trigger and the development risk embedded in these contracts as the two major reasons for their lack of acceptance. In our view, there is confusion between the choice of a trigger and basis risk. As discussed later in this paper, all indexes used as triggers in the ILS market contain some elements of basis risk. The issue per se is not the existence of basis risk but its quantification. Once thoroughly quantified, basis risk in financial transactions can be minimized by “over-hedging” or “under-hedging.”\(^{12}\)

\(^{11}\)A complete description of the ISO DATA Index Methodology is contained in Chapter 2 of the “Catastrophe Insurance Futures and Options” document published by the Chicago Board of Trade (1995).

\(^{12}\)The terms “over-hedging” and “under-hedging” refer to the process of transacting a higher or lower number of derivative contracts than the number that would be necessary for a company to perfectly hedge its exposure. Over-hedging and under-hedging examples using catastrophe insurance options can be found in the CBOT PCS Catastrophe Options User’s Guide (1995, pp. 35–36).
Development risk (also called tail risk) exists when exchange-traded derivatives settle well after the occurrence of the catastrophe. This is the case for the current IFEX and EUREX futures contracts, which, respectively, settle with a maximum of 18 months and 30 months after the occurrence of the catastrophe. On the other hand, derivative instruments with a payout triggered by the Paradex index could potentially settle in 40 business days (as Risk Management Solutions (RMS) releases its modeled loss estimates 40 days after the occurrence of the catastrophe), while the CME event-based futures and options usually settle two days after the occurrence of the catastrophe. Development risk is equally important to both hedgers and investors. Insurance companies would have to pay claims resulting from the occurrence of a catastrophe in advance of the contract payoff, which remains unknown until settlement. Capital is tied up until the expiration of the contracts.

Triggers (or attachment points) on insurance-linked securities and derivatives determine the conditions under which payments are made to the security sponsor. The generic trigger types are (a) the indemnity trigger, where the payouts depend on the insurer’s or reinsurer’s actual losses; (b) the industry loss trigger, where the payouts are triggered by an estimated industry loss for catastrophic events; (c) the parametric trigger, where the payouts are determined by well-defined parameters of a CAT event, e.g., wind speed and location of a hurricane or magnitude and location of an earthquake; (d) the modeled trigger, where the payouts are triggered by a model industry loss that is determined by running the actual event parameters through a modeling firm’s database of industry exposures; and (e) the hybrid trigger, where the payouts are determined by a combination of two or more existing trigger types.

The indemnity trigger requires the disclosure of details about the covered portfolio that make it more costly both to the insurer that would prefer not to reveal the information, and to the investor, who must digest the information. And it also generates a possible conflict of interest since the insurer may settle catastrophic claims in a way that is disadvantageous to investors; this is a well-known moral hazard problem. On the other hand, the index triggers remove the moral hazard problem from consideration but create basis risk.

In the U.S., there is now a variety of index triggers, including two new industry loss indices that gained prominence in 2011: the Country Weighted Industry Loss Index (CWIL), developed by reinsurance broker Guy Carpenter, and the Verisk Catastrophe Index (CVI), developed by the

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13Or less when PCS or EUREX feels confident enough to release an early final settlement price.
ISO, the parent company of PCS. Both indices track industry losses for U.S. hurricanes and earthquakes using information provided both by PCS and by proprietary exposure databases broken down by county levels.

This paper focuses on the three main catastrophe insurance indices: the PCS industry loss index, the Chicago Mercantile Exchange (CHI) parametric index, and the Paradex modeled loss index developed by RMS, which all have readily available historical information. The following paragraphs provide only a summary description of each of these indices. A more exhaustive description of each index is available on the index provider’s website.\(^{14}\)

**PCS Industry Loss Index**

In the U.S., Property Claims Services (PCS) has been the leader in compiling and providing estimates of insured property losses resulting from catastrophes. For each catastrophe, the PCS loss estimate represents anticipated industry-wide insurance payments for personal, commercial, and automobile lines of business. PCS assigns serial numbers to each catastrophe to track its losses and to provide damage and claim estimates.

PCS generally combines two methods to develop an accurate estimate. First, it conducts on-the-ground surveys of insurers to gather data on predicted claim volumes and amounts (i.e., amounts reserved by the company to pay for the claim above a set deductible).\(^{15}\) It then combines the surveyed data with trend factors to determine a loss estimate. PCS also maintains a proprietary database containing information on the number and types of structures, for each U.S. state and by ZIP code, and determines the number of insurable risks in a specific area. The structure data information is then cross-matched with the on-the-ground survey.

PCS releases a preliminary estimate of losses, a few days after the occurrence of a catastrophe. For unusually large catastrophes, it resurveys the affected insurers every 60 days, until it feels confident of the industry loss outcome.

PCS loss industry indices have been constructed to serve as triggers for the payoff of various insurance-linked securities or derivatives. They can be based on the cumulative estimates of catastrophes over a certain period of time\(^{16}\) or just as an index number tracking the loss development of a specific catastrophe. The IFEX and EUREX futures contracts are based

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\(^{15}\)PCS polls companies that represent a market share of about 70% of the insurance underwriting market and extrapolates the rest.  
\(^{16}\)In the nineties, the Chicago Board of Trade (CBOT) futures and options contracts were based on a PCS index that tracked cumulative industry losses for an entire calendar year.
on a PCS index that tracks the loss development of specific catastrophes (hurricanes or earthquakes). The index is quoted in points with one point equivalent to a $1 billion loss. The futures offer a binary payout of $10,000 (when the industry loss amount reported by PCS equals or exceeds one of the applicable loss trigger levels) or zero. The applicable loss trigger levels for each listed event are currently $10 billion to $50 billion, in increments of $10 billion. Binary options or futures replicate the design of industry loss warranties (ILW), which are popular index-triggered reinsurance contracts.

**The CME Hurricane Index (CHI)**

In 2007, CME Group started offering a variety of futures and options to manage the risk of hurricanes in the U.S. For instance, CME futures and options contracts can be event-based (each contract settles after the occurrence of each event), seasonal (based on an aggregate of CHI values for storms occurring during a calendar year), or seasonal maximum (where the contract payout is triggered by the CHI value of the largest storm of the season). All these contracts expire against the CHI index final settlement value times $1,000. More recently, the CME introduced Hurricane Index binary options which offer a binary payout of $10,000 (if the final value of the CHI index exceeds the option strike price) or zero.

EQECAT, a catastrophe modeling firm, is responsible for the calculation of the CHI on behalf of the CME. The CHI is a parametric index that measures the potential for damage from hurricanes. It is calculated based on wind speed and the radius of hurricane-force winds. Unlike the Saffir-Simpson scale, which classifies hurricanes in categories from 1 to 5, the CHI is a continuous measurement, starting from zero and having no maximum value. The data used by EQECAT for its CHI calculation is taken from the Public Advisories issued by NOAA's National Hurricane Center (NHC). EQECAT also uses as reference value a wind force of 74 statute miles per hour (which is the threshold used by NHC to change its classification from a tropical cyclone to a hurricane) and a radius of 60 statute miles. Based on the formula used to calculate the CHI, a storm with the same radius and velocity as the reference values would have a CHI value of 2.5. If the velocity is less than 74 miles per hour, then the CHI is zero.

**The Paradex U.S. Hurricane Index**

RMS, which compiles and manages the Paradex Index, defines it as a “parametric industry loss index that proxies industry insured losses due to US hurricanes.” Our interpretation of the index is that it is more equivalent to a modeled loss index, unlike the CHI, which, to us, is a pure parametric index based only on the physical characteristics of a
catastrophe. RMS runs its Industry Exposure Database through its proprietary U.S. hurricane model to estimate industry losses for each event.\textsuperscript{17} Once a hurricane occurs, RMS runs its model based on the parameters and observed wind speeds of the event, and then extrapolates the financial industry impact of the hurricane with its industry exposure database. Index values are calculated per county for 23 states subject to hurricane risk and for three lines of business: residential, commercial and automobile. These numbers can be aggregated to estimate the global impact of a hurricane.

To date, no futures or options exchange offers derivatives triggered by the Paradex Index. However, it is easy to conceive an event based futures or options contract with a slightly delayed settlement, given that RMS releases the Paradex index values 40 business days after the event occurrence.

All three indices discussed previously show deficiencies in their construction and design and, as a result, carry various levels of basis risk. PCS industry loss estimates, while serving as the industry benchmark for catastrophe losses, largely rely on a survey of insurers rather than on “hard” loss numbers, and the company polls only about 70\% of insurers and must extrapolate the rest. On the other hand, the CHI index is strictly based on actual observations of wind speed and radius. In theory, insurers and reinsurers, who are the most likely hedgers in the CME futures and options contracts, can use the services of a catastrophe modeling firm (like EQECAT, which calculates the CHI index) to assess their own losses resulting from the physical characteristics of a catastrophe. Practically, insurers and other hedgers face parametric risk, i.e., the risk that the parametric features of a catastrophe don’t map well the hedger’s own exposure. Finally, the Paradex Index incorporates both components of the previous two indices. It is a combination of a parametric index based on wind forces translated into an assessment of financial industry losses resulting from the value of the index. The problem here is that the index is calculated based on a probabilistic approach loss estimation model to quantify hurricane risk in the U.S. As such, the Paradex Index is subject to both model and parametric risks. In the last fifteen years, catastrophe modeling firms had to re-calibrate their models many times, in order to more accurately assess industry losses.

\textsuperscript{17}The RMS U.S. Hurricane model is a probabilistic loss estimation model that aims to quantify hurricane risk in the U.S. It essentially measures damages resulting from wind hazard. For more details on the Paradex Index, see www.rms.com/CapitalMarkets/ParametricSolutions.
In addition to basis risk, industry losses–based contracts also carry development risk, as they settle 18 months (IFEX) or 30 months (EUREX) after the end of the calendar year or sooner, if certain criteria are met. On the other hand, the CME derivatives generally expire two days after storm landfall.

**ANALYSIS OF INDEX CHOICE AND DEVELOPMENT PERIOD**

Before we provide descriptive statistics on the various catastrophe-linked indices presented in this paper, we would like to point out that we are fully aware of the limited set of data presented. In the whole historical spectrum of wind storms, very few have resulted in billions of dollars of damages, and consequently, our data sample is small. Originally, we wanted to base our analysis using daily settlement values for the CME and the IFEX/EUREX futures and options contracts, but due to the lack of trading in these instruments, daily settlement values become impractical as these are merely estimations provided by the exchanges. We then decided to focus on final settlement values.

Three sources of data on hurricanes were used in this study—the PCS (Property Claims Services) industry loss estimates (which serve as a base for the final settlement of the IFEX and EUREX futures and options contracts), the CHI (CME Hurricane) Index, and the Paradex Index (which would serve as a base for a final settlement of hypothetical futures/options contracts triggered by the Paradex loss estimates). We obtained the PCS final loss estimates for 24 hurricanes from 1998 (starting with Bonnie) to 2011 (ending with Irene). In addition, we have PCS early estimates for a subset of these storms, which we use in later analysis. The CHI data include 118 storms from 1991 to 2009, not all of which made landfall as hurricanes. The Paradex Index data include 29 hurricanes from 1950 (starting with Easy) to 2008 (ending with Ike). The PCS loss data and the Paradex Index data are dollar financial losses, the former done via survey and the latter through simulation. The CHI is a continuous number, which the CME refers to as a “measure of potential for damage,” that combines wind speed and storm radius to produce a value.

The CME offers futures and options for a variety of regions on the East Coast. One of particular interest is the CHI Cat-In-A-Box (Gulf Box), which is an area bounded by 95°30’0”W on the west, 87°30’0”W on the east, 27°30’0”N on the south, and the corresponding segment of the U.S. coastline on the north.
The CHI Index data contain two important numbers for each hurricane—the landfall number and the final settlement number. The landfall number is the CHI value at the time of the event landfall. It is a reference number only. The CHI value used for the final settlement of each named storm in the CME futures and options contracts is calculated using the data contained in the Public Advisory issued by the NHC immediately prior to the occurrence of the landfall. The Gulf Box settlement value is the “cat-in-the-box” final settlement value, using the maximum index value calculated while the hurricane was in the Cat-In-A-Box.18

In some instances, more than one landfall is possible, in which case each landfall will have a final settlement value.19 Under such a scenario a hedger would need to be careful to re-establish or adjust the hedge. Ultimate hedge effectiveness could be impacted in those rare cases where a second landfall value exceeds the first one in a parametrically settled contract. We include two tables, one based on first settlement and another based on the highest settlement value, to illustrate this potential problem.

The PCS final settlement values and the CHI landfall and settlement values have 14 storms in common. PCS and CHI Gulf Box have 6 storms in common. Finally, the PCS Paradex index settlement values have 11 storms in common. Table 1 presents summary statistics for the PCS final and CHI first landfall and first settlement values for the storms in common.

The mean loss for these 14 storms estimated by PCS is about $7.3 billion, with the median about $4.1 billion; a positive skew. Note that this positive skew remains even if Hurricane Katrina is removed from this data set, and so it is not driven by the high value of this one storm.20 The highest loss estimated by PCS came from Katrina (2005), at over $41 billion.

The CHI landfall (settlement) values have higher medians than means, a negative skew, at 8.49 (8.81) to 7.90 (8.20) respectively. The first CHI landfall (settlement) values for Katrina (2005) are the low values in Table 1. The largest CHI landfall value comes from Hurricane Bonnie, while the largest CHI settlement is attributed to Hurricane Wilma.

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18As mentioned previously, the CHI values start from zero (when the velocity of a storm is less than 74 statute miles per hour) and have no maximum value.
19For a hurricane that makes two or more landfalls in the same contract-specific location (e.g., Gulf Coast) within a 12-hour period, the CME publishes as the final settlement the CHI value based on the Public Advisory immediately prior to the landfall. For a hurricane that makes two or more landfalls in the same contract-specific location that are in excess of 12 hours apart, the CME publishes separate final settlement values of the CHI prior to each distinct landfall.
20The mean (median) without Katrina for the remaining 13 storms is $4,731,015,384.62 ($3,655,000,000.00).
To understand these descriptive statistics, it is important to note that Hurricane Katrina was a very unusual event, not only because of the amount of damages created, but also because of the storm’s occurrence pattern. Usually when a storm makes more than one landfall, the subsequent landfalls tend to have smaller associated CHI values, as the storm loses its strength. But Hurricane Katrina was the exception in that the second CHI landfall and settlement values were much larger than the first.

As result, in Table 2, we recalculate statistics using the highest CHI landfall (settlement) values. Of course, Hurricane Katrina represents the highest CHI values for both landfall and settlement. However, even with
WHY DO INSURANCE-LINKED EXCHANGE-TRADED DERIVATIVES FAIL?

Table 2. Summary for Comparable Storms

<table>
<thead>
<tr>
<th>Storm Name</th>
<th>PCS final $(000)</th>
<th>CHI Index highest landfall</th>
<th>CHI Index highest settlement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonnie ('98)</td>
<td>360,000</td>
<td>10.70</td>
<td>10.70</td>
</tr>
<tr>
<td>Georges ('98)</td>
<td>2,955,000</td>
<td>5.12</td>
<td>5.12</td>
</tr>
<tr>
<td>Floyd ('99)</td>
<td>1,960,000</td>
<td>9.64</td>
<td>9.64</td>
</tr>
<tr>
<td>Isabel ('03)</td>
<td>1,685,000</td>
<td>7.72</td>
<td>7.72</td>
</tr>
<tr>
<td>Charley ('04)</td>
<td>7,510,000</td>
<td>9.01</td>
<td>10.40</td>
</tr>
<tr>
<td>Frances ('04)</td>
<td>4,595,000</td>
<td>7.14</td>
<td>6.63</td>
</tr>
<tr>
<td>Ivan ('04)</td>
<td>7,110,000</td>
<td>10.09</td>
<td>10.09</td>
</tr>
<tr>
<td>Jeanne ('04)</td>
<td>3,655,000</td>
<td>7.98</td>
<td>7.98</td>
</tr>
<tr>
<td>Dennis ('05)</td>
<td>1,115,000</td>
<td>4.12</td>
<td>6.89</td>
</tr>
<tr>
<td>Katrina ('05)</td>
<td>41,100,000</td>
<td>16.47</td>
<td>19.04</td>
</tr>
<tr>
<td>Rita ('05)</td>
<td>5,608,200</td>
<td>9.85</td>
<td>9.85</td>
</tr>
<tr>
<td>Wilma ('05)</td>
<td>10,300,000</td>
<td>10.18</td>
<td>11.24</td>
</tr>
<tr>
<td>Gustav ('08)</td>
<td>2,150,000</td>
<td>7.15</td>
<td>7.15</td>
</tr>
<tr>
<td>Ike ('08)</td>
<td>12,500,000</td>
<td>10.19</td>
<td>9.91</td>
</tr>
<tr>
<td>Mean</td>
<td>7,328,800</td>
<td>8.95</td>
<td>9.46</td>
</tr>
<tr>
<td>Median</td>
<td>4,125,000</td>
<td>9.32</td>
<td>9.74</td>
</tr>
<tr>
<td>High</td>
<td>41,100,000</td>
<td>16.47</td>
<td>19.04</td>
</tr>
<tr>
<td>Low</td>
<td>360,000</td>
<td>4.12</td>
<td>5.12</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>9,978,108</td>
<td>2.83</td>
<td>3.19</td>
</tr>
</tbody>
</table>

the change, the CHI data are still negatively skewed, while the PCS data are positively skewed.

Table 3 presents a comparison between the PCS final loss estimates and the CHI Gulf Box settlement values for the six storms that are common to both data sets. Unlike the CHI Landfall and Settlement values, the mean for the Gulf Box exceeds the median, as is the case for the PCS data.

Table 4 presents a comparison between the PCS final loss estimates and the Paradex industry loss estimates for the 11 storms that are common in both data sets.
In Tables 5 and 6, we analyze the relationship between the PCS final loss estimates, the CHI settlement values, and the Paradex loss estimates. Table 5 uses the CHI first landfall and the CHI first settlement values, while Table 6 uses the highest settlement values when hurricanes make multiple landfalls. Again, the distinction is important especially with Hurricane Katrina (2005). We use correlation and regression analysis. The regressions are OLS with PCS final loss estimates as the independent variable. While the regressions are not used in a predictive sense, the advantage of interpreting the R-squared as “proportion of variance” explained may be preferred to correlation for some, which is why we include both measures. The effect of the choice in the first versus the highest value has a dramatic effect on the correlation and regression results.

In Table 5, although correlations with PCS are high for both the Paradex index and the CHI Gulf Box index, only the Paradex index has a significant relationship to the PCS loss estimates, while in Table 6, the CHI landfall, CHI settlement, and Paradex are all highly and significantly correlated with the PCS loss index.21 The sample size is small in all cases,

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21We attribute the lack of significance in the correlation between the PCS loss estimates and the Gulf Box CHI index to the small sample of storms (6) taken into consideration.
WHY DO INSURANCE-LINKED EXCHANGE-TRADED DERIVATIVES FAIL?

Table 4. Summary for Comparable Storms

<table>
<thead>
<tr>
<th></th>
<th>PCS final $(000)</th>
<th>Paradex Index $(000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floyd ('99)</td>
<td>1,960,000</td>
<td>3,400,000</td>
</tr>
<tr>
<td>Isabel ('03)</td>
<td>1,685,000</td>
<td>4,000,000</td>
</tr>
<tr>
<td>Charley ('04)</td>
<td>7,510,000</td>
<td>4,300,000</td>
</tr>
<tr>
<td>Frances ('04)</td>
<td>4,595,000</td>
<td>6,000,000</td>
</tr>
<tr>
<td>Ivan ('04)</td>
<td>7,110,000</td>
<td>3,400,000</td>
</tr>
<tr>
<td>Jeanne ('04)</td>
<td>3,655,000</td>
<td>8,800,000</td>
</tr>
<tr>
<td>Katrina ('05)</td>
<td>41,100,000</td>
<td>28,100,000</td>
</tr>
<tr>
<td>Rita ('05)</td>
<td>5,608,200</td>
<td>2,400,000</td>
</tr>
<tr>
<td>Wilma ('05)</td>
<td>10,300,000</td>
<td>25,600,000</td>
</tr>
<tr>
<td>Gustav ('08)</td>
<td>2,150,000</td>
<td>4,200,000</td>
</tr>
<tr>
<td>Ike ('08)</td>
<td>12,500,000</td>
<td>10,900,000</td>
</tr>
<tr>
<td>Mean</td>
<td>8,924,836</td>
<td>9,190,909</td>
</tr>
<tr>
<td>Median</td>
<td>5,608,200</td>
<td>4,300,000</td>
</tr>
<tr>
<td>High</td>
<td>41,100,000</td>
<td>28,100,000</td>
</tr>
<tr>
<td>Low</td>
<td>1,685,000</td>
<td>2,400,000</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>10,700,683</td>
<td>8,681,376</td>
</tr>
</tbody>
</table>

Table 5. PCS Final Estimates versus Comparable Storms

<table>
<thead>
<tr>
<th></th>
<th>CHI Index Gulf Box</th>
<th>CHI Index 1st landfall</th>
<th>CHI Index 1st settlement</th>
<th>Paradex Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>6</td>
<td>14</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>Correlation</td>
<td>0.90776</td>
<td>-0.56801</td>
<td>-0.50271</td>
<td>0.7874418</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.824036</td>
<td>0.322639</td>
<td>0.25272</td>
<td>0.620028</td>
</tr>
<tr>
<td>t-statistic (p-value)</td>
<td>4.32805 (0.01236)</td>
<td>-2.39078 (0.034)</td>
<td>-2.01451 (0.067)</td>
<td>3.8322 (0.004)</td>
</tr>
</tbody>
</table>

but the results from Table 6 do suggest that all three methods essentially fill the same role.

Table 7 compares the RMS Paradex industry loss estimates with those of PCS. As mentioned previously, RMS publishes industry loss estimates,
as captured by the Paradex index, 40 days after the occurrence of a hurricane. PCS, on the other hand, provides subsequent estimates until it feels confident that it has reached an accurate loss number.

Table 8 provides the CHI highest settlement values versus the PCS first loss estimates for the subset of storms for which PCS first-estimate data were available. As noted before, the CHI settlement generally occurs within two days of landfall.

Table 9 first shows correlations between the Paradex and PCS industry loss estimates 40 days after the occurrence of an event, then between the Paradex loss estimates after 40 days versus the PCS final loss estimates.
WHY DO INSURANCE-LINKED EXCHANGE-TRADED DERIVATIVES FAIL?

Table 8. CHI Settlement versus PCS First Estimate

<table>
<thead>
<tr>
<th>Storm</th>
<th>CHI highest settlement</th>
<th>PCS first estimate $\text{(000)}$</th>
<th>Day of first PCS estimate after storm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ike</td>
<td>9.91</td>
<td>8,100,000</td>
<td>16</td>
</tr>
<tr>
<td>Rita</td>
<td>9.85</td>
<td>4,695,500</td>
<td>35</td>
</tr>
<tr>
<td>Ivan</td>
<td>10.09</td>
<td>6,010,000</td>
<td>23</td>
</tr>
<tr>
<td>Katrina</td>
<td>19.04</td>
<td>34,358,300</td>
<td>57</td>
</tr>
<tr>
<td>Frances</td>
<td>6.63</td>
<td>4,430,000</td>
<td>13</td>
</tr>
<tr>
<td>Isabel</td>
<td>7.72</td>
<td>1,170,000</td>
<td>12</td>
</tr>
<tr>
<td>Jeanne</td>
<td>7.98</td>
<td>3,245,000</td>
<td>27</td>
</tr>
<tr>
<td>Charley</td>
<td>10.40</td>
<td>6,800,000</td>
<td>10</td>
</tr>
<tr>
<td>Floyd</td>
<td>9.64</td>
<td>1,325,000</td>
<td>7</td>
</tr>
<tr>
<td>Wilma</td>
<td>11.24</td>
<td>6,098,000</td>
<td>29</td>
</tr>
</tbody>
</table>

Table 9. Paradex Loss Estimates vs. PCS 40 Day and Final Loss Estimates

<table>
<thead>
<tr>
<th>Correlation analysis</th>
<th>Paradex versus PCS 40 day</th>
<th>Paradex versus PCS final</th>
<th>PCS 40 day versus PCS final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 7 storms without Katrina</td>
<td>38.68%</td>
<td>57.82%</td>
<td>96.25%</td>
</tr>
<tr>
<td>Table 7 storms with Katrina</td>
<td>73.39%</td>
<td>77.95%</td>
<td>99.60%</td>
</tr>
</tbody>
</table>

| | CHI highest settlement versus PCS first estimate | CHI highest settlement versus PCS final estimate | PCS first estimates versus PCS final estimates |
|--------------------------------------|-----------------------------------------------|-----------------------------------------------|
| Table 8 storms                      | 93.68%                                        | 94.54%                                        | 99.35%                                        |

Note that these correlations are based on the subset of storms listed in Table 7. There were 10 storms used in the calculations for Table 7 (early estimates for Gustav were not available). In many cases PCS will provide early estimates from a storm’s damage. However, these estimates do not occur daily and are not provided at consistent times through the development of a storm. Hence, even with early estimates, we did not have a PCS value on the 40th day following the storm. To get a comparable number for use against the RMS data, we took the two PCS estimates that bracketed the 40th day after the storm and linearly interpolated the PCS 40 day value.
With the exception of Hurricane Katrina, every storm had at least one estimate before and after the 40th day. Katrina’s first estimate was on the 57th day after the storm. As the first estimate for Katrina was at 57 days, the correlations are presented with and without Katrina.

Our interpretation of the low correlations between Paradex and PCS (excluding Katrina) is as follows: the Paradex index is calculated by running the RMS industry exposure database through its proprietary U.S. hurricane model to estimate industry losses for each event. Over time, the methodology used in the RMS hurricane model has evolved and loss estimates have been calculated using different hurricane model inputs and parameters. In addition, RMS developed its industry exposure database using its own customers’ loss exposure information. We also note that the Katrina event is clearly important in contributing to the correlations between the Paradex data and the two PCS data sets (40 day and final).

The statistics shown above lead to interesting conclusions. First, it seems that correlations between the PCS (final) industry loss estimates and the Paradex loss estimates (including Katrina) remain significantly high despite very different methodologies used to compile the two measures. Obviously, the payout received from hedging loss exposure would differ depending on which index is used as a trigger, but as long as insurers or other hedgers manage to quantify the basis risk resulting from either index, the discrepancy can be resolved by over-hedging or under-hedging.

In addition, correlations between the PCS and CHI values, and the Paradex and CHI values are surprisingly high in the case of multiple landfalls, when we use the highest CHI settlement values to perform our regressions. As explained above, multiple hurricane landfalls resulting in multiple settlement values for the CHI index typically occur with mega-catastrophes like Hurricane Katrina. We understand that Katrina is an outlier and changes our correlation numbers dramatically. But it is our belief, as well as others’, that the main role of insurance-linked exchange-traded derivatives is to help entities exposed to risk resulting from very large (Katrina-like) catastrophes. In a recent paper, Cummins and Trainar (2009) argue that when the magnitude of possible insurance losses increases and the correlation of risks increases, the efficiency of the reinsurance model breakdowns and alternative risk management solutions become much more valuable. We value the information learned from Katrina.

Our correlation results suggest that the choice of an industry loss index as a trigger for exchange-traded derivatives (and other securitized instruments) may not matter as much as commonly thought. This conclusion may collide with recent efforts to develop the “holy grail” index that would serve as a base for settlement of ILS and derivatives.
Second, the statistics show that development risk (which again is defined by the length of time between the end of a contract’s period and a contract’s settlement value) doesn’t seem to significantly matter when analyzing storm estimates. As shown in Table 8, the correlations between the Paradex loss estimates (published 40 days after the occurrence of the catastrophe) versus the PCS 40 day loss estimates, and the Paradex loss estimates versus PCS final loss estimates are very similar (73.39% versus 77.95%, when Katrina is included). Similarly, the correlation between the CHI highest settlement values versus the PCS first loss estimates, and the correlation between the CHI highest settlement values versus the PCS final loss estimates, are very close (93.68% versus 94.54%, as indicated in Table 9).

Results from the descriptive statistics suggest that exchanges could redesign their catastrophe insurance futures and options contracts in a simpler manner, by first selecting an index that is easy for market participants to grasp as a trigger for payoffs, and then settle the contracts very shortly after a catastrophe occurs (the CME contracts are the only existing contracts with almost no development period). A long development period may not be needed to more accurately settle the contracts and ensure that their payoff accurately compensates for losses incurred.

**POTENTIAL REASONS FOR FAILURE**

So, if the choice of the index value used as a base for futures and options contracts doesn’t seem to matter much, and if development risk doesn’t seem to be that crucial, why do exchange-traded derivatives fail to attract interest?

First, basis risk is often cited as a deterrent for insurers and reinsurers to use index-triggered futures and options. As previously mentioned, the issue per se is not the existence of basis risk, but its quantification. We can argue that insurance market participants already draw help from organizations like catastrophe modeling firms, which provide tools to help measure basis risk. In addition, there are resources devoted by index suppliers like Guy Carpenter or ISO who have developed “bottom up” methodologies to construct indices based on industry loss and exposure data disaggregated at the zip code or county level. These methodologies make the quantification of basis risk much easier.

Bouriaux and MacMinn (2009) have argued that the current lack of trading activity in exchange-traded derivatives may be better explained by a more fundamental reason: in general, securitization of markets starts with the development of standardized cash instruments. After liquidity occurs, derivatives are designed as tools to hedge exposure to the cash
instruments. To date, there are few signs of standardization in the insurance-linked security markets. The payoffs of ILS are determined by various (indemnity-based or index-based) triggers. In addition, CAT-linked capital structures seem to become more complex, with an evolution from fairly simple CAT bond structures to Collateralized Risk Obligations (CRO) reminiscent of Collateralized Debt Obligations (CDO) in credit markets. Secondary market liquidity generally increases as more standardized structures, i.e., structures with a payoff triggered by an index of pooled risks, appear in the capital markets. For instance, the liquidity in the credit default swaps (CDS) market grew tremendously when CDS triggered by indices of risk started to become the dominant part of the market.

The lack of liquidity in the CAT bond secondary markets translates into a lack of liquidity in the futures and options markets, as there is no perfect or easy hedge between the cash and derivative markets.

The learning curve also remains steep for both hedgers and speculators in these markets. For the investors or risk takers, the learning curve might be even steeper with the CME products, which settle against a parametric trigger. In addition, it is very costly for investors to model the financial damages corresponding to the parametric trigger compared to an industry loss trigger, which only requires access to an industry loss exceedance curve, generally available from catastrophe modeling firms at an acceptable cost. This prohibitive cost is likely to deter potential smaller investors, who otherwise might be willing to provide liquidity in the CME contract.

An additional hurdle is that exchange-traded derivatives do not benefit from a favorable regulatory and accounting treatment compared to traditional risk management or transfer tools like reinsurance. In the years following the listing of the CBOT’s first catastrophe-linked futures and option contracts, only three states (California, Illinois, and New York) openly addressed an insurance company’s authority to engage in exchange-traded derivative transactions and only for hedging purposes. Today, the regulatory treatment of these instruments remains unsolved. In addition, from an accounting standpoint, under current statutory rules, U.S. insurers who wish to transfer some of their underwriting risks to the capital markets via exchange-traded insurance derivatives cannot account for such transactions in their underwriting book.

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22 Industry sources estimate that some catastrophe modeling firms charge up to $200,000 for access to their entire capacities necessary to model a parametric index, while they’ll offer industry exceedance loss curves for about $20,000.

23 See Bouriaux (2001).
The first important contribution of our paper is to argue that the choice of the index and the development period of a futures or option contract may not be the main deterrents for the use of insurance-linked exchange-traded derivatives. Its second contribution is to highlight additional factors not discussed in previous articles that may impede the development of these markets and that are novel to our paper.

First, trading in any market is a result of continuous information flows. Natural disasters are generally unplanned events: earthquakes occur without warning and hurricanes or other wind events can be tracked but only a few days before their landfall. Therefore, a flurry of trading activity may occur only a few days a year. This is especially true for event-based derivative contracts. Some of the CME contracts are settled against the aggregated CHI final settlement values for all hurricanes that make landfall in a specific location within a calendar year. But the aggregation of catastrophic losses creates another element of basis risk which becomes more cumbersome to both hedgers and investors. This problem already plagued the CBOT futures and options contracts, which were based on cumulative losses over a calendar year.

Second, the lack of interest in insurance-linked exchange-traded derivatives may result from the penalizing margining system adopted by futures and option exchanges. U.S. futures and options markets generally calculate margins (deposits) on derivatives contracts based on the historical volatility of the price of the instrument or commodity on which the futures or options contract is based. Futures and options are generally attractive to market participants because the margin, collected at the time the contracts are transacted, represents a relatively small percent of the dollar value of the contracts. Lakdawalla and Zanjani (2012) have pointed out that the full collateralization of CAT bonds departs from the reinsurance principle of economizing on collateral through diversification of risk transfer. In their opinion, full collateralization limits CAT bond penetration in insurance risk management.

Low margins in derivative markets would have provided hedgers and investors with a more economical way to tap the alternative risk management market. However, to date, futures and options exchanges generally require market participants to add more margins to cover possible losses, up to 100% of the dollar value of the contracts, as a “predictable” catastrophe, like a hurricane that takes days before making landfall, approaches. This provision alleviates the low leverage benefits generally provided by exchange-traded futures and options.

Finally, we note that the currently listed derivatives have been designed not as traditional tools to hedge price risk, but more like over-the-counter instruments. For instance, both the CME and IFEX designed
their binary option contracts to replicate industry loss warrants. As a result, these contracts may never be heavily traded and their success or failure should be more accurately measured with statistics on open interest rather than on trading volume.

**CONCLUSION**

Our paper addresses the factors that may limit the viability of insurance-linked exchange-traded derivatives as risk management tools for insurers and reinsurers, and as alternative investments for other market participants. The choice of the index used as a trigger for payoff and the development risk associated with the length of settlement of insurance-linked futures and options do not seem to play a major role in the low liquidity associated with these instruments.

To generate more interest in exchange-traded insurance-linked derivatives, we suggest that exchanges design their derivatives contracts in a simpler manner, by first selecting an index that is easy for market participants to grasp as a trigger for payoffs, and then settling the contracts very shortly after a catastrophe occurs (the CME contracts are the only existing contracts with almost no development period). As discussed earlier, a long development period may not be needed to accurately settle the contracts and ensure that their payoff compensates for losses incurred.

Exchanges that offer futures and options on catastrophic risk should invest more in training and education, and should provide potential investors or speculators in these markets tools that would allow them to better assess catastrophe insurance risk. For instance, an exchange could partner with a catastrophe modeling firm and provide (at a reasonable fee) analytical tools to its members or investors. In addition, exchanges should revisit their margining systems. While catastrophe insurance futures and options can’t be margined similarly to other more traditional derivatives, the use of catastrophe models to assess the probability of a certain risk should help an exchange determine reasonable margins.

In addition, there are potential investors who would like to include insurance risk to further diversify their portfolios but are not currently allowed by law to participate in the CAT bond market. Exchanges should provide easy access to price and trading information on CAT bonds and other insurance-linked securities to their members and their members’ customers.

Finally, and provided that secondary market liquidity in the current ILS market increases, derivatives exchanges should investigate the development of exchange-traded derivatives based on CAT bond return indexes.
(like those supplied by Swiss Re and other index providers). And if the current ILS market is not appropriate as the “cash” market on which insurance-linked futures and options markets should be based, maybe it is time to start to investigate other more traditional price risks such as medical costs or health care costs.

REFERENCES


