



# FINANCIAL CHERNOBYL OR MANAGEABLE RISK?

## THE BREWING STORM IN SUB-PRIME MORTGAGES AND CDO MARKETS

**Rajat Bhatia**

Founder & CEO, Neural Capital

**“ Warren Buffet famously referred to derivatives as financial weapons of mass destruction designed by none other than madmen. ”**

Others too have warned about the risks of using derivatives. Following the demise of many sub-prime mortgage lenders in the United States and the sudden draw-downs of the two Structured Credit Hedge Funds run by Bear Stearns Asset Management, it appears that those who warned against the use of derivatives were finally going to be proven right.

Anyone familiar with the financial landscape of the last few decades is well aware of the debris left behind by major financial disasters like Barings in Singapore, Orange County in California, Long Term Capital Management, Sumitomo in Japan and the Amaranth hedge fund, to name just a few. While I believe that derivatives serve useful purposes, their reckless or ill-advised use can lead to serious financial disasters. Illiquidity, poor understanding of the risks involved and reliance on those selling the securities for advice are common themes in most financial disasters involving the use of derivatives. Just like fire or electricity, derivatives can be a good servant or a bad master.

The difference between the previous financial disasters created by derivatives and the current one is the sheer size and magnitude of the brewing storm. The bail out of Long Term Capital Management ran into four billion dollars. The demise of the Amaranth hedge fund cost investors around six billion dollars. The potential of a serious meltdown in the sub-prime mortgage backed securities and collateralised debt obligations (CDOs) markets, is staggering. Experts put the numbers at anywhere between US\$150 billion and US\$250 billion. This is the equivalent of an accident at a nuclear reactor like the one in

Chernobyl. With all the toxic waste (the equity tranches of CDOs) that is lying in the portfolios of institutional investors such as mutual funds, pension funds, state trusts and hedge funds, there is a real risk that the combined losses of all investors will run into hundreds of billions of dollars.

Bubbles are characterized by increases in asset prices far beyond what the fundamentals warrant. Excessive returns and asset price inflation driven by speculative fever, very high trading volume and high leverage are key defining features of any bubble.

The speculative fever in US housing markets during the last few years was nothing but a bubble that is now coming undone. The crash is unlikely to be a dramatic, one-off event but is more likely to be a train wreck in slow motion, that will take a couple more years to play itself out completely.

### **The brewing storm in sub-prime mortgages**

Recently, a possible blow out at the High Grade Structured Credit Strategies Fund - a hedge fund sponsored by Bear Stearns Asset Management, which invested in CDOs backed by risky sub-prime mortgage, was averted after some last minute brinkmanship on Wall Street. A second hedge fund also sponsored by Bear Stearns Asset Management called the High Grade Structured Credit Strategies Enhanced Leveraged Fund had invested in similar risky securities but with additional leverage, as its name implies. An injection of US\$3.2 billion via a loan from the parent firm, Bear Stearns Companies Inc. saved the hedge funds from imminent collapse and enabled an orderly liquidation of assets. Whilst the bail-out of the two hedge funds by Bear Stearns Companies Inc. was the right thing to do given the difficult circumstances, it had a negative impact on Bear's stock price as the parent firm's exposure to the two hedge funds increased from US\$40 million to US\$3.2 billion.

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Apart from the hedge funds at Bear Stearns Asset Management, there are reports of problems at Basis Capital, a hedge fund manager in Sydney, Australia who reported a 14% decline in the value of one of its funds in June 2007. According to a letter to investors from this hedge fund, it had been hit by indiscriminate re-pricing of otherwise fundamentally sound collateral. Anyone who has traded in the financial markets knows the old adage taught to every new trader "The market may not be smart but it is always right". Basis Capital may consider the re-pricing of the US\$1 billion it has invested in structured credits and junk-rated loans as indiscriminate, but if the ABX Index is any barometer of market conditions for credit-default swaps on sub-prime mortgage bonds, then indications are that the BBB rated sub-prime mortgages and their CDOs are now being repriced at less than 50% of their value in January 2007.

Denver, Colorado based Braddock Financial is closing its US\$300 million Galena Street Fund because of redemption requests. United Capital Holdings in Florida simply suspended redemptions. Another hedge fund in trouble is the Caliber Global Investment fund based in the United Kingdom. According to various news reports institutions who own sub-prime mortgage backed securities and CDOs backed by them include Canada's CIBC (US\$330 million), debt insurers AMBAC (US\$1 billion) and MBIA (US\$800 million).

Besides hedge funds, mutual funds also have large holdings of sub-prime mortgage backed securities. These include: The Franklin Strategic Mortgage Portfolio (US\$50 million), Franklin Total Return Fund (US\$170 million) and Principal Investors Bond and Mortgage Securities Fund (US\$360 million). Mutual funds are also heavily invested in CDOs. According to the Wall Street Journal, 500 mutual funds have invested approximately US\$5 billion in CDOs. Regions Morgan Keegan Select High Income Fund has invested approximately US\$160 million in CDOs.

Bloomberg reported the following investments by pension funds in the equity tranches of CDOs: New

Mexico State Investment Council (US\$522.5 million), General Retirement System of Detroit (US\$38.8 million), Teacher's Retirement System of Texas (US\$62.8 million) and Missouri State Employees' Retirement System (US\$25 million). These equity tranches of CDOs are most susceptible to losses because they are the first to take the defaults on the collateral underlying the CDOs. Owning the equity tranche of a CDO when defaults occur is the equivalent of being on the beach when a tsunami hits. Only time will tell if the bail-out at Bear Stearns is just a band-aid or a successful surgical solution to a festering problem in the market for sub-prime mortgage backed securities and the CDOs that were created by pooling together such risky securities. If the problems in sub-prime mortgages persist and the defaults continue to go up especially as more adjustable rate mortgages are re-set later in 2007 and in 2008, we could well witness another gaping leak in the dam that is still holding up.

The total amount of US mortgage backed securities held by institutional investors is US\$6 trillion of which \$800 billion are securities backed by sub-prime mortgages. Interest rates on billions of dollars worth of Adjustable Rate Mortgages (ARMs) are going to be reset over the next two years. Bank of America stated that US\$515 billion of ARMs will be reset in 2007 and another \$680 billion will be reset in 2008. More than 70% of these ARMs are sub-prime. This implies that sub-prime ARMs worth US\$840 billion will be reset by the end of 2008.

Whichever way you look at the numbers, their size is truly staggering and the outlook not particularly rosy. Already 612 classes of Residential Mortgage Backed Securities (RMBS) worth US\$12.1 billion have been put on negative credit watch by S&P. This happened in the second week of July 2007. Moody's meanwhile downgraded 319 RMBS worth US\$5.2 billion at the same time. The implications for CDOs that invested in RMBS are serious and rating agencies are also reviewing them for possible downgrades.

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### **Previous warnings about CDOs especially their equity tranches**

Warnings about the risks in CDOs are nothing new. When I worked at Citibank Global Asset Management in London during the late 1990s, the Alternative Investment Strategies Group of which I was a part, had a substantial portfolio of Collateralised Loan Obligations (CLOs) and Collateralised Bond Obligations (CBOs). We were active in creating, structuring and marketing these instruments to institutional investors in various parts of the world. The CBOs and CLOs that my group created never had any problems of the kind that are prevalent now.

In March 1997, I read an interesting story on the cover of Risk magazine. It was entitled "Timely or Toxic" and it took a hard look at the CDO market by warning that the high levels of leverage in the equity tranches of CDOs created investment risks that were simply too dangerous for investors. The paper referred to one particular CDO structure in which Capital Markets Risk Advisors had seen a leverage of one thousand times (in the equity tranche).

No wonder the equity tranches of CDOs are referred to as toxic or radioactive waste in the financial markets industry. Risk magazine also warned "by their very nature, CBOs are not readily amenable to VAR analysis - because they are impossible to unwind or sell, one has to assume a very long holding period (either the life of the portfolio or more kindly its average duration)".

Chasing yield without paying much attention to the risks involved is an all too familiar story in the financial markets. Time and again, financial disasters have occurred because investors were too focused on returns and lost touch with the risks that they were taking on. In 1994, numerous companies in Indonesia, Thailand and Malaysia had done trades that involved writing interest rate caps and put options on the Japanese Yen against the US Dollar. These structured deals were often leveraged ten times to deliver yield enhancement to these institutions. Following Alan Greenspan's decision to raise US interest rates five times starting in early 1994, these yield-enhanced structures resulted in huge

capital losses for those who had bought them from well known investment banks.

Similarly, during the last few years, as bond yields fell and credit spreads tightened, investors were forced to look for yield enhanced structured products. The environment of low interest rates that fuelled the housing boom across the United States resulted in investors seeking yield enhancement. This time, instead of writing options on various underlying assets to deliver enhanced yield, many investors took a liking for CDOs and sub-prime mortgage backed securities.

### **Record issuance of CDOs and MBS in recent years**

According to the Securities Industry and Financial Markets Association (SIFMA), issuance of CDOs ballooned from US\$157 billion in 2004 to US\$550 billion in 2006. In the first quarter of 2007, CDO issuance reached US\$158 billion, equal to the issuance during the whole of 2004. According to industry experts, over one trillion dollars of CDOs have been issued in the last few years. It is no coincidence that the rapid issuance of CDOs in recent years has been driven by a low interest rate environment. In Europe, CDO issuance has also been fairly rapid though the numbers are not as high as in the USA. European CDO issuance in 2005 totalled US€48.9 billion and US€88.0 billion in 2006.

The outstanding volume of Asset Backed Securities backed by home equity loans has also risen dramatically from US\$152 billion in the year 2000 to US\$583 billion in 2007.

### **Change in the interest rate environment**

However, when inflationary pressures prompted the Fed Chairman, Ben Bernanke to raise interest rates, the housing market, the mortgage backed securities market as well as the CDOs market began to change course.

In rising interest rate environments, credit spreads start to widen as well. The widening of credit spreads is often euphemistically referred to as the "re-assessment of credit risk". Rising rates plus widening credit spreads have a double negative impact on the

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values of debt instruments. The negative impact is more pronounced in the case of high yield bonds.

During the period 2002 to 2006, US\$2.3 trillion of sub-prime loans originated in the USA. People with poor credit scores were able to buy houses and apartments as mortgage lenders ignored standard credit checks. People who could not repay their mortgages ended up re-financing their properties as the real estate bubble continued to grow. There was a time in recent memory, when Florida real estate sales people would tell prospective buyers that all the apartments in a building would be sold within a few hours of opening, such was the irrational exuberance exhibited by property buyers.

The end of cheap money brought the property boom to an end and those unable to meet their mortgage payments were pushed into foreclosure. Mortgage delinquencies started to rise and reached 13.8% in the first quarter of 2007. The S&P/Case-Shiller Home Price Composite Index - CSXR, traded on the Chicago Mercantile Exchange peaked in July 2006 at 226.17. It has since been on a downward trend. The CSXR futures (the red line in Fig.3) indicate a further worsening of home prices until May 2008.

### **Impact on CDOs backed by sub-prime mortgages**

The problems in the housing market in turn had a negative impact on CDOs backed by sub-prime mortgages. According to MarkIt, the ABX Home Equity Index (ABX.HE), which is a barometer of credit-default swaps on sub-prime mortgage bonds, has fallen sharply. By July 2007, the lowest tranche of the year 2007 ABX Index, which is rated BBB minus, had fallen by more than half from its inception in January of the same year.

The AA rated tranche which had not been impacted until the beginning of July 2007 has now fallen from 100 to 88.17. This reflects the growing malaise in the sub-prime mortgage backed securities and associated CDOs. There have been reports that CDOs supported by sub-prime loans have already lost about US\$20 billion in market value and that more losses are yet to come. Data from Moody's and Morgan Stanley shows that of the US\$375 billion of

CDOs sold in the United States during 2006, sub-prime mortgage backed securities accounted for US\$100 billion of the underlying collateral. Nearly US\$60 billion of CDOs sold in the United States during 2006, were mezzanine asset-backed CDOs in which sub-prime mortgage backed securities account for nearly three quarters of the collateral. By the time the sub-prime and CDOs problems are completely done with, it is likely that total losses will touch US\$150 billion to US\$250 billion. The sheer quantum of this problem will make the Long Term Capital Management disaster seem relatively benign. Richard Bookstaber, who has served many well known Wall Street institutions such as Salomon Brothers as their Chief Risk Officer, Morgan Stanley and Moore Capital, wrote in his book, *A Demon of Our Own Design: Markets, Hedge Funds, and the Perils of Financial Innovation*, that the spread of arcane financial instruments such as CDOs, credit swaps and many others, has made financial disasters unavoidable.

Nevertheless, the key question that remains is whether the risks from hedge funds and derivatives are systemic and could lead to a wide spread contagion or will they be localised and limited to individual hedge funds or financial institutions. As the storm in sub-prime mortgages and CDO markets unfolds, we will get some interesting answers to this very important question. It is possible for individual banks and hedge funds to manage the blow-out and prevent it from affecting the broad CDO market, as Bear Stearns did recently. However, the lack of liquidity, ratings downgrades and reliance on mark-to-model could result in some unpleasant surprises.

### **An overview of CDO structures**

For readers who would like to familiarise or re-acquaint themselves with the various types of CDOs and how they are structured, here are some interesting facts about these financial instruments: CDOs were first created in the form of collateralised bond obligations during the 1980s by Drexel Burnham Lambert, the Wall Street bank that collapsed after being implicated in the famous Ivan Boesky insider scandal. CDOs are structured by pooling together a portfolio of credit risks and

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dividing that credit risk into multiple tranches, each with its own unique characteristics:

1. Senior Tranches are usually rated AAA and pay Libor + 10 basis points
2. Mezzanine Tranches are rated anywhere between AA and BB and can carry varying spreads depending upon their credit rating. A spread of 200 basis points over Libor for single A rated mezzanine tranches was not uncommon. BBB rated mezzanine tranches had spreads of around 600 basis over Libor in March 2007 but have widened since then and some now have spreads of 1000 basis points over their benchmarks.
3. The Equity Tranche or the lowest tranche is unrated. In the industry it often goes by the sobriquet of "toxic waste" as it is the first to absorb the losses arising out of credit defaults. Since the losses are applied in reverse order of seniority, the equity tranches offer higher coupons to compensate for the higher risk. An equity tranche can pay Libor + 12% or more.

It is interesting to note that the return on the equity tranche of a CDO is actually similar to that of a call option on a portfolio of high yield debt instruments. The downside is limited to the extent of the investment made in the equity tranche whereas all excess interest on the portfolio of underlying securities in the CDO goes to the holder of the equity tranche. On the other end of the spectrum, an investment in the senior tranches of a CDO is equivalent to writing out-of-the-money put options on the portfolio of high yield securities.

Equity tranches of CDOs are also akin to the 'Russian Roulette' notes in which the investor suffers a default when one of the reference bonds default. The 'Russian Roulette' note, also known as the cheapest to deliver note gives the investor a higher coupon for selling the bond delivery option to the issuer. The buyer of a "Russian Roulette" note suffers a complete loss when one of a number of bonds in the reference pool default. Similarly, the investor in the equity tranche of a CDO stands to lose all or most of its investment if one of the high yield bonds which forms the collateral underlying the CDO defaults. As an example, consider a CDO which has 10 high yield

bonds with equal weights in the collateral pool and whose equity portion is 5%. If one of the bonds default and the recovery rate is just 50%, the investor stands to lose all the investment in the equity tranche of the CDO. This is identical to what would have happened in the case of a 'Russian Roulette' note. The difference between equity tranches of CDOs and 'Russian Roulette' notes is that the former have higher levels of diversification in the collateral pool and the weights of each bond in the collateral varies. Also, recovery rates play an important part in determining the ultimate pay-off in the case of CDOs.

Fig.6 illustrates the impact of defaults on the returns that are earned by the equity tranche of a CDO. A gross annual default rate of 7% can result in a zero return on the equity tranche and beyond that the capital itself is at risk. In the US sub-prime mortgage industry, default rates have reached much beyond 7% already and are rising.

The three tranches are sold to different groups of investors, with varying risk tolerances and risk preferences. The ability to place the equity tranche is critical to the success of the deal because unless it is placed the CDO cannot be completed.

CDOs can take the form of Collateralised Loan Obligations (CLOs) or Collateralised Bond Obligations (CBOs). The underlying loans and bonds can be investment grade as well as high yield. Emerging market bonds often form the collateral behind CDOs because of the high yields that they provide. CDOs are also structured by pooling together mortgage backed securities that can take the forms of RMBS, CMBS, CMOs and sub-prime mortgages. Such securities come with the added risk that they are callable and have negative convexity when interest rates fall. This is due to the fact that mortgage borrowers can refinance their mortgages in a falling interest rate environment.

According to the cover story in the Risk magazine of March 1997, asset backed securities can even be created with pools of esoteric assets such as the future cash flows from movies yet to be produced, revenues from future sales of tequilas or even the

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sales of second hand cars in Russia. There have even been asset backed securities created by the securitisation of remittances from Pakistani expatriates working in the Middle East.

The key driver of the issuance of such securities is the fact that institutional investors start to seek higher yields, particularly in low interest rate environments. As credit spreads narrow, investors are forced to seek higher returns by accepting riskier credits into their portfolios. Most pension funds, insurance companies and state trusts are prevented from investing in non-investment grade securities. This is where the financial alchemy comes into play. By pooling together non-investment grade securities and creating tranches of different seniority, banks and structured finance houses are able to create investment grade securities with returns comparable to non-investment grade securities. The rating agencies use their models to accord varying credit ratings to the different tranches and all investment grade tranches are snapped up by the pension funds and other institutional investors seeking higher returns.

CDOs can be structured in a number of different ways. A common structure is the 'Cash Flow CDO' which, as the name suggests, is structured to pay off liabilities with the interest and principal payments i.e. the cash flows from the underlying collateral. Synthetic CDOs on the other hand do not involve the purchase of cash flow generating assets and instead use credit default swaps to synthetically replicate a cash flow CDO. Hybrid CDOs utilise the funding structures of both cash flow CDOs and synthetic CDOs. Market value CDOs are structured to support liabilities through the value of collateral.

Arbitrage CDOs attempt to capture the mismatch between the yields of assets (CDO collateral) and the financing costs of the generally higher rated liabilities (CDO tranches). Balance sheet CDOs remove assets or the risk of assets off the balance sheet of the originator. Balance sheet CDOs may be cash or synthetic. In cash deals they are used to move assets off of a balance sheet (frequently to reduce regulatory capital requirements, among other reasons), similar

to traditional ABS securitisations. In synthetic deals, the risk is moved off balance sheet by the originator's purchasing protection from the Special Purpose Vehicle through Credit Default Swaps.

CDO tranches with a maturity of greater than eighteen months are defined as Long Term CDOs while tranches with maturities of less than 18 months are referred to as Short Term CDOs. More esoteric versions of CDOs include a product called CDO squareds. It is essentially a CDO of a CDO. First launched in 1999, CDO squared are leveraged single tranche CDOs whose collateral are tranches of other CDOs.

Similar to the CDO-squareds are the CDOs of asset-backed securities. They offer an investor the opportunity to invest in a highly diversified portfolio of securitised instruments. By creating a pool of securities backed by assets such as residential and commercial mortgage backed securities, auto loans, credit cards and the like and then issuing tranches of CDOs, the investor is able to achieve significant diversification of credit risk and yet higher returns compared to corporate bonds of similar rating. By keeping credit concentrations to low levels and having a wide variety of asset backed securities in the portfolio, the risk of default in the CDO is substantially reduced.

CDOs of Equity Default Swaps are another variant in which equity default swaps (EDS) are included in the portfolio instead of credit default swaps. Daiwa Securities is credited with structuring the first rated CDO in which the collateral was exclusively that of equity default swaps. In an EDS, payment to the protection buyer is triggered when the underlying equity price falls below a specific level. It is somewhat analogous to a knock-in barrier option.

Can the financial Chernobyl be averted?

The million dollar question, or perhaps in this case the billion dollar question, that remains is whether there is a way to manage the systemic risk arising out of the problems in the sub-prime mortgage market and the CDOs which were issued using them as collateral. The simple answer is "Yes". However, the

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solution involves dealing with some very complex structures and issues. A financial Chernobyl can be averted but this is not a trivial problem. Therefore, the solution to this problem requires some serious out-of-the box thinking, co-ordination and co-operation amongst the major market players in this arena. While it is impossible to mitigate the losses in each CDO once the defaults set in, re-packaging of existing CDOs is a plausible way to disperse the risks widely and hence contain the problem. It is like spreading toxic waste across a wide geographical area so that no single particular location is severely affected.

Re-packaging the CDOs into a new pool and issuing new securities will result in the risk being diversified further. However, diversification of risk is of no use when correlations start to rise way beyond historical levels. It is the implied correlation that matters during rough times rather than what happened in the past. From the LTCM experience, it became apparent that a six standard deviation move is indeed possible even though the probability of that move occurring is very low. When everyone heads for the exit door at the same time, a stampede becomes inevitable and it is often the stampede that causes injuries rather than the fire itself.

For individual investors in CDOs and sub-prime mortgage backed securities, the ABX Home Equity (ABX.HE) Indices are an efficient way to hedge the risk. The notional volume traded daily is in the range of US\$25 billion to US\$50 billion. This provides for a very illiquid market that can be used to hedge the risk that is typically embedded in the CDOs backed by sub-prime mortgages.

ABX.HE Indices offer liquidity, transparency and standardisation, which enables easier risk management. CDOs are very illiquid investments designed for holding periods equivalent to the life of the CDO or its average duration at very least. Therefore, selling or unwinding a CDO is not a feasible proposition. Hedging through ABX.HE Indices is the best solution. The ABX.HE Indices were launched on 16th January 2006. There are five indices based upon different ratings : AAA, AA, A, BBB and BBB minus. Therefore, any institution that has invested in sub-

prime mortgage backed securities or CDOs that contain such securities, can take offsetting positions in the ABX.HE indices. Credit ratings can be matched though creating an exactly offsetting hedge, as in the futures markets.

Other ABX Indices linked to credit cards, student loans and auto loans are yet to be launched. ABX.HE Indices are created every six months and reference the asset backed securities issued in the previous six months. Asset managers, hedge funds, proprietary trading desks and dealers are active in trading the ABX.HE Indices. Fifteen investment banks are the primary market makers. Another possible option is to allow for a bigger bubble to be created in the housing market.

Henry Liu, a professor at the University of California Los Angeles, Harvard and Columbia said in his paper, The Interest Rate Conundrum, "Once a genie of excess liquidity is out of the bottle, it is almost inevitable that a bigger genie will have to be let out of a bigger bottle to keep the ongoing bubble from bursting". Rising real estate prices resulted in asset price inflation and this is something that is not captured by standard measure of inflation like headline inflation or core inflation. At some stage, real estate bubbles have to burst or they will have to be managed by creating ever bigger bubbles. The storm in the sub-prime and CDO markets is very much here. Investors in these instruments need to take steps to hedge themselves effectively.

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### ABOUT THE AUTHOR

Rajat Bhatia has 25+ years of experience in the global financial markets in fixed income, equities, currencies, commodities and cross-asset structured products.

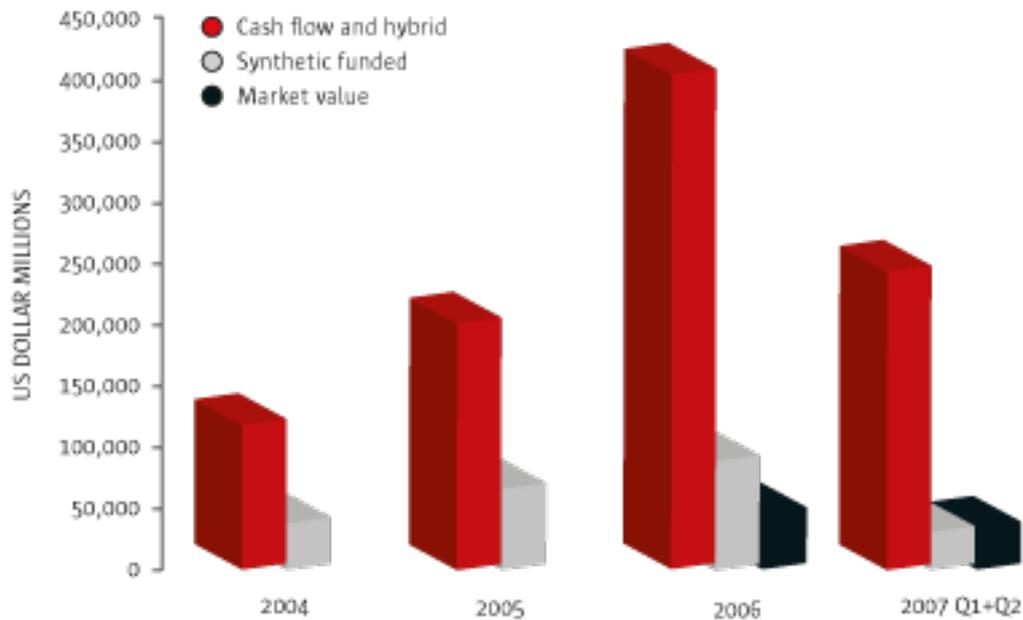
He has worked in New York, London, Hong Kong, Singapore, Sydney, Dubai and India with some of the leading investment banks and strategy consulting firms. Rajat has worked at Citibank Global Asset Management, London, Lehman Brothers, London, Merrill Lynch Capital Markets, Hong Kong, Booz Allen & Hamilton, Sydney and Citibank, India. He has also consulted to McKinsey, Morgan Stanley, Neuberger Berman, Alliance Bernstein, Bain & Co, Bernstein Litowitz Berger & Grossmann and Deutsche Bank in New York, London and Singapore.

As an entrepreneur, his work on neural networks based trading strategies at Financial Engineering LLC, an early stage company in Florida, resulted in the creation of a new hedge fund called Delray Capital. He is currently CEO and Founder of Neural Capital.

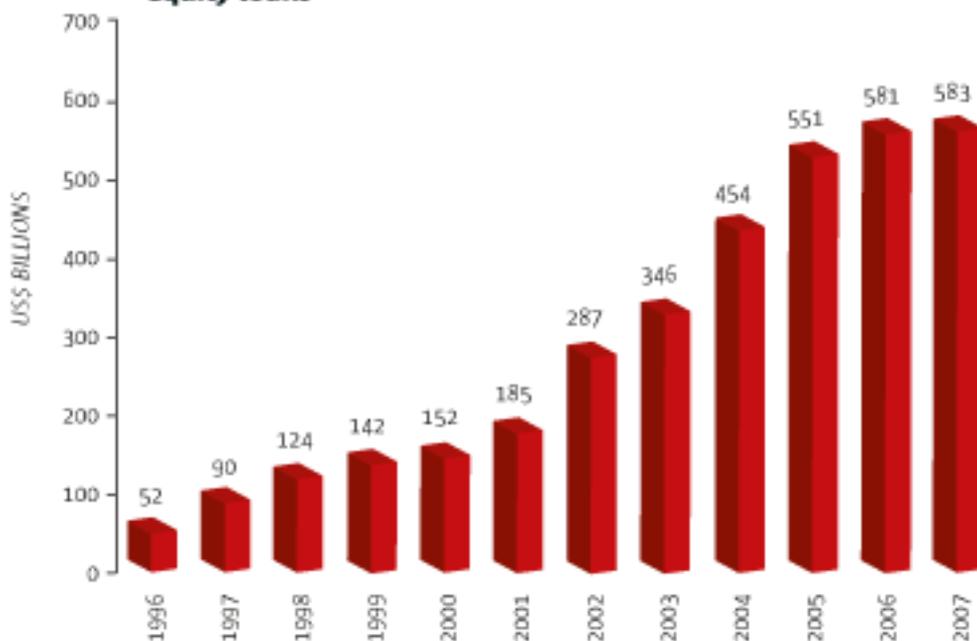
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**Fig.1 CDO Issuance from 2004 to first half 2007**



**Fig.2 Outstanding volumes of asset-backed securities backed by home equity loans**

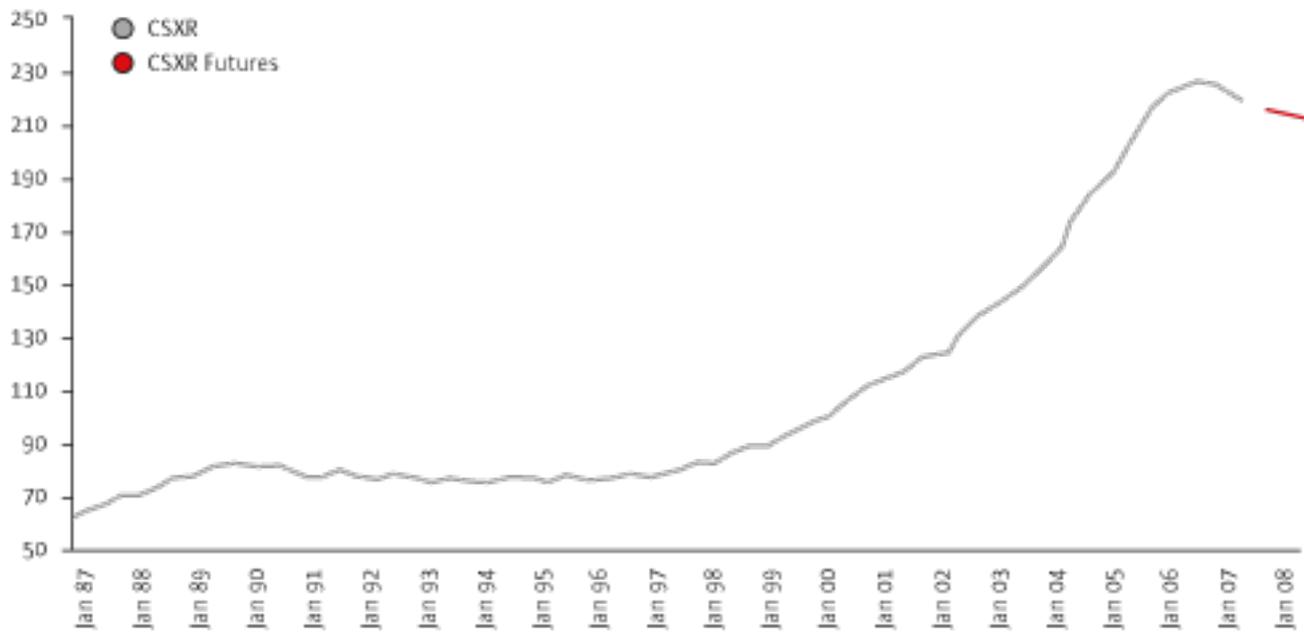


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**Fig.3 S&P/Case-Schiller Home Price Composite Index - CSXR**

Source: Chicago Mercantile Exchange



**Fig.4 Monthly changes in S&P/Case-Schiller Price Composite Index - CSXR**

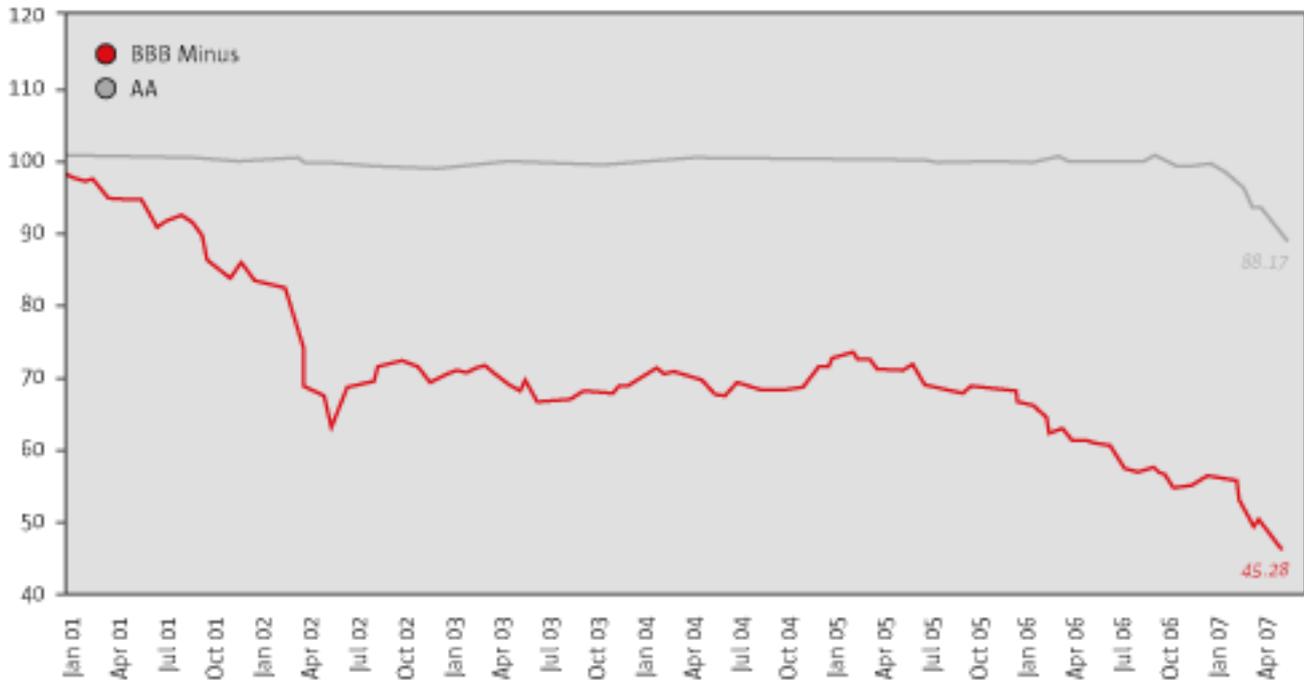


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**Fig.5 ABX Home Equity Indices 2007**

Source: Markit and CDS Index Co



	VALUE AT INCEPTION	VALUE AS OF 17 JULY 2007	CHANGE	HIGH	LOW	COUPON
AAA	100	95.53	-4.5%	100.09	95.53	9
AA	100	88.17	-11.8%	100.09	88.17	15
A	100	69.35	-30.7%	100.01	69.35	64
BBB	100	47.72	-52.3%	98.35	47.72	224
BBB Minus	100	45.28	-54.7%	97.47	45.28	389

**Fig.6 Return on a CDO Equity Tranche for varying Gross Annual Default Rates**

Based on a hypothetical portfolio with an annual YTM of Treasuries + 380 basis points

