Article Title: ARCHIVE | Criteria | Insurance | Specialty: Framework For Rating Natural Peril Catastrophe Bonds Data: (Editor's note 1: This criteria article has been superseded by the article titled "Methodology And Assumptions For Rating Natural Catastrophe Bonds," published May 12, 2009.) (Editor's note 2: The default table presented in this article has been updated. See "Default Table Used To Rate Insurance-Linked Securitizations Updated," published May 8, 2008, on RatingsDirect.) Insurers continue to turn to the capital markets for structured finance and derivative solutions to the volatility of both insurance capacity and pricing. Standard & Poor's Ratings Services' criteria for these transactions address their legal and structural components, the models evaluating their underlying perils, and the potential for rating-agency capital relief for the ceding insurer. Evolution In The Capital Markets The historical increase in the loss severity of catastrophic events has affected reinsurers' risk appetites and, at times, called into question their capital adequacy. In the early 1990s, reinsurers raised premiums sharply and tightened the availability of certain covers, forcing primary insurers to try to control catastrophe exposures through the use of increased deductibles and coverage limitations to their policyholders, including caps on replacement costs. Insurers have also established maximum aggregate insured limits per county or zip code. In some high-risk areas, government-sponsored funds stepped in to provide reinsurance. Entities such as the Florida Windstorm Underwriting Assoc., the Florida Hurricane Catastrophe Fund, the Texas Windstorm Insurance Association, and the California Earthquake Authority are supported by industry assessments. Clearly, it would benefit insurers to seek additional underwriting capacity from the larger capital markets. However, it is difficult for traditional noninsurance company investors to participate in the rewards of insurance underwriting, which include diversification into nontraditional risks. Only licensed insurers have regulatory authority to underwrite insurance risks, either by writing policies or by entering into reinsurance agreements. Insurance securitization provides an effective way for investors to target their investments and for insurers to access the markets' risk capital. The key to the transfer lies in the use of a special-purpose reinsurer: a special-purpose, bankruptcy-remote vehicle incorporated to enter into the reinsurance agreement with the cedent. Most securitizations have used a Bermuda or Cayman Islands special-purpose vehicle, although some issuers have employed a European or U.S.-based special-purpose vehicle. Catastrophe Bonds: Benefits And Risks To Investors Investors are subject to loss of principal in the event of a catastrophic insured peril. From an investor's perspective, the appeal of property catastrophe and other natural hazard insurance lines is their low correlation with more typical capital market risks. Because of the low correlation between, for instance, earthquake risk and interest rate risk, an investment in natural hazard bonds raises a portfolio's Sharpe ratio. Each note is collateralized by a highly rated investment portfolio. The portfolio principal is usually protected by a highly rated total return swap counterparty, which typically provides investors with a floating-rate coupon (usually LIBOR-based) as well as the return of principal if no covered events occur. Coupons exceed those of corporate bonds with similar default expectations, but Standard & Poor's recognizes that a portion of what appears to be excess spread in the note coupon stems from the nature of the default risk in these securities. Catastrophe notes are structured and rated with regard to the probability of triggering the underlying insurance cover. Although the probability of default is low, the notes are likely to default without a gradual decline in credit quality and with little warning to investors. (This phenomenon is sometimes referred to as the credit cliff.) In addition, it is prudent to expect defaulted catastrophe bonds to offer no significant post-default recovery, while corporate issues usually do. Investors should also consider the possibility of moral hazard. To the extent that a ceding insurer has retained significant exposure to the peril underlying the notes, investors are unlikely to see atypical risk in the notes. This retention may protect noteholders from aberrations in the cedent's claims-settlement process. Catastrophe Bonds: Benefits To Ceding Insurers Insurers and reinsurers have been interested in developing a market with deeper capital and greater structural sophistication. The reinsurance market has experienced significant strain in recent years, and harder pricing prevailed in 2005 and 2006, though it has softened in 2007, albeit from high levels. Many reinsurers and primary companies are eager to protect themselves from the capacity and premium gyrations that prevailed and to obtain multi-year coverage. The primary issuer benefit is the introduction of the greater capital and risk capacity of the capital markets. For instance, the economic losses associated with Hurricanes Katrina, Rita, and Wilma are approximately $175 billion. A loss on this order would be less than 1.5% of the market capitalization of the S&P; 500, a loss

frequently and easily absorbed in the U.S. stock markets on a given day. Issuers may also find greater flexibility in the terms of coverage as well as a first-perfected security interest in the principal of the collateral account supporting the notes. The use of collateral removes counterparty credit concerns from the reinsurance treaty or retrocessional agreement providing relief to the issuer. By assuming natural-hazard risk into their portfolios, traditional capital-markets investors receive greater benefits of diversification than property/casualty reinsurers, whose aggregate businesses are already concentrated there. Thus, capital markets investors might require a lower risk premium than that asked by reinsurers. Investor demand following a large catastrophe would probably weaken, forcing coupons upward, but this surge in premium would likely be less than in the reinsurance market, which is smaller. As this asset class has matured, more investors have been drawn to it as credit spreads have tightened significantly. This has enabled more ceding insurers to access this market. The use of structured finance and derivative technologies may allow issuers to create a wide variety of structures linked to insurance risks. Three broad securitization categories have emerged so far. Types Of Bond Cover Indemnified notes When insurance securitizations were first considered, insurers were reluctant to disclose too much of their underwriting data. Cedents receive the most precise coverage from indemnified transactions, which respond directly to a specified group of policies, but many were reluctant to reveal their underwriting procedures or actual policy composition (beyond statutory filings). An indemnified transaction reflects the underwriting and claims-settlement process of the ceding company. To this extent, Standard & Poor's experience in analyzing the cedent's business provides investors with analytical support. Following the risk of a covered peril event, the primary difficulty facing investors in indemnified notes is the existence of lengthy development periods, which are bond extensions that allow for the discovery of damage and the settlement of claims, a feature typical of insurance cover. Although the risk period ends on the scheduled maturity, at the option of the cedent, investors might have to wait two years or more to determine the disposition of their investment. Indexed notes Some insurance bonds are linked not to the ceding insurer's business but to the behavior of an industry-wide or geographic index, such as the data compiled by Property Claims Services (PCS) in the U.S. Ceding insurers that issue indexed notes can be exposed to significant basis risk to the extent that the index does not mimic cedent losses. Because it is generally easier to calculate an index than the final claims of the ceding insurer, indexed notes tend to have development periods under two years. Parametric notes Finally, notes can be structured parametrically, without reference to the cedent's business. Parametric notes make their payments based on a mathematical formulation related primarily to the quantities associated with pertinent events, such as magnitude, intensity, and epicenter of an earthquake, or wind speed, forward velocity, and county of landfall of a hurricane. In fact, this formulation could be complicated and could be viewed as an attempt mathematically to create a virtual replica of the cedent's subject business. This synthetic indemnification could reduce basis risk to the cedent while nearly eliminating the development period for investors. Each indexed or parametric transaction should specify mathematically the relationship between the parametric formula or index and resultant claims against note principal by the ceding insurer. This can be a simple mathematical function (linear or step), or it can be a complex, multivariable relationship that attempts to reduce basis risk to the cedent. Impact On The Ceding Companies Indemnified transactions receive reinsurance credit One of the primary concerns of the ceding company is whether it can expect capital relief upon the issuance of an insurance securitization. For financial strength rating purposes, Standard & Poor's gives full reinsurance credit to cedents using indemnified securitizations because they are exposed to no basis risk and little credit risk. Nonindemnified transactions reduce moral hazard Standard & Poor's takes a positive view of the use of parametric and indexed insurance bonds for investors because they reduce the uncertainty surrounding the cedent's claims-settlement process. In particular, these bonds may reduce moral hazard from the cedent. Here the settlement of claims cannot prejudice investors. The impact of derivatives on traditional analysis Standard & Poor's applies its standard credit charges to investments in securitized risks and includes losses from these transactions in its view of operating performance. Standard & Poor's evaluates the risk transfer in nonindemnified securitizations and may allow capital relief for exposures that are substantially ceded. If a ceding company relies on an indexed or parametric note for protection, the cedent's ability to manage risk depends on its ability to model its exposures. In addition, statutory accounting treatment of these products affects their use as hedging

tools. Property/casualty insurers are measured and benchmarked by various performance ratios, most notably the loss ratio and the combined ratio. These ratios are calculated from premiums, losses, and expenses, as defined by statutory accounting principles. Investment income is not directly considered in any underwriting calculations or ratios. The purchase of reinsurance directly affects these values, and the impact of the reinsurance transaction is reflected in the net underwriting results. Hedge accounting for nonindemnified transactions and derivatives The accounting for these structured transactions is often treated as a derivative investment transaction under U.S. GAAP. In other cases, the contract might meet the requirements for reinsurance accounting, resulting in very different accounting presentation based on the form, rather than the substance, of the transaction. As a derivative, the contract will initially be recognized at its fair value, with the changes in fair value reflected in investment income in the income statement. Absent any loss events, the derivative expires without exercise, and its value will have decreased over the life of the contract through investment income. Similarly, if the derivative is exercised in the event of a catastrophe to which the contract would respond, the gain (representing the reinsurance recoverables) is reflected in investment income. As a result, underwriting profits and ratios are not affected by the purchase of the derivative contract. Contrasting this is the treatment as a reinsurance contract, whereby payments for the contract are treated as ceded premiums and loss recoverables directly offset losses incurred. After a loss, an insurer that purchased an index-based derivative would post higher net underwriting losses and a higher combined ratio than an identical company covered by reinsurance with identical payouts. If no loss occurs, the impact on underwriting results is the opposite such that even though each company would end up with identical capital, when evaluating the companies' loss and combined ratios, the insurer that transferred risk through the derivative in a period of no losses might be inappropriately viewed as a less-effective underwriter. As a result, where these impacts are viewed as significant, Standard & Poor's may make analytical adjustments to the reported financial information to reflect the impact of the derivative agreements in a manner more consistent with a presentation as a reinsurance agreement. In Standard & Poor's opinion, for financial strength rating purposes, a properly structured catastrophe bond serves the same function as a program of reinsurance. This is evident with an indemnified transaction. For other transactions, this will follow from an examination of the effectiveness of the hedge. Where a capital charge is assessed for property catastrophe exposure, Standard & Poor's will assess a capital credit for effectively hedged instruments that mitigate shocks to a company's capital base. Rating Methodology Peril modeling One of the primary factors in the analysis of a catastrophe securitization is the quantification of both frequency and severity of the risks underlying it. The risk analysis has normally been carried out by one of three peril-modeling firms whose models Standard & Poor's has evaluated for rating purposes. For each peril model, Standard & Poor's examines its source of data. For nearly two centuries, industry and various national governments have funded research in atmospheric science and seismogeology, particularly in the U.S., Japan, and throughout Europe. Some perils in some parts of the world might not be well documented, but these lie outside the realm of rated transactions. Primary global sources of peril data include: United Nation's International Atomic Energy Agency Japanese Meteorological Agency Nation Center for Atmospheric Research Japanese National Research Institute for Earth Science and Disaster Prevention U.S. Geological Survey European-Mediterranean Seismological Centre Laboratoire de Détection et de Géophysique, a network of seismic stations of an agency of the French government responsible for monitoring nuclear test explosions and earthquakes University NAVSTAR Consortium, an international organization of more than 80 universities and research institutions The agencies of the National Oceanic and Atmospheric Administration, including the National Weather Service and the National Hurricane Center Standard & Poor's reviews the pertinent academic literature, engineering research, and other information delivered by the ceding company to evaluate whether the modeling assumptions and techniques are consistent with the literature. Standard & Poor's may review the variables, including temperature, wind speed, rotational storm velocity, presence of rain, composition of soils covering bedrock, fault activity (including slippage and subduction), and fire following quake. Standard & Poor's may then evaluate whether the model results correlate with local historical activity and refer to academic research to evaluate whether the model properly incorporates specific local features. Standard & Poor's may also consider whether the peril model is supported by the weight of market as

well as scholarly and scientific opinion: whether the model in question is relied on by users who face substantial financial, personal, and political consequences in the event of failure. Such users could include builders or operators of hydroelectric dams, missile silos, alpine tunnels, elevated highways, and underground structures. For example, the three peril-modeling firms whose various models Standard & Poor's has reviewed for use in insurance securitization are consulted by primary property/casualty insurance companies and reinsurance companies representing the majority of global catastrophe insurance capacity. Other significant users include: Developers, large industrial corporations, schools, hospitals, low- to high-rise offices, R&D; facilities, hotels, convention centers, museums, and parking and underground structures. Energy producers looking for oil and gas or those siting and building offshore drilling platforms, conventional power plant structures, energy storage tanks, and nuclear facilities. Nuclear-device-assembly facilities in the U.S. and Europe. The purpose of these reviews was not to determine each model's accuracy at predicting catastrophe but, rather, the model's reasonableness in the face of known engineering, scientific, and mathematical studies. At present, only AIR Worldwide Corp., EQE International's EQECAT Inc., and Risk Management Solutions have had their models subjected to review. Each of the three has been reviewed for both earthquake and windstorm modeling. Legal issues In catastrophe bonds structures, the issuer—a newly created, bankruptcy-remote, special-purpose entity—accepts through retrocession a portion of the cedent's risk. The issuer is usually capitalized by a combination of equity and the proceeds of the rated debt. Investors are guaranteed investment income unless an insurable event occurs for which the issuer is liable under the retrocession agreement. The issuer's assets, generally liquid investments acquired with the proceeds of the issuance, are held by a collateral agent to be applied against the issuer's reinsurance obligations or paid back to investors as principal if no insurable event occurs during the term of the transaction. The bonds are secured by a pledge of these assets and various funds and accounts. Depending on the particular transaction structure, Standard & Poor's will review the bankruptcy-remoteness of the issuer and generally look for the following legal comfort: If the issuer is an offshore entity, an opinion addressing, among other things, the due organization of the issuer, the enforceability of the transaction documents against the issuer, and the validity of the choice of the law selected to govern the transaction. If the issuer is an offshore entity, opinions to the effect that the entity would not, for tax purposes, be deemed to be engaged in a trade or business in the U.S. or taxable in other jurisdictions, as applicable. An opinion to the effect that the rated obligations are not subject to regulation of contracts of insurance or reinsurance under applicable state law and that the holders of such notes should not be subject to regulation as providers of insurance or reinsurance. As applicable, inclusion of the applicable UCC article 9 representations and warranties as to the creation, perfection, and priority of the security interest of the indenture trustee in the collateral for the benefit of the bondholders, and/or an opinion under the laws of any relevant non-U.S. jurisdiction on these subjects. In addition, depending on the specific features of the transaction, Standard & Poor's may request additional legal comfort in the form of opinions or otherwise. The assignment of a rating In assigning a rating to a catastrophe bond, Standard & Poor's bases its analysis on its U.S. corporate default study. The resultant matrix is statistically stationary and is consistent with Standard & Poor's practices in rating collateralized debt obligations. Each note derives its rating by comparison with two rows of the matrix: the first corresponds to the maturity of the note (or, in the case of a re-setting note, the re-set term); the second stands as a surrogate for the instantaneous probability of attachment. Standard & Poor's compares the note's lifetime and annual probabilities of attachment with the appropriate maturities and locates in each row the first rating category whose likelihood of default exceeds the corresponding probability of attachment. The lesser of these ratings will be the maximum possible rating on the note. Whether a given note achieves the rating based on its attachment probability depends on Standard & Poor's analysis of the many parties to the transaction, particularly the swap counterparty and the ceding insurer. This analysis covers the strength of the agreements binding each party, the nature of any indemnification offered by these parties, and the safety of the assets in the collateral account. This analysis also covers the quality of the peril modeling and Standard & Poor's opinion of the cedent's financial strength and underwriting abilities. Standard & Poor's will typically incorporate a cushion to the modeled probability of attachment to recognize the variability of the peril modeling output. In addition, when provided more than one modeled probability of attachment (e.g., a

near-term and a long-term perspective), Standard & Poor's will rely on the more conservative of the two results in determining the ratings. Standard & Poor's does not refer to expected losses directly in this calculation, but factors expected loss into the statistical analysis of the output of the peril modeling, where it is a measure of how well the loss distribution converges and how well the tail of the distribution behaves. A portion of the matrix follows: Standard & Poor's Cumulative Default Probabilities (%) STATISTICALLY STATIONARY TABLE FOR CATASTROPHE SECURITIZATIONS MATURITY (YEARS) A+ A A- BBB+ BBB BBB- BB+ BB BB- B+ B 1 0.140 0.140 0.150 0.230 0.230 0.540 1.670 2.770 2.790 3.670 8.590 2 0.311 0.324 0.368 0.541 0.648 1.353 3.322 5.262 5.664 7.541 14.508 3 0.512 0.553 0.647 0.924 1.198 2.314 4.924 7.496 8.377 11.086 18.586 4 0.743 0.823 0.978 1.368 1.834 3.343 6.448 9.488 10.822 14.131 21.437 5 1.002 1.130 1.353 1.861 2.523 4.389 7.876 11.255 12.970 16.665 23.479 Under Standard & Poor's criteria, single-event catastrophe bonds are generally subject to a 'BB+' cap. However, if the one-year probability of attachment is no more than 40 basis points (bps) or 20 bps, the notes could be as high as 'BBB-' or 'BBB+', respectively. Otherwise, second-event notes are capped at 'BBB+'. A third-event catastrophe bond may be rated as high as 'A+', and a fifth-event catastrophe bond may be rated 'AA'. For a note to be rated 'AA', Standard & Poor's would expect there to be limited correlation among the modelled perils. In addition, the occurrence of any trigger event cannot result in a downgrade, based on the probability of attachment, of more than one rating category. Standard & Poor's will have discussions with the modelling agency to verify the methodology and results. These guidelines are subject to change at any time an will be adjusted to fit the current facts, risk assessments, and economic assumptions at the time.