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## **Real Estate Mortgage Risk and Real Estate Prices: The Use of Mark-To-Market Valuation and Default Risk Swaps in Residential Real Estate.**

By

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### **Introduction**

A study, conducted by Case, Shiller and Weiss in 1993, identified two major occurrences in the real estate market.

-The increase of foreclosure rates on home mortgages follows a sharp decline or sudden interruption in real estate price increases.

-There is a need for a liquid, transparent and national hedging market.

While the authors examine and prove the above statements from an institutional investment perspective, primarily mortgage underwriting companies, it needs to be stated that individual homeowners are the largest carriers of real estate risk, yet to this day remain unprotected from such.

Below we will focus on how private mortgage holders can protect themselves from declining home prices and avoid potential foreclosures and/or bankruptcies.

### **Hedging in the Real Estate Market**

Investing in mortgages actually represents two different kind of option trading. A call option on the long-term debt and a put option on the underlying real estate price.

The call option protects the investor from any prepayment option in the contract. Such prepayments naturally occur during a period of lower interest rates.

The put option protects the investor from a default on the loan, which occurs when the loan-to-value ratio changes dramatically due to a sharp decline in home prices.

It may seem that such instruments are not conventional but the fundamentals with stock options remain the same.

The mortgage underwriters and traders in the secondary mortgage market all use the available instruments to protect themselves from the risks associated with the mortgage



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market. They hedge their holdings against interest risk, prepayment risk and default risk by using options, futures and swaps.

However the mortgagors, or individual holders of mortgages, do not protect themselves against the same risks.

One of the main reasons of course is the complexity of the instruments used by professional financial companies as well as the accessibility of such trading markets and instruments.

However, as we will show here, this does not have to be the case anymore. Private investors, homeowners and real estate investors, can easily protect themselves from non-predictable market conditions and influences at a low cost.

Not only will we show how this methodology protects the mortgagors but ultimately benefits the mortgagees as well.

### **The Non-linear Correlation between Foreclosures and Home Prices**

Over the past 30 years several institutes have tracked the correlation between the occurrence of foreclosures and the underlying home value.

While such foreclosures and bankruptcy filings are influenced by economic and demographic variables, the largest contributing factor is the sharp decline in real estate prices.

Using the notation made by Case and Shiller (1987) that the home value (P) equals the sum of the log of citywide housing prices (C), a Gaussian random walk (uncorrelated to the home value) (H) and the time-of-sale house-specific random error (N), whereas (*i*) is the purchase price of said home and (*t*) is the time of purchase, then we derive the following equation:

$$P(it) = C(t) + H(it) + N(it)$$

Supposing that the house is financed with a fixed-rate mortgage and knowing that the risk of default is related to the (log) loan-to-value ratio, we can mathematically express such function as:

$$L(it) = M(it) - P(it)$$

The loan-to-value (L) equals the mortgage balance as a function in time (M) minus the home value (P).

In addition there are other factors influencing this Log function, as mentioned before.



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Such factors can be identified as  $X(it)$  and encompass the local economic conditions as well as the prevailing unemployment rate.

Therefore we can conclude that the probability of default is a non-linear log function of the loan-to-value ( $L$ ) and other factors ( $X$ ).

$$P(it) = f\{L(it), X(it)\}$$

The non-linear aspect of this function is important since for very low values of  $L$ , the probability of default nears zero independent of the value of  $X$ .

However, for high values of  $L$ , the log function approaches 1.00 but never reaches such value since the foreclosure does not happen immediately and only exists for a short period of time.

Now that we have established the mathematical importance of the loan-to-value aspect for homeowners and the risks associated with it, we will explore what options are available to effectively hedge such and how the marketplace can change to accommodate a more effective approach.

Before we do, let us first look at the standard insurance options widely available and required by mortgagees.

### **Current Hedging Instruments**

The most common instrument used by mortgage lenders and banks is the Personal Mortgage Insurance (PMI). This extra insurance, payable by the mortgagor, protects the lender from any additional risk associated with a loan-to-value (LTV) greater than 0.80 at the time of purchase.

While this protection has had and still does have its advantages, it is rapidly becoming an outdated method in a market of ever increasing and changing sophisticated products.

One of the biggest disadvantages is the fact that the PMI is calculated at a specific time and does not float with changing market values of the mortgaged property.

Homebuyers, subject to such PMI, watch their property value rise but yet the PMI remains intact until such time as the previously calculated LTV drops below the preset 0.80. This has resulted in theoretical financial losses in the past for homeowners until the IRS changed the tax code and now allows the mortgagors to deduct the PMI cost from their tax return.

The only recourse homeowners have in a rising real estate market is to refinance the existing loan for the same amount, based on the actual fair market value (FMV) and appraisal.



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This obviously comes with closing costs associated and may not always be justifiable given the stipulation of the current tax code that such refinancing costs should be depreciated and cannot be deducted in full as an expense.

The second option available to mortgagors, who wish to borrow at a ratio higher than 0.80, is an increased interest rate applicable to the total amount of the loan and for the duration of the loan.

It is needless to say that the latter is an option of last resort when all other options have been depleted.

### **The Prevailing Default Risk**

As we mentioned earlier, the most influential factor and cause of default is the sharp decline in real estate prices. The sudden or persistent drop in FMV causes two scenarios to occur.

- The reduction in available equity (theoretical savings).
- The creation of negative equity (theoretical debt).

Both scenarios represent a risk for both the mortgagor as well as the mortgagee and are not risk protected.

In scenario 1, the mortgagee has an increased risk due to the change in LTV correlation but has no direct recourse against the mortgagor.

Assume that a mortgage was initiated at a standard 0.80 LTV. Over time, the FMV is reduced to 80% of its original value due to declining home prices.

$$L(it) = P(it) * 0.80$$

The mortgagee now carries an increased risk on its balance sheet, while the mortgagor has a theoretical risk of zero equity.

In scenario 2, both the mortgagee and mortgagor carry a substantial default risk if and when:

$$L(it) \geq P(it)$$

It must be noted that the losses for the mortgagee exceed the default risk of the mortgagor.



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In the current housing market, both scenarios have created a significant increase in defaults and bankruptcy protection filings. In addition, we are witnessing a new phenomenon: the mortgage walkers.

The mortgage walkers are not individual homeowners under financial distress, but individuals who realize that their negative equity is not worthwhile.

We will now look at other options that could be made available and how such could be implemented. The most important ones we will examine are the use of mark-to-market and the use of default risk swaps.

While neither one is currently available for residential and private investors, we will show how such products can be structured and tailored to the individual needs in the current market by a collaboration of banks, mortgage lenders and insurance companies.

We will also show how all participants benefit from such, long-term, and how the current risks can be curbed and effectively managed.

### **Risk Management Products**

#### **1) Mark-To-Market Strategy:**

In the current and prevailing mortgage market, the mark-to-market only occurs during the lender's due diligence as part of the loan approval process.

The only other occurrence is of course when an existing loan is refinanced.

The risk associated with a lack of mark-to-market as a risk management tool is that during the life of a loan, the market volatility, due to decline in property values, can cause the risk for both mortgagor and mortgagee to be substantially different from such calculated risk at the time of the origination of the loan.

Such risk can be alleviated by using the mark-to-market model on an annual basis and adjust the exposed risk on the lender's balance sheet.

$$R(it) = P(it) - L(it) + D(it)$$

The risk (R), at time of loan initiation, equals the FMV of the property minus the loan amount increased with the original down payment.

In this formula, the risk is zero from a theoretical perspective. However, from a mortgagee balance sheet perspective the loan will have a book value of 95%, which includes an expected industry average default risk of 5%.

During the duration of the loan, the risk(R) will vary based on price fluctuations in the market as well as the remaining outstanding loan value (L).



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To protect both mortgagor and mortgagee during the loan duration, the application of a mark-to-market strategy would curb and contain such risk.

The mark-to-market strategy compares the original FMV of the property at the time of purchase to the actual FMV at the time of valuation.

Such can be achieved on an annual basis through the underwriter of the loan by using annual tax assessment records as prepared by the Tax Assessors Office.

If such records indicate that:

$$P(it2) < P(it)$$

And

$$L(it) > P(it2)$$

Whereby  $P(it2)$  represents the FMV in any given year of the duration of the loan.

Then such represents an increased risk for the mortgagee or underwriter because of the negative equity in the property and therefore a potential balance sheet risk which is currently not reflected in any mandatory quarterly financial reporting to regulators.

As mentioned before, it also represents a risk for the mortgagor because of the potential negative equity in the property versus the remaining outstanding loan balance.

As we have witnessed these past months, a dramatic drop in real estate prices can have a dramatic effect on the over-leveraging of banks and the subsequent write-offs and losses.

The implementation of an annual mark-to-market would alleviate such from a reporting and control perspective, indicating the immediate need for risk coverage and would contain or alleviate potential substantial losses for both parties.

## 2) Credit Default Swaps:

A Credit Default Swap or CDS is the transfer of a potential risk associated with loans and Mortgage Backed Securities from mortgagee or underwriter to a third party.





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In essence, a CDS is similar to an insurance policy on a property. If the property were to be damaged, then the insurance company agrees to refund the policyholder for the total insured value of the damage caused.

A CDS has the same purpose with three main differences:

- The underlying asset of a CDS is a loan, mortgage or bond.
- The contract length is typically 5 years unless specified otherwise.
- The contract covers the default risk of the issuer.

The premiums associated with CDS contracts are calculated annually based on agreed upon Bps per underlying value and paid on a quarterly basis. In case of a loan default, the seller of the CDS guarantees the buyer full payment of the underlying loan or bond at pari-passu.

The CDS market does not just consist of a primary market. Since its debut in 1994, the market has developed a large secondary market, which to this day remains unregulated whereby contracts can be purchased and sold OTC.

So why would this product be of interest to the residential real estate market?

As mentioned before, the current insurance premium technique used by financial institutions and mortgage brokers alike is PMI (Personal Mortgage Insurance) at loan origination and based on any loan amount greater than 80% of the appraised value.

This makes PMI a static risk calculation that does not take into consideration market valuation volatility nor does it incorporate a fluctuating risk during the lifetime of the mortgage.

In the previous paragraph, we have shown how a mark-to-market strategy can incorporate such market volatility.

Now we will show how CDS contracts can provide the second layer of protection against the default risk due to increased exposure at any given time and how both will ultimately provide better risk management tools.

### **2.1) CDS at Loan Origination:**

If at loan initiation, the borrower requires more than the maximum of 80% LTV, then the lender can buy a CDS to cover the increased risk to protect their balance sheet holdings from any potential default.



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The lender can negotiate such in the primary CDS market on behalf of the borrower and pass on the quarterly premium to the borrower through the establishment of an escrow account at origination.

Such CDS contract will continue to exist and is payable by the borrower until such time as the LTV reaches the required 80% value, upon which the CDS will cease to exist.

In order to determine the annual LTV, we refer back to the mark-to-market strategy as previously discussed.

In case of default by the borrower during the existence of the CDS, either due to personal default or through a decline in home prices, both the mortgagor and mortgagee are protected from any potential shortfall.

This can be equated as follows in two scenarios:

Scenario 1:

The borrower sells the home for less than the total outstanding principal:

$$L(it_2) > P(it_2)$$

Whereby  $L(it_2)$  represents the outstanding loan value and  $P(it_2)$  reflects the sale price of the home.

In this case, the borrower will repay the original 80% of the initial loan minus any principal paid prior to the sale.

The lender will call in the CDS contract to make up for the shortfall as covered by the contract.

Scenario 2:

The borrower defaults on the loan and the bank repossesses the home.

In this case, the lender will sell the property at FMV and apply the proceeds to the outstanding principal.

The lender will call in the CDS contract as in scenario 1 to cover the shortfall.

## **2.2) CDS during the Life of the Loan:**

Assuming that a standard 80% loan was approved and went into effect.

During the life of the loan and according to the mark-to-market strategy, the LTV rises above the mandated 80%.





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In this case, the lender will buy a CDS contract to cover the default risk and will mandate from the borrower to pay the quarterly premiums through the establishment of an escrow account (see above) until such time as the LTV reaches a normal level again or until the property is sold and the loan repaid.

### **Market Conditions and Implementation**

It is obvious that under the current structure, both the mortgage markets and the CDS market, that implementation of such radical change is not possible overnight. Certain market conditions have to be put in place in order to make this happen.

#### **1) Market Conditions:**

As mentioned before, the current CDS market is unregulated and all contracts trade OTC (Over The Counter).

This structure, which in large part contributed to the lack of liquidity and hence a dramatic drop in contract value, is insufficient to sustain and control the trading activity in this synthetic market.

The establishment of a Clearing House is a first mandate to work towards a successful implementation.

The Clearing House will function as others in the options and futures markets and will therefore be responsible for:

- Opening and closing contracts during trading hours.
- Maintain and control all open interest accounts.
- Calculate and impose all margin calls for uncovered or naked contracts.
- Calculate the initial pricing of the contracts upon issuance taking into account the intrinsic and time value of said contracts.

The second condition to be established is the control of mark-to-market valuations of financial institutions. This can be achieved through existing regulatory bodies already in place, i.e. the SEC, Federal Reserve or the FDIC.

Our preference would be to establish an oversight committee that consists of members of all three institutions.



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## 2) Implementation:

Once the basic structures are in place in the market then we can start working on a full cooperation between financial institutions, mortgage brokers, insurance companies and regulators.

It is imperative that such cooperation results in a clear and concise procedure with the utmost transparency to both mortgagors and mortgagees at any given time.

The implementation of a mark-to-market strategy is the easiest step within the total process and can be accomplished fairly easy through a change of internal control and compliance procedures within our financial institutions and mortgage brokers.

The second step is for insurance companies to rely on the FMV to issue the corresponding CDS contract in the primary market so that coverage is immediate and in effect either upon loan origination or when the FMV requires such versus the LTV.

The third step, and probably the most complicated, is the market regulation of the secondary market and the change from OTC to a fully regulated transparent market.

## Conclusions

It is our conclusion that the implementation of both risk management tools, as described here, is the cornerstone to move our financial markets into the future.

In addition, it will create the transparency, the accuracy of valuations and the flexibility, all of which, or should we say, the serious lack thereof, were the main cause of the international financial meltdown we have and are witnessing.

By implementing such tools and apply them to the residential real estate markets, we not only provide valuable tools for investors and homeowners, but we effectively manage the potential risk for mortgagors and mortgagees, thereby reducing the risk of default and write-offs.



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