CME Group
A CME/Chicago Board of Trade Company

Research & Product Development

Alternative Investment Overview

John W. Labuszewski, Managing Director
Research & Product Development
312-466-7469, jlab@cmegroup.com

Paul Peterson, Director
Research & Product Development
312-930-4587, Paul.Peterson@cmegroup.com

Charles Piszczor, Associate Director
Research & Product Development
312-930-4536, Charles.Piszczor@cmegroup.com

Successful futures contracts tend to be based upon "benchmarks," *i.e.*, products or indexes that represent the standard measure of performance in whatever asset class they purport to represent. Contract designers employed by derivatives exchanges study the potential to develop derivatives based on these various asset classes and attempt to identify or create benchmark measures of performance. Of course, the most commonly referenced asset classes include equities and fixed income securities. And for good reason: stocks and bonds account for vast investment amounts of monies. But stocks and bonds are not the only asset classes worth considering.

Most successful futures contracts are based on "benchmark" indicators of pricing activity in traditional asset classes such as stocks and bonds.

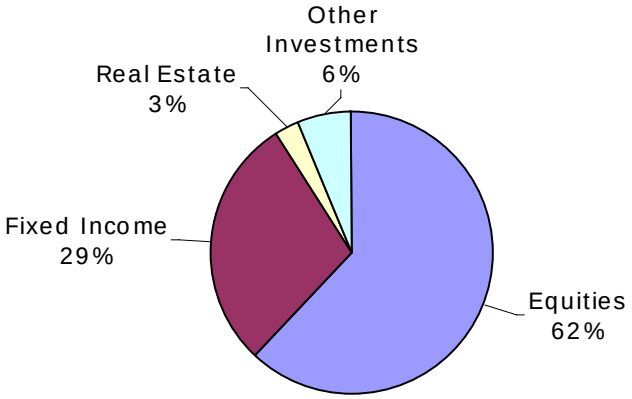
In recent years, many investors, certainly investors active in developed economies, have experienced a certain level of frustration with traditional passive investment strategies deployed in traditional asset classes such as stocks and bonds. In many cases, returns available in these markets have simply not been sufficient to meet the obligations of particular types of investors such as pension funds. Accordingly, investors have increasingly looked to "alternative investments" as a potential source of attractive returns.

But investors have increasingly turned to "alternative invest-ments" in recent years to the extent that returns in traditional asset classes have disappointed.

The typical domestic pension fund allocates roughly 60% of its assets to stocks, 30% to fixed income instruments and almost 10% to "alternative investments."

The "typical" or "average" pension fund in the United States will look to diversify their assets over particular asset classes to achieve an attractive mix of investments. A typical mix might include an approximate 60% allocation to stocks, 30% to fixed income securities and 10% to "alternative" assets. These alternative assets may include a diverse range of investments including real estate, commodities, fine art, antique automobiles or any number of exotic items or derivative instruments.

Typical Market Exposure of S&P 500 Defined Benefit Pension Plans ($1.3 bil in assets, 12/04)



Source: Credit Suisse Asset Management, "Alpha Management Revolution or Evolution, A Portable Alpha Primer," November 2005

The futures industry has responded to the growing interest in alternative investments, developing contracts on esoteric items including weather, real estate and economic indicators.

The futures industry has taken notice and, over the years, has been building up its capabilities in this regard, recognizing that "alternative investments" are indeed a legitimate and increasingly important form of asset or asset class. This has resulted in some rather imaginative new products on CME Group including futures on weather conditions, losses from hurricane damages, real estate and economic indicators. We intend to highlight some of the more noteworthy of these new developments by reviewing some of the staples of CME Group's alternative investment offerings including those covering weather, real estate and economic indicators.

Weather

It has been estimated that weather exerts a significant impact upon approximately one-third of U.S. economic activity.[1] Noting that the Gross Domestic Product (GDP) of the U.S. totaled some $13.9 trillion in 2007, this suggests that weather conditions exerted an influence over some $4.6 trillion in GDP in 2007. The impact that weather has on businesses such as energy and agriculture is particularly acute.

Up to one-third of U.S. economic activity is impacted by weather conditions.

This realization actually motivated the energy industry to commence development of over-the-counter weather based derivatives by the late 1990s. In 1998, CME Group began development of what has grown to become a well-rounded family of weather derivatives including temperature, hurricane, frost and snowfall based futures and option contracts. These contracts are currently listed based upon weather conditions in diverse locations within the United States, Canada, Europe and Asia.

Economic dependence on weather led to the development of OTC and exchange-traded weather derivatives.

Historical Market Developments – The development of the weather derivatives markets represents an interesting case study of sorts regarding the linked and complementary nature of over-the-counter (OTC) and exchange-traded derivatives. This market was originally inspired by a transaction that was consummated in July 1996 between Aquila Energy and Consolidated Edison Co. Per this transaction, ConEd would buy electricity from Aquila. The unique feature was a clause that provided for a discount if weather were to be cooler than anticipated. In particular, the transaction referenced weather conditions measured at Central Park in New York City. This prompted Enron Capital & Trade Resources to transact the first documentable derivatives trade in mid 1997 tied to fluctuations in weather conditions. It was not long after that that CME Group became interested in weather derivatives and launched the first Weather futures and option markets in 1999.

Weather derivatives got their start in 1996 with a seminal deal tied to temperature readings.

In the early going, the two most popular instruments to emerge included option contracts based on heating degree day ("HDD") and cooling degree day ("CDD") options. The HDD and CDD Indexes represent energy industry standard measures of the extent to which average temperatures during a particular day deviate from a (benchmark) of 65 degrees Fahrenheit. The concept of a heating degree day (HDD) index was developed by engineers who observed that commercial buildings were frequently heated to maintain an indoor temperature of 70° Fahrenheit whenever daily mean (average) outdoor temperatures fell below 65° Fahrenheit. Each degree of mean temperature below 65° Fahrenheit is counted as "one heating degree day." Conversely, air

Heating Degree Days (HDD) and Cooling Degree Days (CDD) represent common references to temperature readings relative to a standard of 65 degrees Fahrenheit.

[1] Per Dean John Dutton, Penn State University (2002)

conditioning may be employed when temperatures rise much above the 65° Fahrenheit standard. Thus, each degree of mean temperature above 65° Fahrenheit is counted as "one cooling degree day." These concepts are expressed mathematically as follows.

The HDD reading for any particular day represents the maximum of the either zero or the amount by which average daily temperature falls short of 65° F.

$$HDD = Max(0, 65°F - \text{daily average temperature})$$

The CDD reading for any particular day represents the maximum of either zero or the amount by which average daily temperature exceeds 65° F.

$$CDD = Max(0, \text{daily average temperature} - 65°F)$$

For example, if the average of a day's maximum and minimum temperature on a midnight-to-midnight basis is 35° F, that day's HDD is 30 and the CDD is zero (0).

CME Group began gathering market intelligence on weather-related derivatives with an eye towards the development of weather-based futures contracts in late 1997. Because OTC derivatives may be highly customized subject to the bi-lateral agreement of the two counterparties, a variety of trade practices had evolved amongst the major energy firms and broker/dealers that represented the core players in the OTC markets. Thus, prospective market participants were interviewed regarding ways to construct standardized weather futures contracts. Issues included how contracts might be settled, which index providers might provide reliable references and the timing associated with contract settlements. Because weather is a localized phenomenon, further study centered about the most likely regions or cities upon which to base futures contracts.

Four significant energy firms including Aquila Energy; Enron Capital & Trade Resources; Koch Supply & Trading; and, Southern Co., Energy Marketing represented the most active OTC weather derivative traders. Input was further solicited from a broad group of prospective commercial contract participants including utilities, fuel suppliers, propane distributors, hydroelectric generators, Florida orange growers, Colorado ski resort operators and municipalities concerned about the expense of snow removal.

CME Group HDD and CDD contracts rely upon data from EarthSat, the leading supplier of weather-related data.

Contract specifications were drafted based upon this market intelligence and subsequently validated with the major players. Of critical importance was the selection of a data provider who would maintain the indexes and whose participation was supported by OTC derivative traders. Earth Satellite Corporation (EarthSat), of Rockville, Md., was selected as the data provider based upon their experience and reputation as an internationally recognized service firm specializing in the development and the application of remote sensing and geographical information technologies. EarthSat's responsibilities include updating weather files via the web on a daily basis and maintaining historical records of data pertaining to CME Group Weather products.

HDD and CDD Futures **-** CME Group received approval from the Commodity Futures Trading Commission ("CFTC") to list Heating and Cooling Degree Day (HDD and CDD) futures in August 1999. The very first Weather futures contracts listed in September 1999 were based upon HDDs to the extent that this coinciding with the commencement of the heating season. CDD based contracts were subsequently introduced in January 2000. While these contracts were amended and listings expanded over the years, their current terms and conditions are described in the accompanying table.

HDD and CDD futures and options were introduced at CME Group in 1999.

Monthly and Seasonal HDD/CDD Contract Specifications

	Futures	Options
Contract Size	$20 x HDD/CDD Index	One Futures Contract
Minimum Tick Size	1.00 Degree Day Index Point = $20	
Monthly Contracts	Monthly HDD contracts are available for the contract months of October, November, December, January, February, March and April. Monthly CDD contracts are available for the contract months of April, May, June, July, August, September and October.	
Seasonal Strip Contracts	Seasonal "strip" contracts created by linking from 2 to 7 consecutive months. *E.g.,* an HDD seasonal strip may be created based on cumulative HDDs in months of October, November, December and January. *E.g.,* a CDD seasonal strip may be created based on cumulative CDDs in months of June, July and August.	
Listed Cities	HDD and CDD contracts available for the following U.S. cities: Atlanta, Baltimore, Boston, Chicago, Cincinnati, Colorado Springs, Dallas, Des Moines, Detroit, Houston, Jacksonville, Kansas City, Las Vegas, Little Rock, Los Angeles, Minneapolis-St. Paul, New York, Philadelphia, Portland, Raleigh, Sacramento, Salt Lake City, Tucson, Washington DC.	
Last Trading Day	Last Exchange business day of a calendar month	
Final Settlement Day	The 2nd Exchange business day immediately following the last day of calendar month	
Final Settlement Price	Settled in cash at monthly HDD/CDD Index as calculated by EarthSat	Exercisable into one futures contract
Option Exercise	Na	European Style
Strike Prices	Na	Strike prices listed "on demand"
Trading Hours	Traded on CME Globex electronic trading platform nearly 24 hours a day	Offered on the floor of the exchange

The original HDD and CDD futures were based on the cumulative value of HDDs or CDDs throughout a specific subject month. To illustrate, an average daily temperature of 45°F degrees is associated with an HDD of 20 (= 65°F - 45°F). If the average daily temperature were in excess of 65°F, the HDD for that day would be zero. A monthly contract is cash

The original HDD and CDD contracts were based on the accumulated HDD or CDD readings during a particular month during the heating or cooling seasons.

settled at the cumulative value of HDDs recorded on each day of the month. *E.g.,* assume that the month had 31 days and the average daily temperature for all of those days was 45°F. Accordingly, the cumulative monthly HDD would equal 620 (= 31 days x 20). The futures contract value would be identified by multiplying that figure by $20. In this example, the cash value of the contract would be $12,400 (= $20 x 620).

A seasonal strip contract is a simple variation on the monthly contracts. Seasonal strips are settled based on the accumulated HDD or CDD readings during two or more consecutive months during the heating or cooling seasons.

A seasonal strip contract is based on the cumulative HDD or CDD values during two to seven months within the season. The traditional heating season runs from November through March while the traditional cooling season runs from May through September. October and April are transition or "shoulder" months for which both HDD and CDD values are calculated and, therefore, October and/or April may be included in a seasonal strip.

For example, an HDD seasonal strip may be created based on cumulative HDDs in months of October, November, December and January. Or, a CDD seasonal strip may be created based on cumulative CDDs in months of June, July and August. These contracts are identified by the first month and the number of months within the season as constructed. Seasonal strip contracts provide the same type of risk exposure as monthly HDD and CDD contracts but offer the convenience of being able to trade a bundled package of months when one seeks coverage over several months during the heating or cooling season.

Contracts based on readings accumulated over a particular week are also available.

A further refinement of this concept was introduced with the development of weekly weather contracts based upon average temperatures between Monday through Friday of a particular week.

While the original HDD and CDD contracts were based on temperatures observed at various points in the U.S., the concept has been extended to Europe, Canada and Japan.

The concept of temperature-linked futures has likewise been expanded to include international coverage in Europe (Amsterdam, Barcelona, Berlin, Essen, London, Madrid, Oslo, Paris, Rome and Stockholm), Asia (Tokyo and Osaka) and Canada (Calgary, Edmonton, Montreal, Toronto, Vancouver and Winnipeg). These contracts are based upon cumulative monthly temperatures during the cooling season and HDD readings during the heating season. These contracts are denominated in Euros, Japanese yen and Canadian dollars in the case of the European, Asian and Canadian based contracts, respectively. They utilize contract multipliers of ¥250,000, 20CAD and £20.

These contracts are based on a standard of 18° Centigrade rather than 65° Fahrenheit.

These contracts further depart from the U.S. standards in the sense that temperature readings are recorded on the Celsius rather than Fahrenheit scale. Rather than reference a base of 65°F, these indexes reference a base of 18°C. As a matter of nomenclature, the European cooling contracts are based upon a so-called Cumulative Average Temperature

(CAT) index rather than a CDD to the extent that the term CDD is not in use in the context of European OTC weather markets.

Risk Management Applications – HDD and CDD futures and options are employed by a wide variety of enterprises, largely operating in the context of the energy industry, to manage their temperature-related risks.

HDD and CDD contracts are used for a wide variety of risk management purposes but predominantly by energy concerns.

Energy companies, for example, have been known to sell HDD or CDD contracts to manage the risk of diminished revenues under mild weather conditions, noting that the quantity of energy sold is heavily contingent upon consumer demand driven by temperatures. Large scale energy consumers including automobile manufacturers and large residential building operators may buy HDD or CDD contracts to hedge against the risk of rising utility costs under extreme weather conditions.

Retailers whose sales are sensitive to weather conditions might control inventory costs more effectively through the use of HDD or CDD contracts. Beer consumption reaches a seasonal peak in the summer and cool weather can put a dent in beer sales. According to the 2000 Preliminary Report for SABMiller, "History shows that on a summer day with the temperature over 25 degrees Celsius, sales can be more than 50% greater than on a day where the temperature is under 20 degrees ... " [2]

Weather contracts are useful for hedging "volumetric risks." *E.g.,* energy company revenues may be affected negatively if demand for energy decreases as a function of moderate temperatures.

Amusement parks rely on favorable weather noting that people stay home if conditions are too hot or cold. It is a simple matter for parks to correlate temperatures to attendance and construct a "collar" to hedge revenues should temperatures fall outside a preferred range.

Let's focus on the use of temperature contracts on the part of utility companies. Utilities may utilize HDD or CDD futures and options to guard against so-called "volumetric risks." These volumetric risks are based upon the quantity of energy that might be expected to be marketed throughout the course of a heating or cooling season. These transactions rely upon the intuitive and well-documented relationship between power consumption and temperature extremes.

Thus, if the daily average temperatures during the course of a winter season were abnormally high, utility firms might face depressed demand for heating. Utilities have traditionally increased consumer prices to offset lower retail consumption volume. However, intensifying competition caused by ongoing deregulation has made it increasingly

[2] 2000 Preliminary Report for SAB Miller.

difficult for utilities to raise prices arbitrarily.[3] Therefore, it becomes necessary for utility firms to address volumetric risks using other means such as HDD or CDD futures and options.

A simple numerical example is presented here to illustrate the hedging application of HDD futures. Let us assume that ABC Utility Co. sells electricity in the Chicago area at $0.08/Kilowatt hour. Under normal winter weather conditions, ABC may forecast sales of 1 billion Kilowatt-hours (kWh) with a projected revenue of $80 million. However, ABC is concerned about the possibility of Ĕl Nino weather effects and would like to utilize HDD futures to hedge against the possibility of warmer than expected winter conditions.

In order effectively to place a hedge, one must empirically assess the relationship between an economic outcome and weather conditions.

In order to construct a hedging strategy, it will become necessary to quantify the relationship between economic outcomes (such as sales revenues) and weather conditions (as implied in weather futures prices). In particular, one wants to find an appropriate hedge ratio (HR) that might balance the anticipated change in revenues (denoted as ΔRevenues) with the changing value of the subject derivatives contracts (ΔValue of Futures). A statistical regression between revenues and weather conditions is frequently useful in assessing these quantitative relationships.

Statistical regression analysis is often useful for these purposes.

Assume that, based on historical regressions, ABC finds that its sales are positively correlated with the CME Group Chicago HDD Index with a sensitivity ratio of 0.80. *I.e.,* a 1% change in HDD may give drive a 0.8% change in ABC's anticipated $80 million in revenues. Assuming futures are trading at 1,250.00, an effective hedge ratio may be calculated as follows.

$$\begin{aligned} \text{Hedge Ratio (HR)} &= \Delta\text{Revenues} \div \Delta\text{Value of Futures} \\ &= (\$80{,}000{,}000 \times 0.8\%) \div (1{,}250 \times \$20 \times 1\%) \\ &= 2{,}560 \text{ futures contracts} \end{aligned}$$

Hedge ratios may be constructed with an eye to balancing any change in revenues with change in the value of the futures contract.

This suggests that ABC might sell 2,560 futures to hedge the risks of higher than expected temperatures and lower than expected revenues. Assume that temperatures are mild and that the HDD Index settles at 1,150. This decline of 100 HDDs (8% of original value of 1,250) implies that sales may decline from 1 billion to 936 million kWh for sales of $74,880,000 ($0.08/kWh x 936,000,000 kWh). This implies a revenue shortfall of $5.12 million. But this shortfall is offset by a corresponding $5.12 million profit in futures.

---

[3] The Comprehensive Electricity Competition Act, pending approval by Congress, allows consumers to choose their electric company by 2003, thereby bringing consumer choice and retail competition to the largest regulated markets. This act is designed to replace the Public Utility Holding Company Act of 1935.

	Revenues	Futures
Now	Expected Revenues of $80 million or 1 billion kWh @ $0.08/kWh	Sell 2,560 futures @ 1,250
Later	Realized Revenues of $74,880,000	Futures Settled @ 1,150
	Revenue Shortfall of $5,120,000	Profit of 100 HDDs or $5,120,000 (= 2,560 x 100 x $20)

(We should note that this analysis is based upon an assumption that the relationship between sales and temperatures is linear when, in fact, it is more likely that a non-linear relationship exists such that energy demands will increase (decrease) exponentially as a function of rising (falling) HDDs. In other words, the hedge ratio becomes rather dynamic and may therefore require active adjustment in response to changing conditions.)

Proper use of temperature-related contracts not only enables utility firms to stabilize revenue streams but may also be used to provide at least a partial hedge to the cost side of the equation. Note that most utility firms operate under inherent capacity limitations. In particular, electricity represents a non-storable commodity. If temperatures suddenly rise or decline dramatically, utility firms may need to deploy less efficient generators to meet the sudden jump in demand or may be compelled to purchase electricity from the power grid in the face of soaring demands and rising prices. This implies that energy prices may increase and transmission costs may grow simultaneously. In this case, utility firms may find both weather derivatives and energy contracts useful to stabilize its economic outcomes, i.e., to hedge both volumetric and cost-based risks.

Hurricane Products – Hurricanes represent perhaps the most prevalent and, certainly the most devastating, type of risk faced by property insurance companies. This was clearly in evidence in the wake of Hurricanes Andrew and Katrina. Hurricane Katrina in 2005 was the costliest hurricane on record with insured damages estimated (by one source) at $96 billion in the wake of this storm. Hurricane Andrew hit Florida before sweeping through the Gulf of Mexico and striking Louisiana in 1992 and was the second most costly storm with an estimated $26 billion in insured damages. Some scientists believe that the global warming phenomenon will be responsible for increased hurricane risk in the Atlantic in the years to come.

Hurricanes can create devastating property damage. The difficulty of managing hurricane related risks on the part of insurance and reinsurance companies has prompted development of hurricane futures and options.

The difficulty of managing these risks is, of course, responsible for a good deal of the growth witnessed in the reinsurance business. Hurricane-related risk has also inspired the development of over-the-counter

products including catastrophe bonds and other related products. Actually, the Chicago Board of Trade (CBOT) had pioneered the development of hurricane related derivatives in the 1990s with the introduction of futures tied to accumulated insurance losses. But this market was probably a little ahead of its time. The product was also, paradoxically, a little behind its time in the sense that it was pegged to stated insurance losses which could not be fully accounted for until well after the hurricane. Thus, the product lost some of the "economic immediacy" that characterizes the futures markets.

CME Group Hurricane contracts are based on the Carvill Hurricane Index (CHI).

Prompted by the difficulty of managing hurricane-related risks, CME Group introduced futures and options based on the Carvill Hurricane Index (CHI) beginning in 2007. These contracts are designed to address the risk of storm damage as precisely as possible and are available in a number of structural configurations.

The Saffir-Simpson scale has traditionally been referenced to measure the destructive capacity of hurricanes.

Measuring Hurricane Intensity – The Saffir-Simpson scale was devised in 1971 to measure the potential for damage associated with hurricanes. Storms are rated on a scale from 1 through 5 and provide a crude indication of the potential for wind and flood related damage as a result of a hurricane landfall. Wind speed is the predominant factor in the rating noting that flooding is contingent upon various physical characteristics at the point of landfall including water depth and shape of the shoreline.

Saffir-Simpson Index

	Max Sustained 1-Minute Wind Speed	Storm Surge	Pressure (millibars)	Damage Description
Category 5	>156 mph	>18 feet	<920	Catastrophic
Category 4	131-155	13-18	920-945	Extreme
Category 3	111-130	9-12	945-965	Extensive
Category 2	96-110	6-8	965-980	Moderate
Category 1	74-95	4-5	>980	Minimal
Tropical Storm	39-73			
Tropical Depression	<39			

The Saffir-Simpson scale may be just a bit clumsy because it utilizes only 5 categories. While the scale accounts for wind speed, it does not take into consideration other factors that impact upon the potential for a storm to inflict damage such as the radius of the hurricane.

Unfortunately, the extremely analog character of a 1-5 scale renders the Saffir-Simpson scale just a bit clumsy. As a result, meteorologists have taken to describe storms with finer gradations, *e.g.*, a "weak" Category 3 storm or a "strong" Category 2. While the Saffir-Simpson scale considers wind speed as the primary cause of property damage, it does not take into account other significant characteristics of a hurricane such as the size or area over which a hurricane extends or the amount of precipitation that accompanies the storm. Working at the University of Colorado, Professor Lakshmi Kantha published a paper in 2006 suggesting some alternatives to the Saffir-Simpson index which incorporate these other factors that impact upon the amount of damage inflicted by a storm.

Researchers at the ReAdvisory Group of Carvill America subsequently extended the tenets of Kantha's work to develop the Carvill Hurricane Index (CHI). The CHI takes explicit account of the radius of hurricane force winds as well as wind speed as follows. Where V = maximum sustained wind speed velocity; V_0 = a velocity reference value calibrated to 74 mph; R = the radius of hurricane force winds; and, R_0 = a radius reference value calibrated to 60 miles.

The CHI references both wind speed velocity as well as the radius of the storm.

$$CHI = (V \div V_0)^3 + [\ 1.5 \times (R \div R_0) \times (V \div V_0)^2\ ]$$

To illustrate, consider Hurricane Katrina which achieved a sustained wind speed velocity of 145 mph over a 120 mile radius. The CHI for Katrina is calculated as 19.0 as follows.

$$\text{Katrina CHI} = (145 \div 74)^3 + [\ 1.5 \times (120 \div 60) \times (145 \div 74)^2\ ]$$
$$= 19.0$$

Sometimes two storms of the same rated intensity along the Saffir-Simpson scale imply very different destructive force. Both Hurricanes Katrina and Charley were rated Category 4 storms with identical maximum sustained wind speed velocities of 145 mph. But Katrina encompassed a radius of 120 miles while Charley was relatively small at only 30 miles. Katrina generated an estimated $96 billion in insured damages while Charley resulted in only $15.0 billion in damages.

Sometimes two storms with very different destructive capacities may achieve the same rating on the Saffir-Simpson scale.

Rating Hurricanes on CHI Scale

	Estimated Damages	Saffir-Simpson Scale at Landfall	Wind Speed Velocity	Radius	CHI
Katrina (2005)	$96.0 bil	4	145 mph	120 mi	19.0
Charley (2004)	15.0	4	145	30	10.4
Wilma (2005)	14.4	3	125	90	11.2
Ivan (2004)	14.2	3	130	105	13.5
Rita (2005)	9.4	3	120	85	9.9
Frances (2004)	8.9	2	105	75	6.6
Jeanne (2004)	6.9	3	115	70	8.0

While the Saffir-Simpson scale did not distinguish Katrina and Charley, Katrina was rated at 19.0 while Charley was at 10.4 per the Carvill Hurricane Index. In fact, the correlations between insured damages and the CHI are much stronger than the correlations between insured damages and the Saffir-Simpson categorizations. Many other factors that are not referenced in the CHI can certainly influence the value of hurricane-related damage, notably whether or not a hurricane makes landfall at a

The CHI is much more highly correlated with property damages than the Saffir-Simpson scale.

heavily developed urban as opposed to a sparsely developed rural area. Still, the CHI represents a superior measure of the destructive potential associated with a hurricane than does the classic standard of measurement.

Hurricane Contract Specifications

	Futures	Options
Contract Size	$1,000 x Carvill Hurricane Index (CHI)	One Futures Contract
Minimum Tick Size	0.10 Index Point = $100	
Named Storm Contracts	Contracts are issued for trading on named hurricanes that occur from June 1st through November 30th. Final settlement of these contracts is based on the CHI associated with the particular names storm as it achieves landfall.	
Seasonal Contracts	Seasonal contracts available for the following regions: Gulf Coast (Brownsville TX to AL/FL Border), Florida (AL/FL Border to Fernandina Beach FL), Southern Atlantic Coast (Fernandina Beach FL to NC/VA Border), Northern Atlantic Coast (NC/VA Border to Eastport ME), Eastern US (Brownsville TX to Eastport ME). Cash settlement of these contracts is based on the aggregate CHI for all hurricanes that achieve landfall in the particular area between June 1 and November 30th.	
Seasonal Maximum Contracts	Seasonal contracts available for the following regions: Gulf Coast (Brownsville TX to AL/FL Border), Florida (AL/FL Border to Fernandina Beach FL), Southern Atlantic Coast (Fernandina Beach FL to NC/VA Border), Northern Atlantic Coast (NC/VA Border to Eastport ME), Eastern US (Brownsville TX to Eastport ME). Cash settlement of these contracts is based on the maximum CHI for any hurricanes that achieve landfall in the particular area between June 1 and November 30th.	
Contract Expiration	• In case of contracts based on named storms, trading terminates at 9:00 am (CT) on 1st business day that is at least 2 calendar days following last forecast/advisory issued by National Hurricane Center for named storm. • In case of Seasonal contracts, trading terminates at 9:00 am (CT) on 1st business day that is at least 2 calendar days following November 30th.	
Option Exercise	Na	American Style
Strike Prices	Na	Strike prices listed "on demand"
Trading Hours	Traded on CME Globex electronic trading platform nearly 24 hours a day	

CME Group hurricane contracts are generally cash settled based upon a value of $1,000 times the CHI.

CHI Futures and Options – Accordingly, CME Group built its family of hurricane-related products on the Carvill Hurricane Index. One version is based on named storms noting that the United States Weather Service started naming hurricanes in 1953. These contracts are generally cash settled based upon a value of $1,000 x the applicable CHI. For example, a hurricane contract based on a particular named storm achieving a CHI equal to 8.5 may be settled at a final cash value of $8,500.

In addition to a series of contracts based on named storms as they are observed, there are a series of CHI-based contracts that are structured a bit differently to address somewhat different risk-management purposes including contracts based on named storms.

For example, seasonal contracts are based on activity in broad regions along the East and Gulf coasts. Their payouts are determined based on the aggregate or accumulated CHI for all named storms that reach landfall in that particular area over the course of a season. Seasonal maximum contracts are based on the highest CHI reading associated with all storms that reach landfall in a particular area. Other variations on these themes have been offered from time to time as well.

Other Esoteric Weather Products – In addition to temperature and hurricane related contracts, CME Group also offers futures and options based on somewhat more esoteric aspects of the weather including frost and snowfall.

CME Group has further developed futures and options based on esoteric weather phenomenon including frost and snowfall.

Frost days are referenced in the Netherlands by unions that represent construction workers. Union contracts are such that construction workers are routinely excused in the event of frost. This creates risks on the part of construction companies which may lose valuable time due to unscheduled frost-related work stoppages. These Frost contracts are tied to temperatures observed during a month or a season but confined to working hours and days excluding holidays and weekends.

It is estimated that snow removal costs U.S. municipalities up to one million dollars for every inch of snowfall, the bulk of which cost is tied to labor. Snowfall is readily measured and CME Group offers monthly and seasonal contracts based on snow recorded in New York's Central Park and at Boston's Logan International Airport.

Residential Housing Futures

Real estate is an asset class that accounted for $22.6 trillion in value in 2006 and is comparable in significance to traditional asset classes such as stocks and bonds.

The significance of a residential housing or home real estate futures contract stems from the sheer size of real estate as an asset class. Federal Reserve Flow of Funds data suggests that the value of residential real estate held by households and nonprofit organizations totaled $22.6 trillion[4] by the conclusion of 2006, essentially on par with the $18.1 trillion held in domestic equities[5] and $27.4 trillion in fixed income assets.[6] As such, residential real estate represents perhaps one-third of the total value of these highly significant and visible asset classes. Unlike the markets for stocks and bonds, however, there is no liquid market or facile means of hedging the attendant real estate risk.

Thus, Case, Shiller and Weiss articulated the concept of real estate futures in 1992 … "[f]utures and options markets should be established that are cash settled based on indices of real estate prices, and there should be separate markets for each of the major geographic regions … at present no real estate futures contract exists in the world; nor are there good substitutes for such markets." [7]

CME Group offers futures on the S&P/Case-Shiller® Home Price Indices to address the need for a hedging vehicle for residential real estate.

Futures and options based on the S&P/Case-Shiller® Home Price Indices ("S&P/CS Indices" or "the Indices") at CME Group (CME Housing futures and options) in early 2006 represents the fulfillment of that vision and an historic financial event, forging the creation of a novel derivatives asset class. CME Housing futures and options are designed to provide to provide a facile way for institutional and individual investors to gain exposure to real estate risk and effectively diversity their portfolios. Commercial and private asset holders are afforded an efficient hedging mechanism. In the process, this novel market may have the effect of reducing transaction costs for trading real estate.

We discuss the economic circumstances that lend impetus to this initiative; a discussion of the S&P/Case-Shiller Home Price Indices, as published by Fiserv CSW Inc. (CSW), which serve as the subject of CME Housing futures and options; and, review the use and characteristics of CME Housing futures and options.

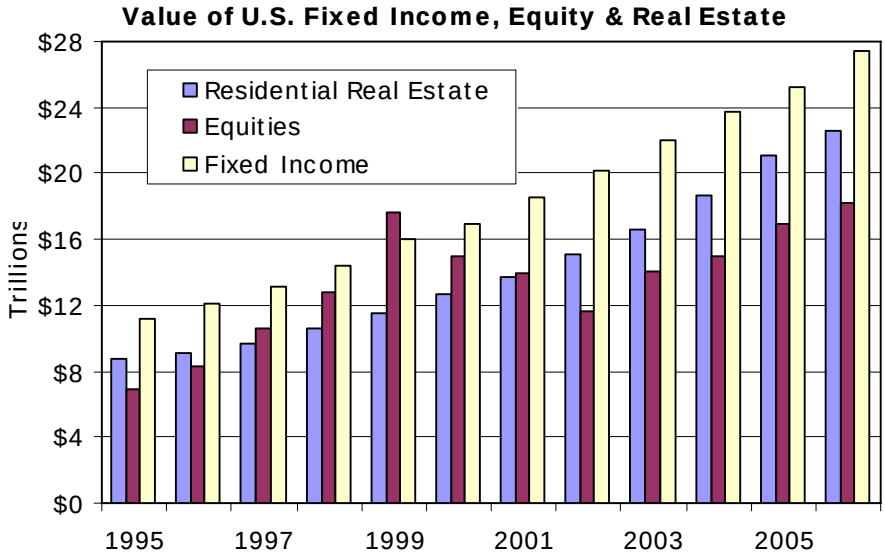
---

[4] See Federal Reserve Statistical Release Z.1, Table B.100, Balance Sheet of Households and Nonprofit Organizations. This figure represents the market value of "[a]ll types of owner-occupied housing including farm houses and mobile homes, as well as second homes that are not rented, vacant homes for sale, and vacant land."

[5] See New York Stock Exchange (NYSE) Fact Book, "Global comparison of market capitalization of domestic listed companies."

[6] Estimates of the Securities Industry and Financial Markets Association (SIFMA).

[7] Case, Karl E., Shiller, Robert J., Weiss, Allan N. (1992), "Index-Based Futures and Options Markets in Real Estate," Cowles Foundation Discussion Paper 1006.



The Housing Boom and Bust - Certainly a driving force behind the development of CME Group Housing futures and options has been the "housing boom" of the early 2000s … followed by a subsequent "housing bust." By July 2006, the median value for a home across the United States was valued at $230,900, representing an advance of close to 52% over the past five year period, according to data from the National Association of Realtors (NAR). The charge had been lead by housing prices on the west and east coasts with the more stolid Midwest booking the most modest advances.

Housing had rallied approximately 52% over five years leading up to mid 2006. The housing boom was driven by aggressively low mortgage rates and high income growth.

At the time, there was much talk in the media and amongst the public to the effect that the U.S. housing market was in the midst of a housing "bubble." This bubble was fueled by high income growth and (arguably) over-aggressively low mortgage rates. Much concern had been expressed that the bubble might burst resulting in homeowner distress and financial uncertainties. Sharp and unanticipated declines in housing values are not unprecedented, noting that Los Angeles home prices fell 41% in real terms from 1989 to 1997, while on the opposite coast, Boston home values declined 29% between 1987 and 1994.

The housing boom peaked near mid 2006 but the bubble subsequently burst. Housing values plummeted some 16% from July 2006 to February 2008.

Subsequent dramatic declines in housing activity and values were in fact realized … a housing "bust" if you will. By February 2008, the NAR estimated the median value of a U.S. home at $193,900 or approximately 16% off the highs from mid-2006. Just as the East and West coasts experienced the most dramatic advances in values, these markets likewise exhibited the most severe declines.

Housing Affordability - The housing boom of the early 21st century reflected growing affordability driven by low long-term rates and income growth. Thirty-year fixed-rate mortgages had fallen to a

nationwide average of 5.39% by July 2003, the lowest rates seen at any time reaching back to the 1960s. However, the continual advance in housing prices offset that decline in mortgage rates to a degree, with the median single family home value in the United States breaking the $200,000 barrier by December 2004. According to statistics from the National Association of Realtors (NAR), the median single family home value peaked at $230,900 by July 2006.

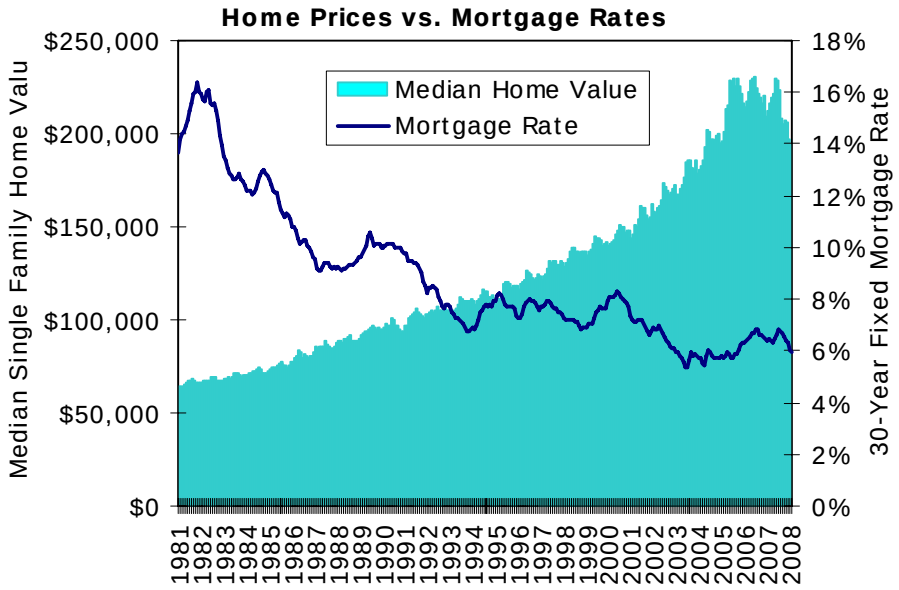
Housing became increasingly affordable in the early 2000s as a function of low mortgage rates. The ensuing buying demand bid the median home value up to $230,900 by July 2006.

While home values had risen, and risen sharply, that had not been enough to offset the effect of falling mortgage rates and rising family incomes. Principal and interest payments (P&I) on a median single family home were reported by NAR at just $795 per month or $9,540 on an annual basis by February 2003, representing just 18.2% of median family income of $52,303. That figure has been generally declining over the course of the past 25 years from a high of 39.1% in November 1981 (when mortgage rates soared to 16.38%) to a low of 17.8% in February 1999 (and prior to the boom of the early 2000s).

Principal and interest payments (P&I) on the average home fell to just 17.8% of median family income by February 1999.

But the proportion of household income consumed by housing costs began to rise as a function of rising home values coupled with rising mortgage interest rates. By July 2006, 30-year fixed rate mortgages had advanced to 6.82% and median home valued peaked at $230,900. Median monthly principal plus interest payments (P&I) increased to $1,207 a month or $14,484 on an annual basis to consume 25.1% of median household income of $57,685.

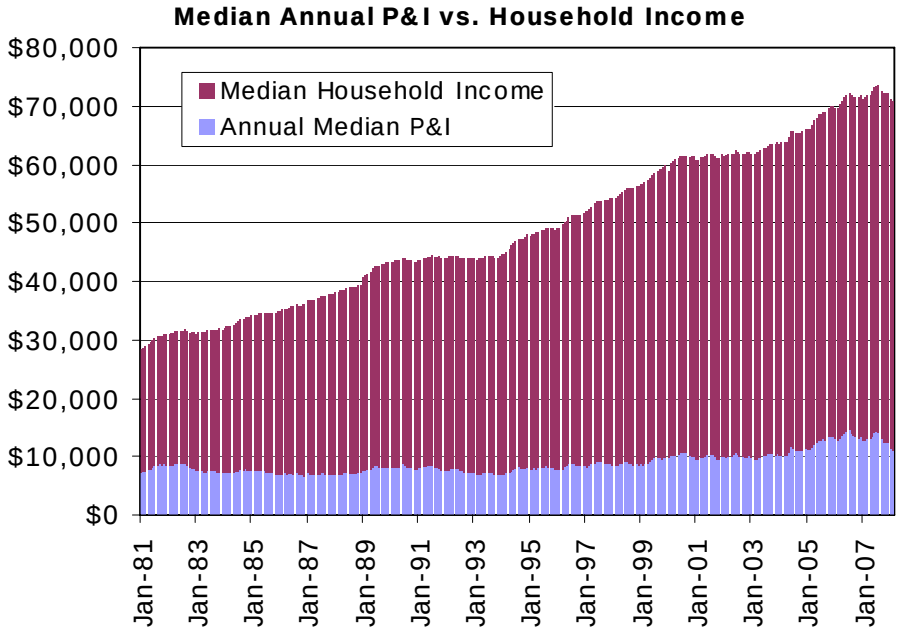
Rising home values prior to 2006 eroded that affordability.



Housing affordability peaked in February 2003 but subsequently plummeted by July 2006.

As a result, the NAR's Housing Affordability Index, which was as high as 137.1 in February 2003, plummeted to 99.6 by July 2006. Note that, the higher the index, the more affordable housing is deemed to be. In

particular, any figure in excess of 100 suggests that the median household can afford to purchase a median single family home.

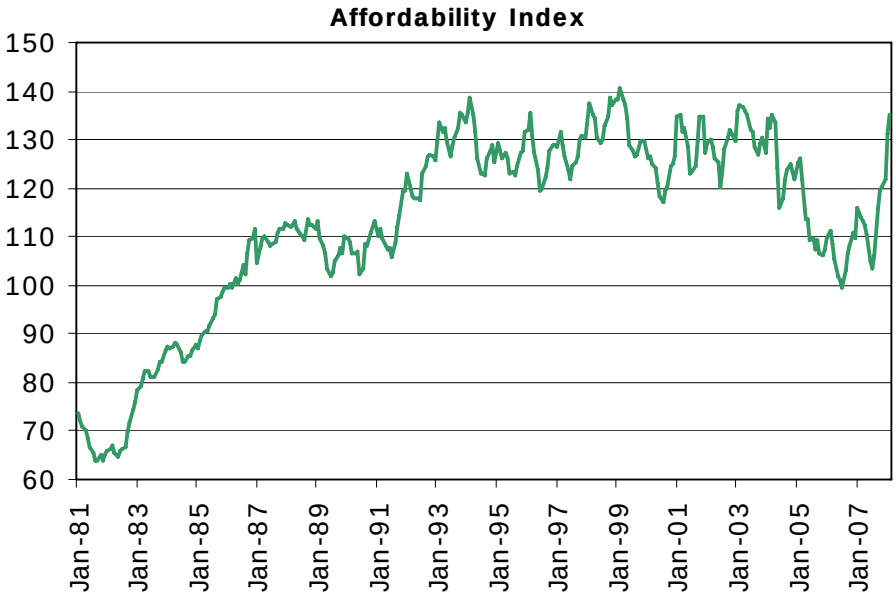


Homeownership rates were particularly high during the course of the housing boom. The U.S. Census Bureau reported homeownership as high as 69.2% by the second quarter of 2004, and up dramatically from a low of 63.8% in 1986. This figure was bolstered by the fact that as many as 5 million former renters had become empowered to purchase their own homes as a result of the affordability discussed above. Longer term homeowners had been moving up to higher priced housing.

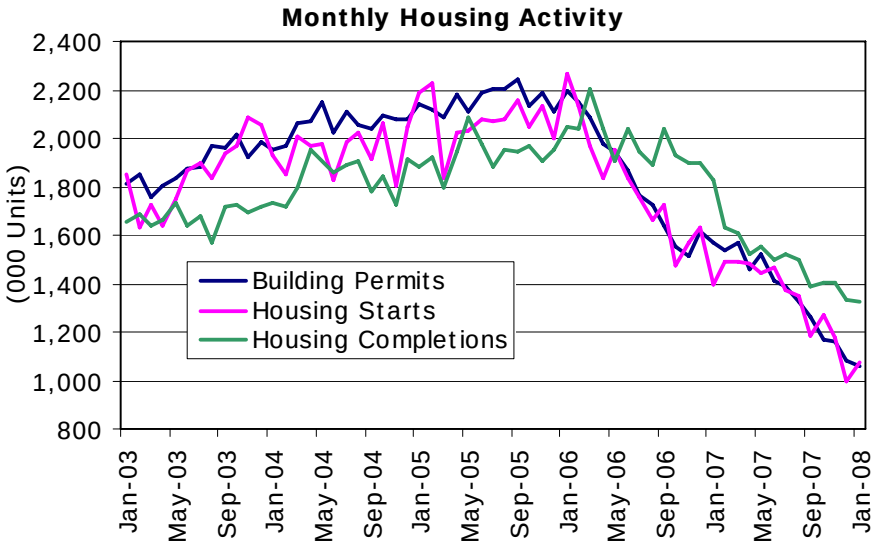
Real estate speculation had likewise become a factor. Fannie Mae reported that investors had accounted for up to 12.2% of purchases in the conventional mortgage market by 2005 compared to an average of 6.9% in 2002. These proportions were much higher in other venues, including Miami, where investors were behind upwards to 70% of home purchases by the height of the boom. By the 4th quarter 2007, however, U.S. homeownership rates had slipped to 67.8% as the housing bubble burst.

In the aftermath of the housing bust, affordability has actually rebounded nicely to near all-time highs once more.

Still, housing affordability as measured by the NAR Housing Affordability Index is rebounding sharply in the midst of the housing bust. By February 2008, the median home price had declined to $193,900 with 30-year fixed mortgage rates down to 5.94%. Median P&I payments declined to just $924 a month or 18.5% of median household income at $59,967 a year. Thus, the Affordability Index had rebounded to 135.2 and in the vicinity of the high water mark of 137.1 recorded in February 2003.



Housing Stock - Housing volume figures, whether measured by building permits, housing starts or housing completions had been strong and had, in fact risen to all-time highs by late 2005 or early 2006. House prices had concurrently surged to historic highs with Arizona, Nevada, Hawaii and California leading the way. Florida, District of Columbia, Maryland and Virginia likewise witnessed strong appreciation. Colorado, Ohio, Oklahoma, Indiana, and Texas showed the least appreciation. This reflects a restricted supply of build-able land on U.S. coasts. In particular, and spurred on by the tech boom, coastal California housing took off as early as 1995 along with demand in other favorable climes.



But all of these measures of housing market robustness came crashing down in early 2006. The same largely coastal markets that had

experienced the greatest strength during the boom, subsequently exhibited the greatest weakness during the bust. By early 2008, there were no indications in housing stock figures that suggested the downward trend might be approaching a conclusion.

Home Finance Trends – The rising prices early in the decade of the 2000s meant that financing the purchase of a home was becoming increasingly difficult. Thus, buyers sought out ways to hold down monthly payments with the use of interest-only or adjustable rate mortgages. These loans became quite attractive to the extent that short-term interest rates were very low, anchored by Fed monetary policy holding the target Fed Funds rate at just 1% in 2003 and 2004. The situation was exacerbated in some cases as lenders offered low initial "teaser" rates to mortgage borrowers. As such, adjustable rate mortgages were priced very low relative to 15- or 30-year fixed rate mortgages that were tied to longer term rates. In other words, the shape of the yield curve was upwardly sloped, encouraging mortgage lending tied to those very low short-term, as opposed to longer-term, interest rates.

Rising home values of the early 2000s enhanced the popularity of adjustable rate mortgages (ARMs). In some cases, ARMs were offered to under-qualified buyers at initial, below-market "teaser" rates.

The sharp upward slope of the yield curve encouraged borrowing tied to short-term interest rates.

Lenders, who were faced with increased competition because of excess capacity, were accommodating with respect to their loan standards. Many buyers opted for the most lenient loan terms to acquire a larger home, in the hopes of profiting more from further appreciation. Others leveraged themselves to acquire multiple homes. These aggressive lending practices shifted price risk, particularly in inflated markets, onto buyers and mortgage insurance companies.

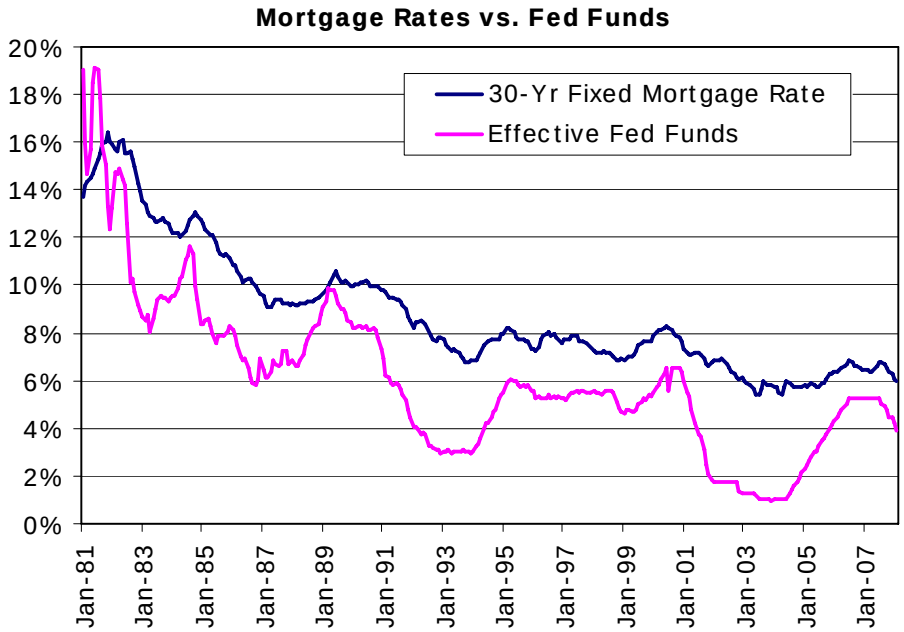
ARMs became less attractive as the yield curve began to flatten in the period from 2004 into 2006. Fixed rate mortgages were rather stable but ARM rates increased sharply.

This lead to a spate of foreclosure activity particularly in the coastal regions where real estate speculation had sent home values soaring. Subprime ARM borrowers were particularly hard hit by rising short-term rates.

But by 2004 through 2006, the yield curve began to flatten. While long-term rates and fixed-rate mortgages remained relatively stable, we saw short-term rates and adjustable-rate mortgage rates increase sharply to levels comparable to long-term term rates. This curve flattening put sharp pressure on overextended homeowners and their mortgage companies. This, in turn, led to a spate of foreclosure activity all over the country but particularly in those coastal areas that had witnessed the greatest amount of price appreciation or in markets where real estate speculation was most prevalent. Subprime borrowers subject to premium mortgage rates suffered even further as their resources were straining, forcing many into foreclosure situations and kicking off the so-called subprime mortgage crisis by mid 2007.

Fed Action - Alan Greenspan, addressing a joint Congressional committee on June 9, 2005, stated, "…exceptionally low interest rates on ten-year Treasury notes, and hence on home mortgages, have been a major factor in the recent surge of homebuilding and home turnover, and especially in the steep climb in home prices. Although a 'bubble' in

home prices for the nation as a whole does not appear likely, there do appear to be, at a minimum, signs of froth in some local markets."



The high incidence of mortgage foreclosures prompted the subprime mortgage crisis.

Similarly, Fed Governor Don Kohn had discussed imbalances in the U.S. economy with a specific focus on the housing market … "people should now be aware of risks in the real estate market … there is a role that monetary policy plays in reacting to these imbalances and this inevitable unwinding … By increasing the return to saving and dampening upward momentum in house prices, rising rates should induce an increase in the personal savings rate and thereby lessen one of the significant imbalances we have noted." It appeared that Mr. Kohn is advocating the use of monetary policy to induce a housing downturn and presumably encouraging less spending and more personal savings thereby.

In retrospect, of course, the Fed's focus on the housing sector was not unjustified. Indeed, it was estimated that the housing boom had generated over 800,000 new jobs in the homebuilding, real estate marketing and durable consumer goods sectors over the past three years. Still, the Fed's tightening actions beginning in 2004 had done little to affect long-term fixed rate mortgages. While target Fed Funds was increased from 1% to 5-¼% by 2005, the long end of the yield curve remained stable or even declined slightly in terms of yield. It was of course the short-end of the yield curve that was affected by Fed action. As such, Fed action did not necessarily keep new long-term borrowers out of the housing market but rather caused current homeowners on adjustable-rate mortgages to see their costs spiral higher.

By July 2007, the subprime mortgage crisis kicked off with a spate of reported large losses by some significant hedge funds. By September 2007, the Federal Reserve started to ratchet down short-term rates. Significantly, some of the easings were in 50-basis-point increments as opposed to the previous standard 25-basis-point adjustment. Fed Chairman Bernanke acknowledged in testimony to Congress that "global financial losses have far exceeded even the most pessimistic estimates of the credit losses on these loans … creating significant market stress." Chairman Bernanke further suggests that the Fed would take measures to prevent abusive or bad lending practices … "the Federal Reserve takes responsible lending and consumer protection very seriously. Along with other federal and state agencies, we are responding to the subprime problems on a number of fronts … We are committed to preventing problems from recurring, while still preserving responsible subprime lending."

By Spring 2008, the crisis was still in full swing, highlighted by a bailout of Bear Stearns and legislation on the table that might provide homeowners with some relief. As of this writing draft legislation to this effect was being developed in the Senate. In the meantime, many speculate that the U.S. is already in throes of a recession, possibly to be confirmed by forthcoming economic reports.

S&P/Case-Shiller Home Price Indices - The S&P/Case-Shiller Home Price Indices as published by Fiserv CSW Inc. (CSW) are widely recognized as the most reliable and authoritative measures of residential housing price movements for a variety of purposes, including loan portfolio due diligence, customer retention, loss reserve reviews, market surveillance, mortgage default, loss and prepayment analyses. The S&P/Case-Shiller Home Price Indices represent market-specific time series designed accurately to track residential home values.

The S&P/Case-Shiller Home Price Indices published by Fiserv CSW Inc. (CSW) are the most authoritative measures of housing prices available.

The development of the Indices was pioneered in the 1980s by CSW's research principals, Karl E. Case and Robert J. Shiller. In particular, Case and Shiller developed the repeat sales pricing technique, a methodology that is recognized as the most reliable means to measure housing price movement and a technique that has been applied by most other modern home price index publishers, notably the Office of Federal Housing Enterprise Oversight (OFHEO).

The S&P/Case-Shiller Home Price Indices are created using the "repeat sale" or "same home resale" method of mining data.

Case and Shiller were initially motivated by the sheer size and value of home equity in the United States and the impact it exerts on consumer behavior patterns. As suggested above, the value of residential real estate held by households and nonprofit organizations totaled $22.6 trillion at the end of 2006, rivaling the value of the domestic equity and fixed income markets. While the significance of the marketplace cannot

be disputed, there simply were no truly accurate measures of home value movements available at the time.

Accordingly, Case, Shiller Weiss, Inc. was founded in 1991 to provide a practical outlet for this work. The firm was subsequently acquired by Fiserv, Inc. in 2002 and now operates as Fiserv CSW, Inc. (CSW). In 2006, Standard & Poor's (S&P) stepped in to rebrand and eventually assume responsibility for marketing the tradable indexes as the S&P/Case-Shiller® Home Price Indices.

CSW is built upon a firm foundation of leading edge data collection, filtering, analysis, and modeling of home values. In the process of researching home values, the firm has accumulated an extensive nationwide database of residential real estate information. This data comprises the REdex Library™ of home pricing indices and related metrics, and CASA®, an automated property valuation service.

The Indices are fundamentally based on observed changes in home values. In particular, CSW collects data regarding transactions on all residential properties during the time period in question. Next, CSW conducts a search of its accumulated database to find information regarding any previous sales for the same home. If this search is successful, this data point is examined in order to eliminate from consideration data points that might distort the calculations. Specifically, these transactions would include … non-arm's length transactions (*e.g.,* the surnames of the seller and buyer match); foreclosure sales by mortgage lenders; transactions where the property type designation is changed (*e.g.,* properties originally recorded as single family homes are subsequently recorded as condominiums); suspected data errors where the order of magnitude in values change dramatically.

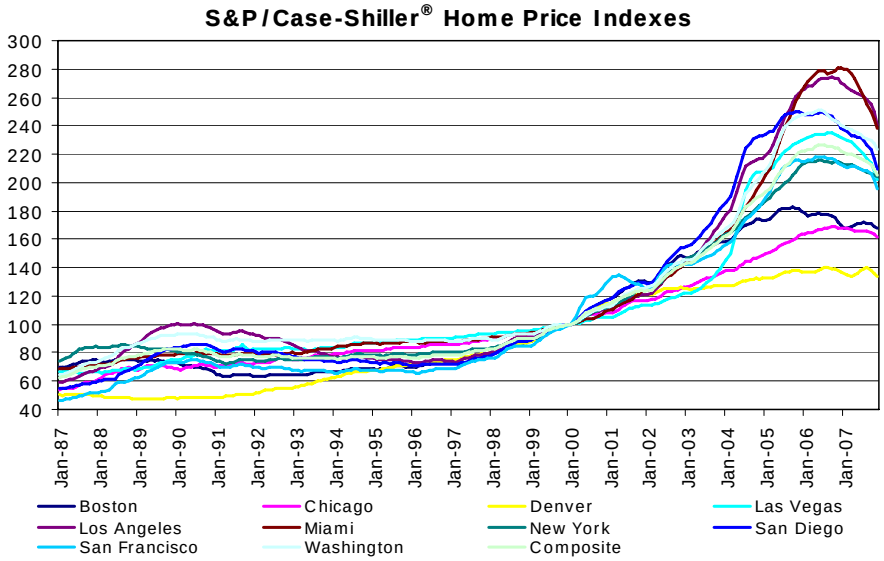
The sale pair is thereupon aggregated along with all other sales pairs found in a particular region to create the index. CSW utilizes both published and unpublished index calculation techniques created by Case, Shiller, and CSW's research staff to arrive at the index value.[8]

[8] Sales pairs within a particular geographic area are statistically combined, creating a "price path" of all single-family homes in that area using an M-Index-Robust Interval- and Value-Weighted Arithmetic Repeat Sales Chain-After Base model to create a single home price index. The home need not be sold within one quarter to measure changing values in the current quarter. Rather, sales pairs spanning some time are referenced to estimate an index point for that period. But the value of individual homes may fluctuate for many reasons. For example, a home may be remodeled or abandoned and deteriorate with obvious implications with respect to value. These situations speak more to a change in the physical characteristics of the property than the change in market value. CSW addresses these concerns by weighting sales pairs utilizing proprietary software that weights changing home values based on their

The Indices are established with a base value of 100.00 in the quarter ending March 2000 (the "base year"). The Indices are generated for geographic areas located across the entire United States and categorized on the basis of property type and price level. These geographic areas include U.S. Census Divisions, state, Metropolitan Statistical Area (MSA), counties and ZIP codes. The figures are produced on a quarterly basis and released near the conclusion of the second month of each calendar quarter representing activity in the previous calendar quarter.

The S&P/Case-Shiller Home Price Indices were established at a base value of 100.00 near the turn of the 21st century and are available based on a variety of geographic areas.

Distinct indices are published for both single-family homes and condominiums. Further distinctions may be made, as permitted by specific market conditions, on the based of three price tiers: high-, moderate- and low-priced homes. Tiering is established at levels that represent approximately one-third of the housing stock within the geographic region being measured. The Indices may be accessed via CSW's index-based Portfolio Valuation Services.



statistical distribution in that geographic region. Specifically, CSW employs an "M-Index-Robust Weighting" methodology where M is a reference to M-Estimate class. As a first cut, if a large change in the sales pair is observed relative to the statistical distribution of all area sales pairs, the suspect pair may be discounted or removed altogether from the sampling. Data related to homes that sell very frequently are excluded to the extent that historical and statistical data suggest that such sales are usually not at arms-length. Sales pairs are further weighted based on the period between the two sales dates ("Interval-Weighting"). When sales intervals are very long, it becomes more likely that a house may have experienced physical alteration and, therefore, longer interval pairs are discounted. Finally, each sales pair is assigned a weight equal to the first sale price ("Value-Weighting"). For more discussion regarding the repeat sales methodology, please refer to Shiller, Robert J. (1991) "Arithmetic Repeat Sales Price Estimators," *Journal of Housing Economics,* 1, 110-126.

The Indices are created using uncompromising standards for data quality.

Quality data is the cornerstone of any index and CSW approaches the tasks of accumulating and screening raw data rigorously. Long-term contracts are maintained with multiple redundant sources to ensure access to data in all geographic regions. In the process, CSW has vastly expanded its library of data without compromising quality. CSW further filters the raw data per proprietary methodologies to ensure accuracy, given the sometimes uneven quality of data from various public databases. CSW meticulously scans its database for possible errors and cross-checks data from its multiple data suppliers. CSW standardizes residential home addresses per U.S. Postal Service specifications.

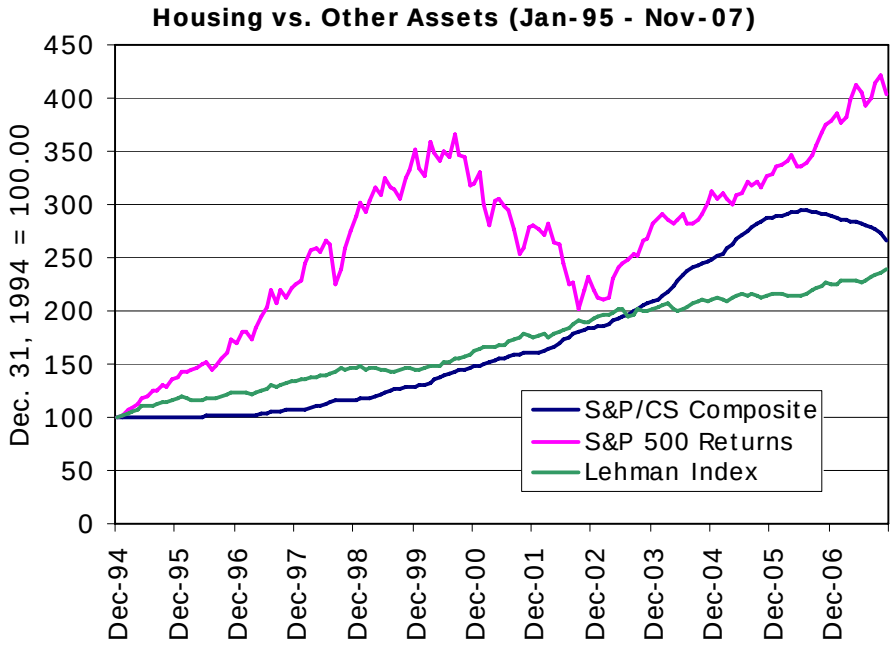
The S&P/Case-Shiller Home Price Indices are not the only housing price indices available. In addition, the National Association of REALTORS® (NAR) publishes the NAR housing indices. Similarly, housing indices are published by the Office of Federal Enterprise Housing Oversight (OFHEO).

S&P/CS Indices are more representative than the NAR or the OFHEO indices.

The NAR indices are quoted in terms of median home values and, therefore, might not actually measure the potential investment return of homeowners. Median values may be deceptive and may readily be skewed if, for example, homes are remodeled or new luxury or low-cost housing is constructed in the area. Further, high end homes tend to sell most heavily in the summer months when high income homeowners are more willing to move their children from one school to the next. Thus, there is a certain degree of seasonality in the NAR series. As a result of these considerations, there may be dramatic changes in the value of these indices which have little to do with the actual price fluctuations of homes. The Indices utilize a repeat sales methodology which is more robust and which speaks directly to homeowners' wealth.

Other home price indexes are available. But none truly compare to the S&P/Case-Shiller Indices in terms of the rationale of their methodology or their coverage.

The OFHEO indices utilize a repeat sales methodology applying the work of Case and Shiller. But they are based on a geometric, not an arithmetic average, which introduces certain biases to the data. Further, sampling is confined to Fannie and Freddie conforming mortgages and is therefore biased towards lower end rather than higher end housing. Note that only perhaps one-sixth of all California home sales conform. The Indices draw upon much larger sample sizes. Further, OFHEO references appraisal data to supplement actual transactions. Because the Indices are not confined to conforming mortgages, they incorporate a wider sample and do not resort to use of appraisal data. Note that appraisal data is often biased on the high side. OFHEO indices typically undergo multiple adjustments and restatements because they are released two months after the conclusion of the quarter.



A Unique Asset Class – Modern investment theory underscores the benefits of diversification. Residential real estate represents a rather unique asset class, the returns on which are distinguished from other major asset classes including stocks and bonds.

Housing as an asset class provides some unique benefits. Volatility is generally low relative to stocks and bonds and correlation is negative. Thus, housing provides diversification benefits.

The graphic above depicts the performance of the S&P/Case-Shiller 10-City Composite Index vs. stock performance represented by the Standard & Poor's 500 (S&P 500); vs. the bond market represented by the Lehman Aggregate Bond Index. (Note that these values were normalized at a value of 100.00 as of December 31, 1994 for purposes of this comparison.)

Performance of Asset Classes
(Jan-95 thru Nov-07)

	Average Monthly Return	Volatility (Standard Deviation of Monthly Returns)
Housing	0.64%	0.73%
Bonds	0.57%	1.05%
Stocks	0.99%	4.11%

During the approximate 12-year period from January 1995 through November 2007, the returns on these three assets were reasonably similar. But, the three different asset classes achieved those returns in very different ways. In particular, housing experienced the least volatility of returns as measured by the standard deviation of monthly percentage returns.

Correlation of Various Asset Classes
(Jan-95 thru Nov-07)

	Housing	Bonds	Stocks
Housing	-		
Bonds	-0.106	-	
Stocks	-0.150	-0.039	-

It is also interesting to note that housing displayed a negative correlation with the other three asset classes over the past ten years as depicted in the table below. Accordingly, housing as an asset would imply some important benefits in terms of diversification.

Users of CME Group Housing futures and options include owners of real estate who wish to hedge the possibility of price declines. Mortgage investors and insurers exposed to high loan-to-value ratios should find immediate application of futures and options.

Housing Futures and Options – CME Group began offering futures and option contracts based on the S&P/Case-Shiller Home Price Indices as published by Fiserv CSW Inc. (CME Housing futures and options) in early 2006. But the real estate asset class is different from other asset classes such as stocks or bonds in that real estate is frequently held for use over protracted intervals of time. Homeowners who expect to live in the same home for the rest of their lives, or businesses whose real estate holdings are very stable through time, may think that they do not need to hedge. In fact, however, there are substantial variations in the disposition of real estate assets through time that ought to generate hedging demand.

Real estate futures hold appeal to some home buyers to hedge their risks. Builders who have an inventory of homes to sell may want to hedge the inventory. Builders, who have a supply on the market, may also immediately want to offer some kind of value warranty to home buyers, who may be suddenly wary about buying in a market that appears possibly to be peaking, as an inducement to buy.

Other users include holders of mortgage portfolios. Mortgage insurers currently hold a significant exposure to home prices since a sustained decline combined with high loan-to-value (LTV) ratios could result in dangerous levels of mortgage defaults. Government-sponsored entities (GSE's), agencies, and other issuers of mortgages also would benefit from these markets in order to address the risk inherent in their portfolios.

Without a futures market, a period of rising rates combined with general home price declines could be catastrophic for the issuers. An event that impacts the agencies themselves could create a crisis that cuts through the entire U.S. economy. Finally, investors at large will find CME Group Housing futures and options useful to provide exposure to a very

important asset class without incurring the difficulties of actually executing real estate transactions.

Economic Benefits – On a macroeconomic level, futures based on home prices may add stability to the economy by allowing institutions to hedge their exposure to home prices and diversify the potential impact of sustained declines in home prices. As articulated by Case, Shiller and Weiss …

> "Nowhere in the world today are there markets that would allow investors to invest in a widely diversified portfolio of real estate without incurring enormous transaction costs. Since they cannot invest in a widely diversified portfolio of real estate, they cannot invest in a truly diversified portfolio at all. Thus, the presumed diversification that is supposed to be practiced by all investors according to modern financial theory just isn't happening.

Housing futures and options can provide convenient exposure to an important asset class without the difficulties attendant to an actual real estate transaction.

> "Nor are there markets that would allow individuals and institutions with large exposure to specific real estate risk to hedge these risks. Individuals for various reasons usually prefer to own their own homes, rather than rent them from institutions, and firms usually prefer to own real estate that they use in connection with their operations. But they cannot easily hedge the risk of these holdings.

> "In order to hedge their portfolio, these owners of real estate should sell real estate futures or buy put options that are closely correlated with the real estate that they live in or operate. At the same time, everyone should invest in a broad portfolio of real estate futures and options, which they can do by holding a portfolio of the opposite sides of the futures and options contracts that those who own real estate concentrated in a certain area undertake.

Housing futures and options have the potential to reduce the cost of doing business in the real estate markets.

> "Thus, the long sides of any given futures or options contract should be taken by a wide spectrum of investors, presumably primarily institutional, who invest in many futures contracts and options as a means of diversifying their portfolios; the short side should be taken by owners of region-specific real estate: individual homeowners, managers of rental properties, developers, corporation, and farmers." [9]

Further, it is possible and perhaps even likely that the availability of real estate futures may facilitate the introduction of a variety of risk management products that may be made available to individuals, such as home equity insurance or mortgages with guaranteed down payments. Institutions that offer such retail products will want to hedge their interests in futures markets. In fact, we might speculate that these institutions are unlikely to appear until futures markets are in place. We would expect that over a period of years after the introduction of real

[9] *Op. cit.,* Case, Shiller, Weiss.

estate futures a substantial risk management industry will develop that will be intensive users of real estate futures. In the process, the costs associated with real estate transactions might be reduced on an institutional and on a retail level alike …

> "The establishment of real estate futures and options contracts might be described as having the effect of spectacularly lowering transactions costs for trading real estate. The modern theory of the transaction costs (see for example Demsetz [1968], Akerlof [1970], Gammill and Perold [1989], and Gorton and Pennachi [1991]) stresses the importance of traders with superior or inside information: dealers must announce bid-asked spreads wide enough that they are not routinely 'picked off' by more informed traders. Baskets of corporate stocks and other financial assets are inherently subject to lower bid-asked spreads than are individual assets because there is less informed trading about the aggregates. The same would be true about the baskets of real estate on which the index is used to settle real estate futures and options contracts is based. Those who invest in real estate would be spared the concern that they are buying lemons, they can thereby forego the enormous costs and risks associated with buying individual properties." [10]

Tradable Indices – CME Group lists futures and options based on "tradable" S&P/Case-Shiller Home Price Indices as opposed to the more comprehensive set of "standard" Case-Shiller Indices. The tradable S&P/Case-Shiller Home Price Indices which are the subject of CME Group futures and options are released on a monthly basis on the last Tuesday of the month. They reflect housing sale data from the quarter ending approximately 7 weeks before or an approximate 2-month "look-back" basis. *E.g.,* the Indices released on the last Tuesday of February 2008 include data from October-November-December 2007; the Indices released on the last Tuesday of January 2008 include data from September-October-November 2007. In other words, the Indices represent "rolling 3-month" snapshots of housing data. By contrast, the standard S&P/Case-Shiller Indices are released only on a quarterly basis representing the prior entire calendar quarter and are released near the end of the next calendar quarter on a 3-month look-back basis.

CME Group lists futures and options based on 10 cities. Futures and options are also listed on the S&P/Case-Shiller Composite Home Price Index, representing all 10 cities.

Futures and options are available on tradable indices which represent matched sale prices for single family residential dwellings in ten (10) metropolitan statistical areas ("MSAs"). The 10 MSAs include Boston, Chicago, Denver, Las Vegas, Los Angeles, Miami, New York, San Diego, San Francisco and Washington D.C. In addition, the Exchange also lists futures and options based upon a composite index of the ten MSAs. However, there are additional indexes published including indexes that represent housing values in Atlanta, Charlotte, Cleveland,

[10] *Ibid.*

Dallas, Detroit, Minneapolis, Phoenix, Portland, Seattle and Tampa. Finally, a Composite of the 20 MSA based indexes as well as a national index is also available.

CME Housing Futures and Options

	Futures	Options on Futures
Contract Size	Each contract shall be valued at $250 times the S&P/Case-Shiller® Home Price Index, *e.g.,* the value of the Los Angeles Index was reported at 264.78 in the 4th calendar quarter 2005, which equates to a contract value of $66,195 (=$250 x 264.78)	One futures contract
Minimum Price Fluctuation	0.10 index points ($25.00)	0.05 index points ($12.50)
Trading Hours	Offered exclusively on CME Globex® on Sundays-Thursdays 5:00 p.m.-2:00 p.m. the next day	Traded via open outcry in CME Eurodollar options pit Monday–Friday, 7:20 am–2:00 pm (central time)
Contract Months	February Quarterly Cycle of February, May, August and November	
Final Settlement Date	Trading in expiring contract ceases at 12:00 noon (central time) on last Tuesday of contract month	
Cash Settlement	Cash settlement based on reported value of S&P/Case-Shiller Home Price Indices of home prices as published by Fiserv CSW Inc. (CSW) for the cities of Boston, Chicago, Denver, Las Vegas, Los Angeles, Miami, New York, San Diego, San Francisco, Washington DC and an index that represents a composite of the 10 cities	Exercised into the associated futures contract
Strike Prices	NA	At one (1) point intervals above and below prevailing market price

Note that the S&P/Case-Shiller New York Home Price Index is not based on an MSA but, rather, represents a customized index that measures single family home values in select New York, New Jersey and Connecticut markets with significant populations that commonly commute to New York City for employment purposes. The S&P/Case-Shiller Composite Home Price Index is a weighted average of the 10 MSA indices. While the Indices are intended to be representative of all single family residential homes within the subject MSA, data for particular properties or component areas may be unavailable. Performance of individual properties or counties is not necessarily consistent with the MSA as a whole. County components are subject to change as a result of revisions by the U.S. Census Bureau or data insufficiencies.

Economic Indicators

Nonfarm Payrolls (NFPs) are the most significant of domestic economic indicators.

CME Group commenced offering futures and options based on Nonfarm Payrolls (NFP) in April, 2008. Nonfarm Payrolls represents the most anxiously anticipated and closely watched of all domestic economic indicators. Unexpected movements in NFPs can exert tremendous influence on fixed income, equity and currency markets.

NFPs are generally released at 7:30 a.m. (Central Time) on the first Friday of each month.

Employment Reports - Nonfarm Payrolls (NFPs) are released by the Bureau of Labor Statistics (BLS) usually at 7:30 a.m. Central Time on the first Friday of each month, along with a battery of other employment information. Actually, there are two distinct reports generated from separate surveys: the "Establishment Survey" of approximately 375,000 businesses used to generate NFPs; and, a "Household Survey" of approximately 60,000 households used for the unemployment rate. We focus on the Establishment Survey depicting the seasonally adjusted change in total Nonfarm Payrolls.

The Federal Reserve pays careful attention to NFPs as one of the first major economic releases of the month depicting economic activity in the prior month.

Significance of NFPs - The Establishment Survey is one of the first major economic releases of the month that depicts economic activity in the prior month. Note that the Federal Reserve's implicit mission is to balance the risks of inflation with the goal of achieving maximum possible stable growth and employment. Thus, the Fed takes heed of the various labor market reports including the monthly change in NFPs, the unemployment rate, average workweek, overtime and average hourly earnings. In turn, the market focuses on NFPs for clues regarding possible Fed intentions. The value of interest rate, equity and currency markets might all be impacted accordingly.

Futures and Options – Despite the significance of the NFPs, there is no facile means by which to gain direct exposure to this figure for either speculative or risk management purposes. CME Group's NFP futures and options address this issue. Futures are cash settled based on a value of $25 x reported change in size of civilian labor force quoted in thousand jobs.

While these numbers are sometimes revised in subsequent months, NFP futures and options are settled based upon the preliminary or "headline" number regardless of any subsequent revisions. Because we quote the change in the number of jobs, this can result in quotation of negative prices or strike prices. These contracts expire in each calendar month and are based on the employment report for the prior calendar month. They are offered exclusively on the CME Globex® electronic trading platform.

Nonfarm Payroll (NFP) Futures and Options

	Futures	Options
Contract Size	$25 x change in Total Nonfarm Payrolls (NFPs) as published by BLS	One (1) futures contract
Quote	Quoted in thousands, *e.g.,* May 2007 contract would have settled at +157, representing change in Nonfarm Payrolls (in 000s) from April to May 2007. Each minimum price fluctuation of 1 point (1,000 jobs) = $25.00	Quoted in 500 jobs or minimum fluctuation of 0.5 (=$12.50)
Contract Months	Contracts available for all NFP releases, listed on the Monday after the previous month's release	
Trading Hours	Offered exclusively on CME Globex® electronic trading platform on Sundays through Thursdays from 5:00 p.m. to 4:00 p.m. CT	
Last Trading Day	Trading in an expiring contract concludes at 7:25 a.m. CT on the first Friday of the contract month or such other day on which NFP figures are scheduled to be released by the BLS	
Final Settlement	Settled in cash based on change in seasonally adjusted total Nonfarm Payrolls (NFPs) reported by U.S. Dept. of Labor, Bureau of Labor Statistics Table B-1., Employees on nonfarm payrolls by industry sector and selected industry detail, seasonally adjusted change in total nonfarm payrolls for month prior to named contract month	American style options may be exercised into one (1) futures contract
Strike Prices	Na	Established at 10 point (or 10,000 jobs) intervals from -500,000 to +500,000 jobs
Price Limit	Price limit of ±200 points (200,000 jobs = $5,000) applied to final settlement price from previous business day's settlement price	Movement in value of a call (put) is effectively capped (floored) by virtue of price limit applied to futures contract