THE VIABILITY AND EFFECTIVENESS OF VARIOUS INTEREST RATE AND CREDIT DERIVATIVE PRODUCTS IN HEDGING RISKS OF A RESIDUAL EQUITY OWNER IN MORTGAGE BACKED SECURITIES

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ABSTRACT

Around the world, in most of the countries which have an active Debt Market, the mortgages form a major constituent of it. The portion of equity left after securitizing a pool of mortgages is known as the Residual Equity, which is normally owned by the issuer of Mortgage Backed Securities. The yield on these residuals is affected by two main factors – the Prepayment Rate and the Default Rate. These two parameters in turn depend upon a number of factors. The Prepayment Rate is mostly influenced by the prevailing interest rates as a reduction in the interest rates make the people refinance their mortgage loans and thus lead to an increase in the prepayment speed. So the Constant Prepayment Rate (CPR) is taken as a function of interest rates, although there are a number of other smaller reasons also that affect the prepayment speed. Similarly the defaults are measured by the Constant Default Rate (CDR) and they directly impact the return on these residuals.

This paper attempts to explore the viability of using various interest rate and credit derivative products in hedging the Prepayment and Default Risk of Residual Owners in MBS. The most common interest derivative products used are bond options, interest rate caps and floors, and swap options. The swaps have been used extensively by the Mortgage Portfolio managers and Mortgage Servicer but whether they can be used by the residual owners as well, has been explored in this paper. Similarly the Credit Default Swaps and Total Return Swaps can be used to hedge against credit defaults. But all of them may not be applicable in certain situations and in some of the scenarios, certain alternatives may be more appropriate than others. So the objective of the paper is to explore alternative hedging options available to residual owners and evaluate their effectiveness.

Keywords: Residual Equity owners, Mortgage Backed Securities, hedging, interest rate derivatives, credit derivatives, Prepayment Rate, Default Rate

INTRODUCTION

Mortgages form a major portion of the debt market in all the countries. Their most attractive features include their liquidity and customization. The development of CMOs (Collateralized Mortgage Obligations) has vastly enhanced the investor's options to choose the risk return profile according to his appetite. The basic purpose of a CMO is to break the collateral cash flow into separate classes of claims to satisfy investors with different preferences.[2]

The tranches of the CMO pay interest simultaneously, while the principle is paid out in a sequence depending on the maturity period of the particular tranches. The most risky set of investment among these is the residual equity, which receives payments only after the servicing fees; interest & principal payments for all the tranches and replenishment of any credit enhancements (Reserve Fund or Over Collateralization) have been done.

In order to make an estimation of the risk weighted return from these investments, it is necessary to consider the prepayment and default risks, because prepayments and defaults are the center of all mortgage security valuation and analysis.

The Prepayment Rate is mostly influenced by the prevailing interest rates as a reduction in the interest rates make the people refinance their mortgage loans and thus lead to an increase in the prepayment speed. So the Constant Prepayment Rate (CPR) is taken as a function of interest rates, although there are a number of other smaller reasons also that affect the prepayment speed. Similarly the defaults are measured by the Constant Default Rate (CDR). Both these factors directly influence the pricing and returns of these investments.

So this paper attempts to explore the viability of using various interest rate and credit derivative products in hedging the Prepayment and Default Risk of Residual Owners in MBS and also to find other available hedging options.

[2] Oldfield & Reynolds, *Making Markets for Structured Mortgage Derivatives*

THE BASE MODEL

For the purpose of elaboration a base model of Sequential Pay Class Mortgage Securities has been developed and the effect of using credit derivatives has been tested on it.

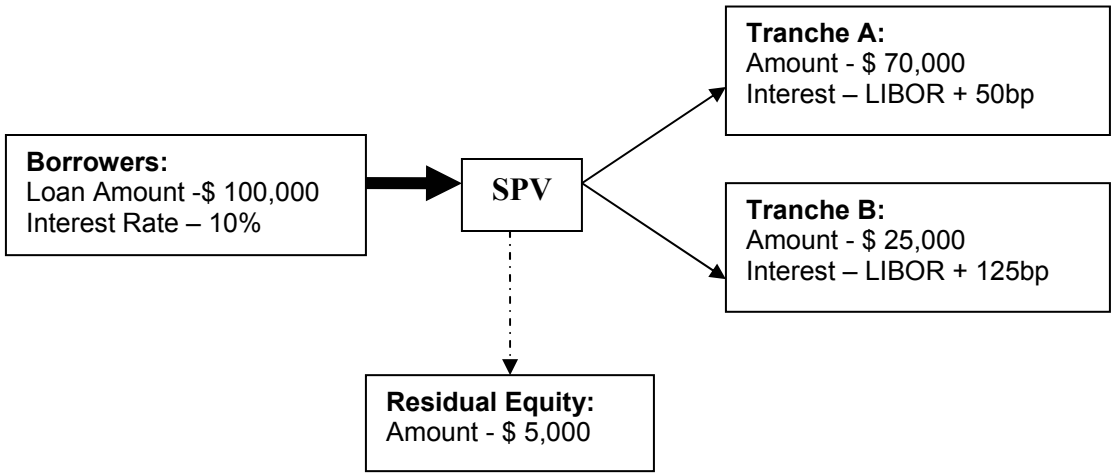

Fig. 1: The Base Model

OTHER PARAMETERS USED

1. Servicing Fees – 0.5% of Unpaid Principal Balance
2. Time to Maturity – 30 years
3. For calculations LIBOR has been taken as 5%
4. Required OC (Over-Collateralization) Fund of $1,900 of which 50% is initially funded by the residual owner and it is build up to the required level with the excess interest spread received
5. A Recovery Rate of 70% on Defaults

PREPAYMENT AND DEFAULT CURVE

In industry the concerned players use their proprietary models to forecast Prepayments and Defaults. Normally it is done in by using the past prepayment and default data. For the purpose of our model we have used the Standard PSA (Public Securities Association) curve for Prepayments and the SDA (Standard Default Assumption) curve for defaults.

The prepayment speed for the base model has been taken as 100 PSA, which is empirically defined as the case when the annual CPR starts from 0.2% in the first month and increases to 6% by month 30 and remains stable at that value for the rest of the period.

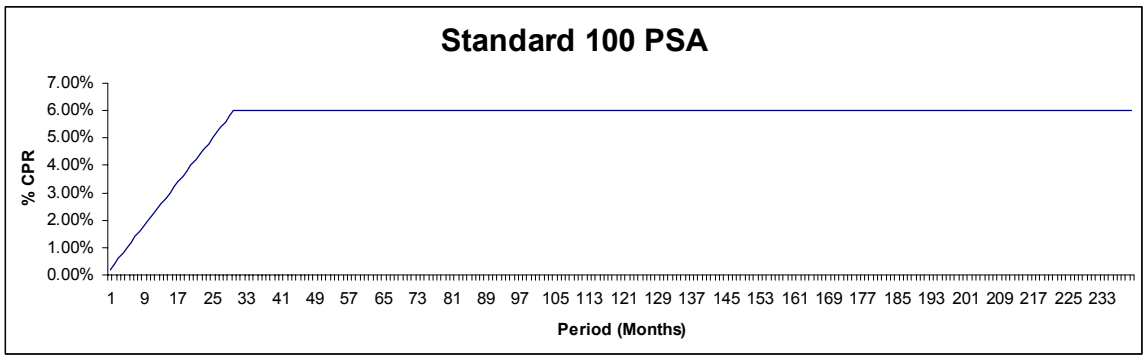

Fig. 2[3]: Standard 100 PSA curve

Similarly the Default curve for the model has been taken as 100 SDA. In this, the Annual CDR% starts from 0.02% in the first month and continuously increases to 0.6% till month 30. After this it remains stable at this value until month 60 after which it drops to 0.01% by month 120 and remains stable at that thereafter.

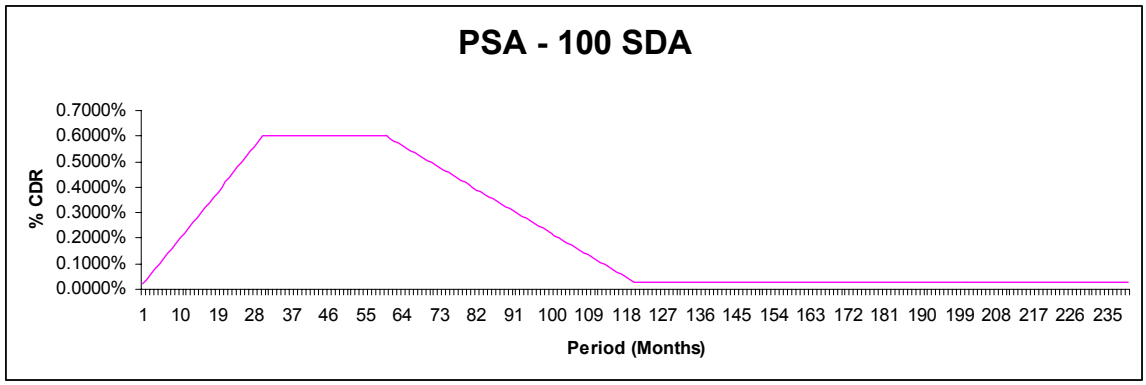

Fig. 3[4]: Standard 100 SDA curve

THE WATERFALL STRUCTURE OF THE MODEL

Sequential Pay Class Security and the priority of collected Principal amounts and Interest payments of the model can be broken down in the following format. The Principal constitutes the Scheduled Principal paid regularly by the borrowers, the Prepayments made and the Defaults. The losses are calculated at 30% of the default values. This amount is made up from the OC Fund and the OC is kept at the required level through the excess interest received by the residual owner. In the event of very high losses where even the OC and

[3] Frank J Fabozzi, *Bond Markets, Analysis and Strategies*, p242
[4] Frank J Fabozzi, *Bond Markets, Analysis and Strategies*, p250

excess interest are also not able to pay for it the difference would be borne first by the residual owner, then by tranche B and then by tranche A.

PRINCIPAL PAYMENTS - All Principal Payments will go first to the investors of the A class security. B class will receive principal payments only after Class A has been fully repaid its par value. Any principal left thereafter will be given to the residual owner.

INTEREST PAYMENTS – The interest payments would be utilized to pay the servicing fees, and subsequently both the tranches will receive interest payments (based on their respective current principal balance) while the class is outstanding. The remaining interest after these payments would be used to replenish the OC fund to its required level. The residual owners would receive any excess interest left after all these payments.

Pool Balance	100000																				
Interest Rate	10.00%		Tranche	Principal	Interest Rate	Yield	Selling Price														
WAM	360		A	70000	0.46%	5.50%	100%	Recovery													
PMT	($877.57)		B	25000	0.52%	6.25%	100%	$25,000.00													
Servicing Fee	0.50%		Residual	0	0.83%	10.00%	0%														
Default Recovery	70%																				
Loss Trigger	5%			95000	LIBOR	5.00%															
				5000	A-spread	0.50%															
Is initial OC funded?	Y				B-spread	1.25%															
if yes, what %	50%																				
Initial OC	$ 950.00																				

Month	UPB	PMT	Principal	Interest	Servicing Fee	Default	Default Value	Recovery	Loss	Cummulative Loss	Loss trigger	Prepay ment	Prepay Principal	Total P	Total I	Is Int sufficient ?	Required OC	OC Le
1	$ 100,000.00	$ 877.57	$ 44.24	$ 833.33	$ 41.67	0.08%	$ 79.96	$ 55.98	$ 23.99	$ 23.99	0	0.10%	$ 99.96	$ 224.16	$ 791.67	1	$ 1,900.00	$ 1,2
2	$ 99,775.84	$ 875.99	$ 44.53	$ 831.47	$ 41.57	0.16%	$ 159.57	$ 111.70	$ 47.87	$ 71.86	0	0.20%	$ 199.46	$ 403.56	$ 789.89	1	$ 1,900.00	$ 1,5
3	$ 99,372.28	$ 872.84	$ 44.74	$ 828.10	$ 41.41	0.24%	$ 238.39	$ 166.87	$ 71.52	$ 143.38	0	0.30%	$ 297.98	$ 581.10	$ 786.70	1	$ 1,900.00	$ 1,8
4	$ 98,791.18	$ 868.13	$ 44.87	$ 823.26	$ 41.16	0.32%	$ 315.99	$ 221.19	$ 94.80	$ 238.17	0	0.40%	$ 394.99	$ 755.84	$ 782.10	1	$ 1,900.00	$ 1,9
5	$ 98,035.34	$ 861.87	$ 44.91	$ 816.96	$ 40.85	0.40%	$ 391.96	$ 274.37	$ 117.59	$ 355.76	0	0.50%	$ 489.95	$ 926.83	$ 776.11	1	$ 1,900.00	$ 1,7
6	$ 97,108.51	$ 854.12	$ 44.88	$ 809.24	$ 40.46	0.48%	$ 465.91	$ 326.13	$ 139.77	$ 495.53	0	0.60%	$ 582.38	$ 1,093.17	$ 768.78	1	$ 1,900.00	$ 1,9
7	$ 96,015.34	$ 844.89	$ 44.77	$ 800.13	$ 40.01	0.56%	$ 537.44	$ 376.20	$ 161.23	$ 656.76	0	0.70%	$ 671.79	$ 1,253.99	$ 760.12	1	$ 1,900.00	$ 1,7
8	$ 94,761.35	$ 834.25	$ 44.57	$ 789.68	$ 39.48	0.64%	$ 606.19	$ 424.33	$ 181.86	$ 838.62	0	0.80%	$ 757.73	$ 1,408.49	$ 750.19	1	$ 1,900.00	$ 1,8
9	$ 93,352.86	$ 822.23	$ 44.29	$ 777.94	$ 38.90	0.72%	$ 671.82	$ 470.28	$ 201.55	$ 1,040.17	0	0.90%	$ 839.78	$ 1,555.89	$ 739.04	1	$ 1,900.00	$ 1,9
10	$ 91,796.97	$ 808.91	$ 43.94	$ 764.97	$ 38.25	0.80%	$ 734.02	$ 513.82	$ 220.21	$ 1,260.37	0	1.00%	$ 917.53	$ 1,695.49	$ 726.73	1	$ 1,900.00	$ 1,6
11	$ 90,101.47	$ 794.35	$ 43.51	$ 750.85	$ 37.54	0.88%	$ 792.51	$ 554.76	$ 237.75	$ 1,498.13	0	1.10%	$ 990.64	$ 1,826.66	$ 713.30	1	$ 1,900.00	$ 1,7
12	$ 88,274.82	$ 778.63	$ 43.00	$ 735.62	$ 36.78	0.96%	$ 847.03	$ 592.92	$ 254.11	$ 1,752.23	0	1.20%	$ 1,058.78	$ 1,948.81	$ 698.84	1	$ 1,900.00	$ 1,7
13	$ 86,326.01	$ 761.81	$ 42.42	$ 719.38	$ 35.97	1.04%	$ 897.35	$ 628.14	$ 269.20	$ 2,021.44	0	1.30%	$ 1,121.69	$ 2,061.46	$ 683.41	1	$ 1,900.00	$ 1,8
14	$ 84,264.55	$ 743.98	$ 41.78	$ 702.20	$ 35.11	1.12%	$ 943.30	$ 660.31	$ 282.99	$ 2,304.43	0	1.40%	$ 1,179.12	$ 2,164.19	$ 667.09	1	$ 1,900.00	$ 1,9
15	$ 82,100.36	$ 725.23	$ 41.06	$ 684.17	$ 34.21	1.20%	$ 984.71	$ 689.30	$ 295.41	$ 2,599.84	0	1.50%	$ 1,230.89	$ 2,256.66	$ 649.96	1	$ 1,900.00	$ 1,9
16	$ 79,843.69	$ 705.65	$ 40.29	$ 665.36	$ 33.27	1.28%	$ 1,021.48	$ 715.04	$ 306.45	$ 2,906.29	0	1.60%	$ 1,276.85	$ 2,338.63	$ 632.10	1	$ 1,900.00	$ 1,7
17	$ 77,505.07	$ 685.33	$ 39.45	$ 645.88	$ 32.29	1.36%	$ 1,053.53	$ 737.47	$ 316.06	$ 3,222.35	0	1.70%	$ 1,316.92	$ 2,409.90	$ 613.58	1	$ 1,900.00	$ 1,7
18	$ 75,095.17	$ 664.36	$ 38.56	$ 625.79	$ 31.29	1.44%	$ 1,080.82	$ 756.57	$ 324.24	$ 3,546.59	0	1.80%	$ 1,351.02	$ 2,470.40	$ 594.50	1	$ 1,900.00	$ 1,9
19	$ 72,624.77	$ 642.83	$ 37.63	$ 605.21	$ 30.26	1.52%	$ 1,103.32	$ 772.33	$ 331.00	$ 3,877.59	0	1.90%	$ 1,379.16	$ 2,520.11	$ 574.95	1	$ 1,900.00	$ 1,9
20	$ 70,104.66	$ 620.85	$ 36.64	$ 584.21	$ 29.21	1.60%	$ 1,121.09	$ 784.76	$ 336.33	$ 4,213.91	0	2.00%	$ 1,401.36	$ 2,559.09	$ 555.00	1	$ 1,900.00	$ 1,4
21	$ 67,545.57	$ 598.50	$ 35.62	$ 562.88	$ 28.14	1.68%	$ 1,134.17	$ 793.92	$ 340.25	$ 4,554.16	0	2.10%	$ 1,417.71	$ 2,587.49	$ 534.74	1	$ 1,900.00	$ 1,3
22	$ 64,958.08	$ 575.87	$ 34.56	$ 541.32	$ 27.07	1.76%	$ 1,142.65	$ 799.86	$ 342.80	$ 4,896.96	0	2.20%	$ 1,428.32	$ 2,605.53	$ 514.25	1	$ 1,900.00	$ 1,2
23	$ 62,352.55	$ 553.07	$ 33.46	$ 519.60	$ 25.98	1.84%	$ 1,146.67	$ 802.67	$ 344.00	$ 5,240.96	1	2.30%	$ 1,433.34	$ 2,613.47	$ 493.62	1	$ 1,900.00	$ 1,1
24	$ 59,739.08	$ 530.17	$ 32.35	$ 497.83	$ 24.89	1.92%	$ 1,146.37	$ 802.46	$ 343.91	$ 5,584.87	1	2.40%	$ 1,432.96	$ 2,611.68	$ 472.93	1	$ 1,900.00	$ 9
25	$ 57,127.40	$ 507.27	$ 31.21	$ 476.06	$ 23.80	2.00%	$ 1,141.92	$ 799.35	$ 342.58	$ 5,927.45	1	2.50%	$ 1,427.40	$ 2,600.54	$ 452.26	1	$ 1,900.00	$ 8
26	$ 54,526.86	$ 484.44	$ 30.05	$ 454.39	$ 22.72	2.08%	$ 1,133.53	$ 793.47	$ 340.06	$ 6,267.51	1	2.60%	$ 1,416.92	$ 2,580.50	$ 431.67	1	$ 1,900.00	$ 6
27	$ 51,946.36	$ 461.77	$ 28.88	$ 432.89	$ 21.64	2.16%	$ 1,121.42	$ 784.99	$ 336.43	$ 6,603.93	1	2.70%	$ 1,401.77	$ 2,552.07	$ 411.24	1	$ 1,900.00	$ 5
28	$ 49,394.29	$ 439.33	$ 27.71	$ 411.62	$ 20.58	2.24%	$ 1,105.81	$ 774.07	$ 331.74	$ 6,935.68	1	2.80%	$ 1,382.26	$ 2,515.78	$ 391.04	1	$ 1,900.00	$ 1

Fig. 4: Calculation for the Base Model

The residual cash flows are calculated for the above stated model. The 3 constituents of these are the Principal Payments received, the Excess Interest and the OC released. The distribution of the timings of the principal and interest payments is shown below.

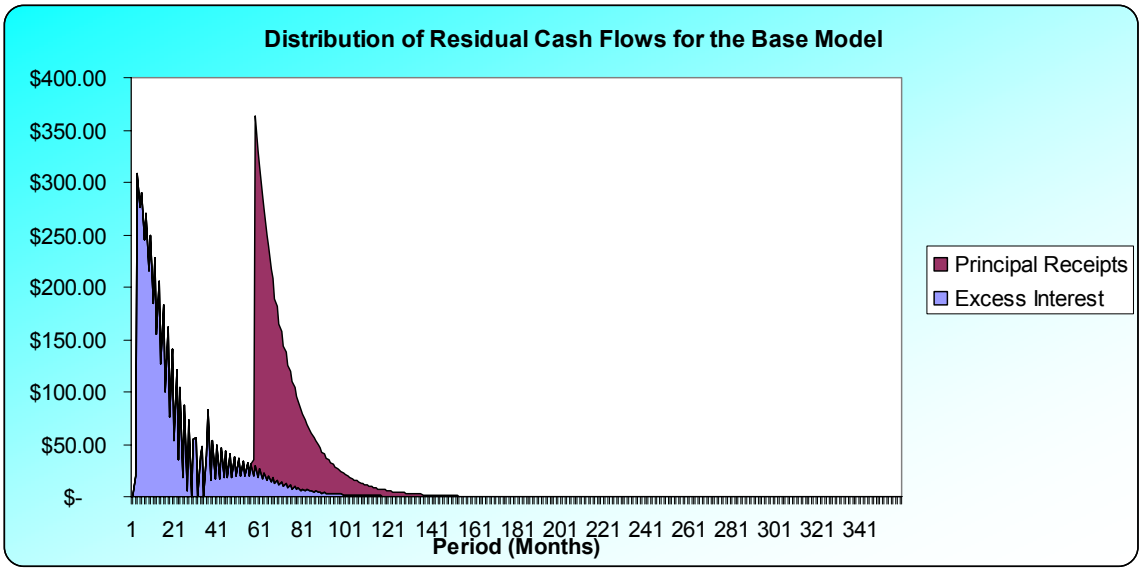

Fig. 5: Distribution of the principal and interest receipts for the Residual Cash Flows

As is clearly evident from this graph that the residuals are receiving their Principal payments very late, so if the prepayment speeds are slow and the default speeds are high, then the yield of the residuals will fall drastically.

DISCUSSION AND ANALYSIS

For the purpose of analysis 4 different cases of PSA and SDA speeds (50, 100, 200 and 400) are considered and 16 scenarios are developed and the Residual yield is calculated in all of them. The results for the base model are as shown below:

Residual Yield		SDA					
		50	100	200	400	Mean	SD
PSA	50	34.05	22.5	7.06	-25	9.6525	25.61128
	100	30.06	23.2	12.8	-14.4	12.915	19.54358
	200	29.6	24.1	15.71	5.2	18.6525	10.63251
	400	27.9	24.3	17.8	9.9	19.975	7.91091
	Mean	30.4025	23.525	13.3425	-6.075	Without Using CDS	
	SD	2.60308	0.834166	4.663278	16.42952		

Observing the individual effects, it is evident from the graph below that the yield for low defaults is high and less volatile for all the 4 cases of prepayment. But at high default speeds (200 and 400), there is drop in its value and it also starts exhibiting high volatility. So defaults have a very significant impact on the yield of residuals.

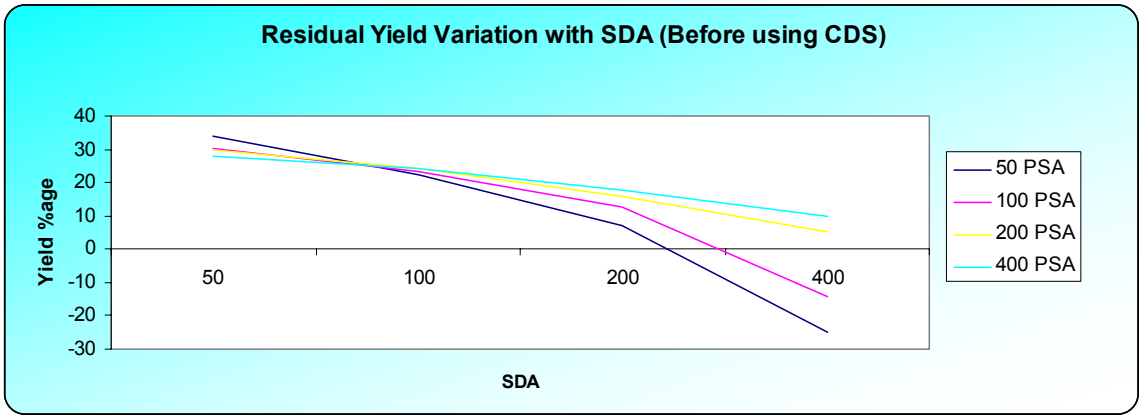

Fig. 6: Residual Yield Variation with SDA before using CDS

The graph of yield variation with prepayment speed is shown below and it clearly indicates a high variation at low prepayment speeds. The variation is significantly reduced at higher prepayment speeds. This happens because with high prepayments you get the principal back early and the effect of defaults get reduced.

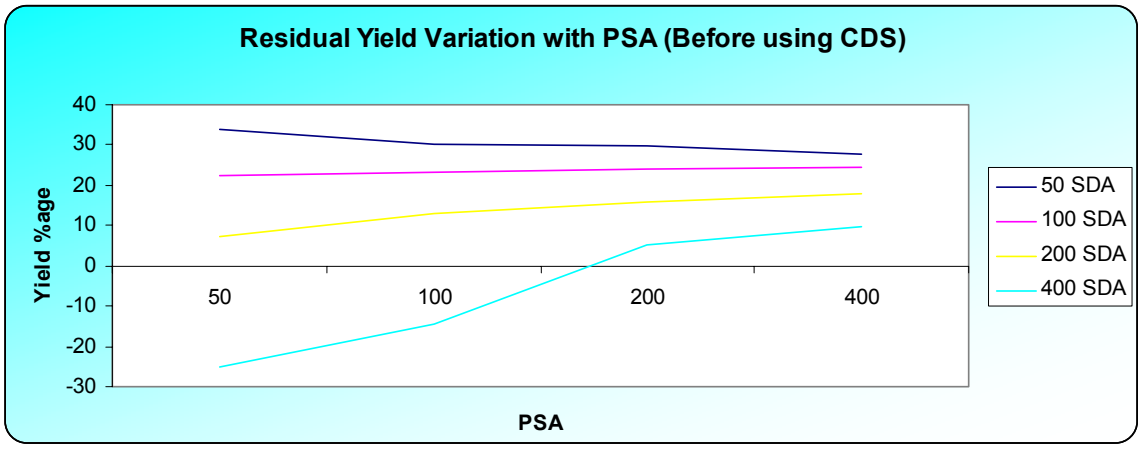

Fig. 7: Residual Yield Variation with PSA before using CDS

The combined effect of variations in yield with both variations in PSA and SDA can be observed in the graph shown below. The yield surface has been plotted against the SDA on X-axis and PSA on Y-axis.

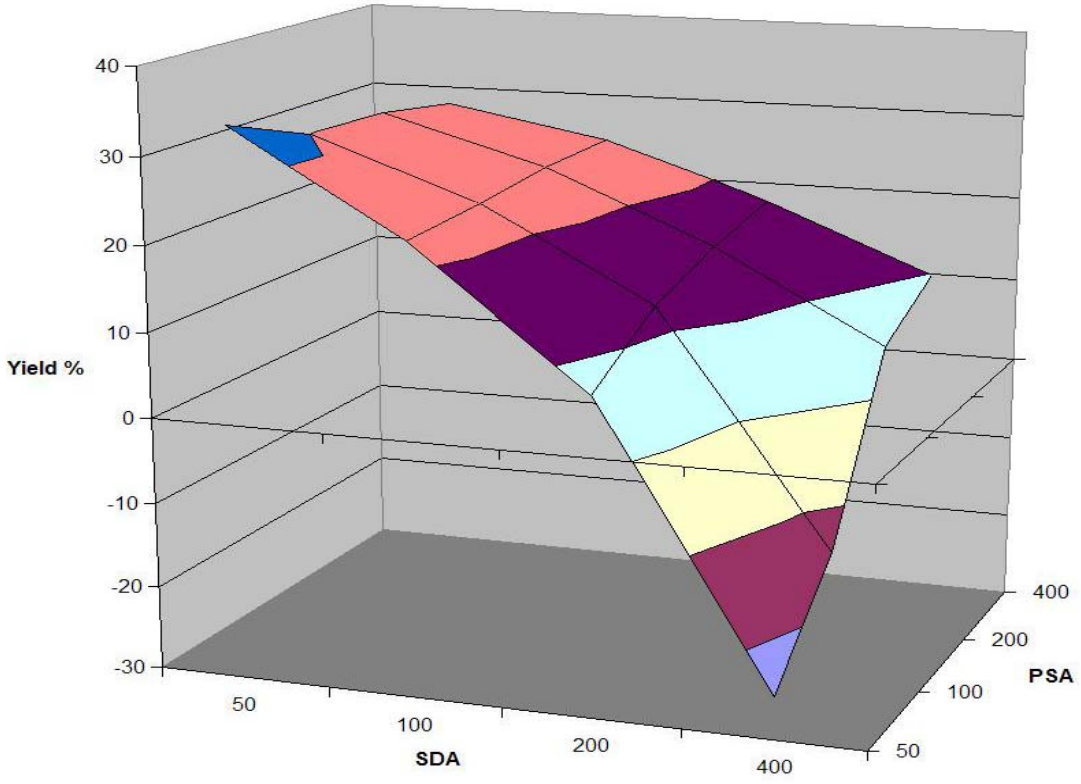

Fig. 8: Residual Yield Surface before using CDS

The worst scenario is when the defaults are very high and the prepayments are slow, in which case the yield on residuals even becomes negative. Low prepayments are good as long as defaults are less and high prepayments are also good when the default speed is slow. But if the defaults are low and the prepayments are high then also the yield gets reduced (although very marginally) because of a loss in excess interest that could have been earned.

HEDGING OF DEFAULT RISK FOR THE RESIDUAL EQUITY OWNERS

The Credit Default Swap[5] has today become the standard credit derivative and is widely regarded as the basic building block of the credit derivatives market. A default swap is a bilateral contract that enables an investor to buy protection against the risk of default of an

[5] J.P.Morgan's *Handbook on Credit Derivatives*

asset issued by a specified reference entity. Following a defined credit event, the buyer of protection receives a payment intended to compensate against the loss on the investment. This is shown in the figure below. The settlement might be done through cash or through physical settlement[6], as shown. In return, the protection buyer pays a fee. For short-dated transactions, this fee may be paid up front. More often, the fee is paid over the life of the transaction in the form of a regular accruing cash flow.

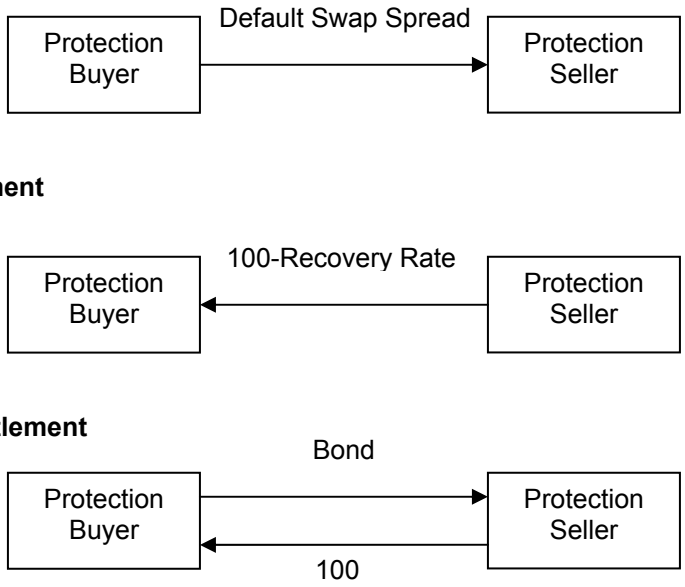

Fig. 9: Credit Default Swaps

Credit Default Swaps for bonds and tranches have a high liquidity in the market and are traded very actively with well defined structure to find the applicable credit premium to be paid to the protection seller in exchange for a pre-defined credit protection given to the buyer. But the residual equity in a mortgage security is not a tranche and a CDS protection for it is not commonly traded in the market.

The defaults for a residual are very high as it is providing protection to the securitized tranches and if we consider it as a tranche then the rating is normally below BBB-. So, for practical purposes it will be very difficult to find a counterparty that will take this risk and write a CDS for it.

But for academic purposes we can consider an entity that will sell credit protection in return for a premium calculated on 150% of the expected losses (extra premium for bearing a high

[6] The Lehman Brothers *Guide to Exotic Credit Derivatives*

risk due to less knowledge of the product and the uncertainty involved). The credit premium for such a CDS is calculated by equating the Present Value of the Protection Leg (which in this case is the present value of 150% of the expected losses) and Premium Leg. The present value of the premium in this case comes out to be $ 3,437. After using this, the yield on the residuals is calculated for the same 16 scenarios as before and there effect is compared. The results are as shown below

Residual Yield		SDA					
		50	100	200	400	Mean	SD
PSA	50	21.45	18.74	14.62	17.2	18.0025	2.858582
	100	16.9	15.07	14.1	9.6	13.9175	3.103636
	200	12.08	10.66	9.34	10.32	10.6	1.134313
	400	6.25	5.27	3.8	4.22	4.885	1.100136
	Mean	14.17	12.435	10.465	10.335	Using Credit Derivatives	
	SD	6.520373	5.807584	5.038687	5.324844		

The effect of using CDS on the residual yield is clearly evident from the new Yield Surface that is obtained as show below which clearly indicates a low volatility at different defaults.

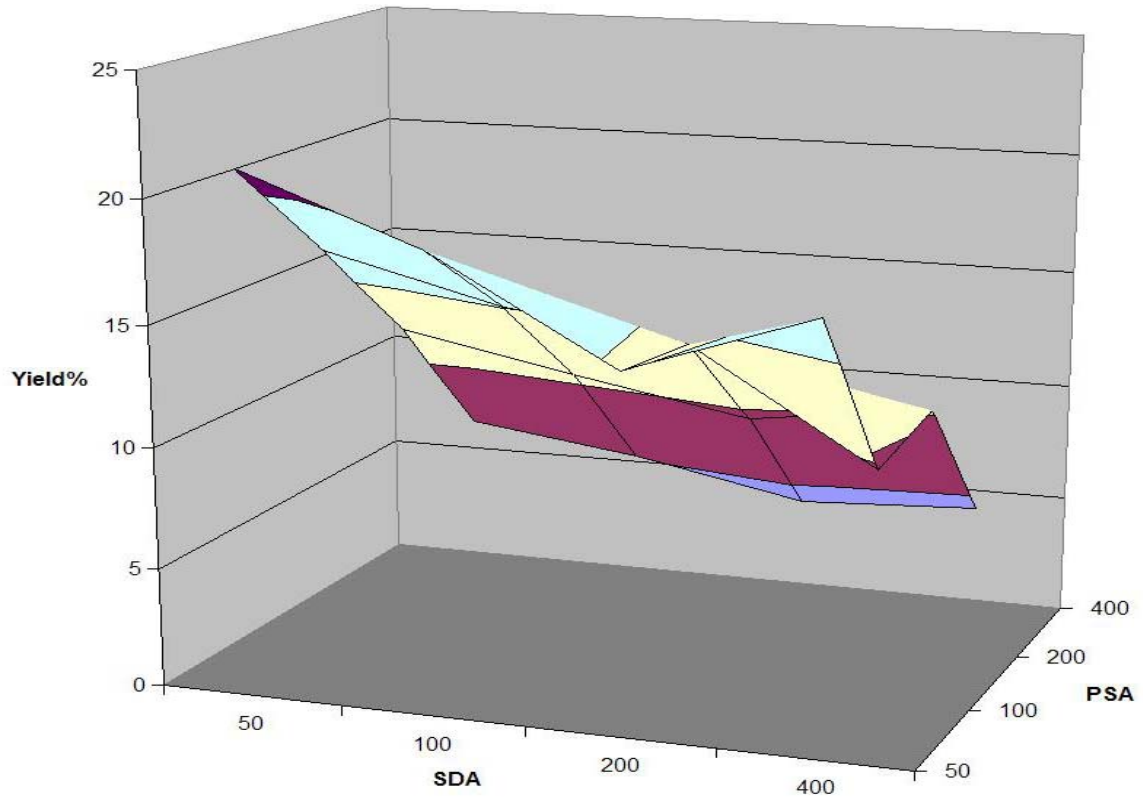

Fig. 10: Residual Yield Surface after using CDS

The individual variations based on SDA and PSA have been analyzed in the following 2 graphs. It can be observed that although this strategy has aggravated the prepayment risk as yield volatility for different prepayment speeds have increased but it remains very stable at different values of defaults. Thus it clearly shows its effectiveness in hedging the default risk of the residual owner. But the Credit Derivative products should be used in tandem with other options that can hedge the prepayment risk. Any effect on the defaults should not be looked in isolation and its correlation with prepayments should be taken into account.

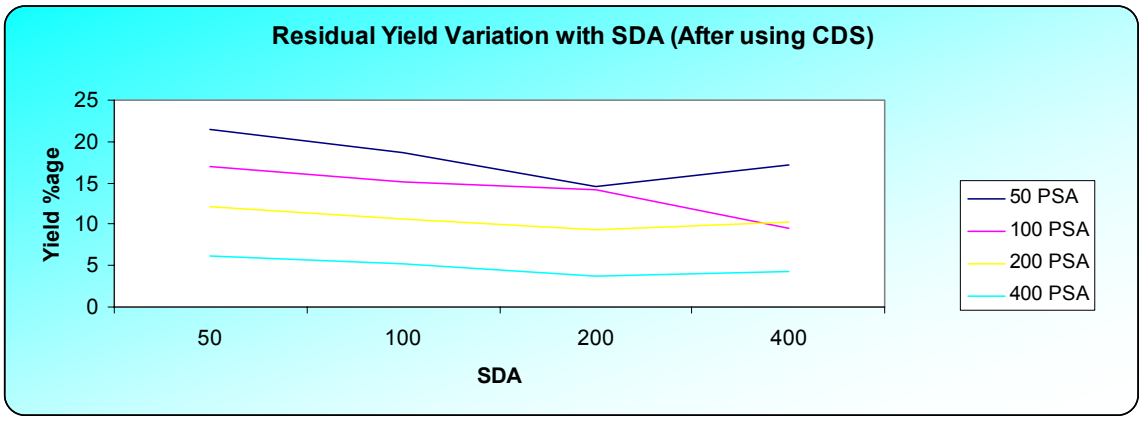

Fig.11: Residual Yield Variation with SDA after using CDS

For the yield variation with prepayments, the variation for different default curves has fallen drastically. Although there is a slight deviation from the normal trend at prepayment speed of 100 PSA but that is because of the shape of the prepayment and default curves and their correlation with each other in impacting the yield on residuals.

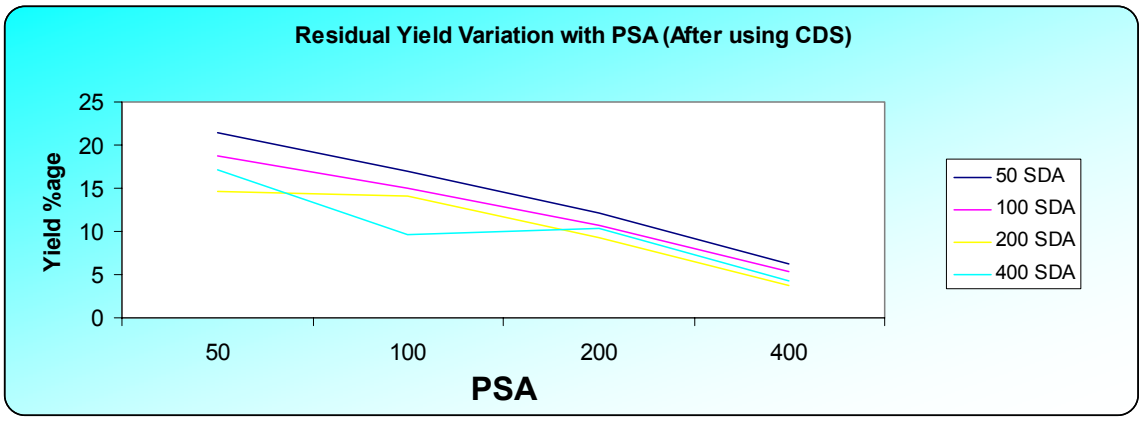

Fig. 12: Residual Yield Variation with PSA after using CDS

EVALUATING EFFECT OF USING CREDIT DERIVATIVES ON RESIDUAL YIELD

Finally, the effect of using CDS in hedging the default risk of the residuals is evaluated through a pictorial representation of the yield for different prepayment and default speeds, both before and after using credit derivatives.

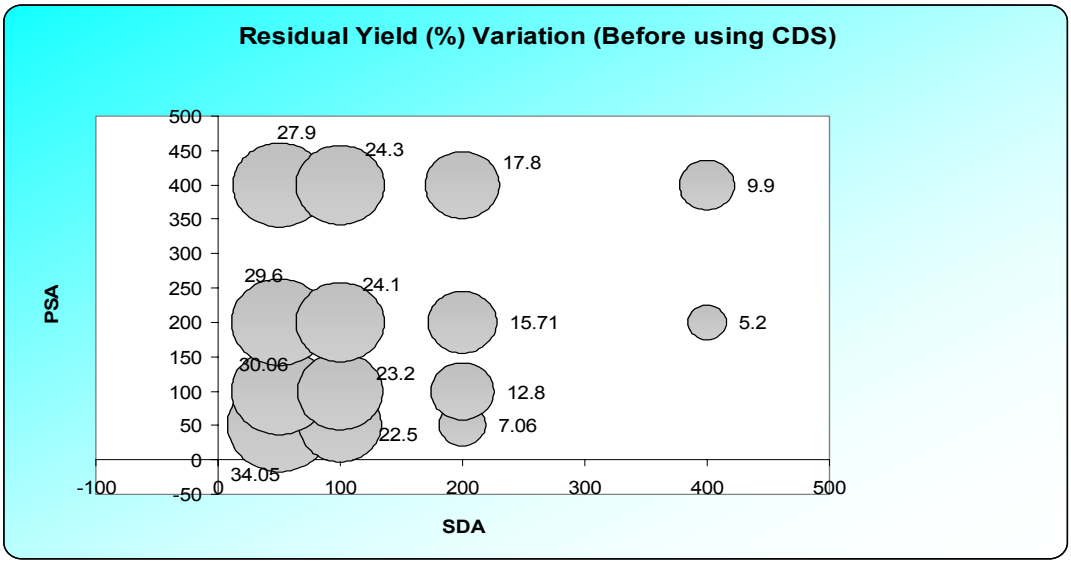

Fig. 13: Residual Yield Variation before using CDS

These two graphs clearly show the impact of CDS on the residual yield. Before using it the yield variation for different prepayment speeds at given default value was very low, whereas the same variation for the defaults was very high.

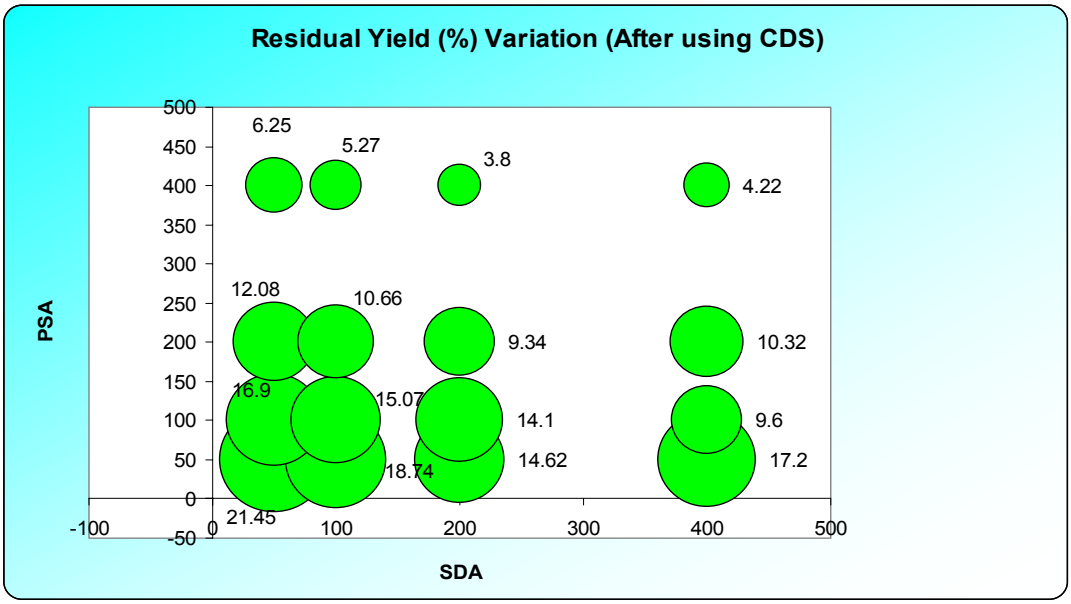

Fig. 12: Residual Yield Variation after using CDS

However, after using CDS the trend gets reversed. The yield variation for different default speeds at a given prepayment rate becomes stable whereas the yield variation across prepayment rates becomes high. Thus the hedging of default risk aggravates the prepayment risk (although not to a very high level) but effectively hedges the default risk.

The yield for high default and high prepayments remain more or less the same but the yield for high prepayments and low defaults becomes very low which was earlier very high, and the yield for high defaults and low prepayments gets a big jump when the same was very low earlier. So the default hedging should be used in association with other strategies to hedge the effect of high prepayment speeds.

HEDGING OF PREPAYMENT RISK FOR THE RESIDUAL OWNER

The Prepayment Rate for Mortgage Backed Securities depends upon a number of factors like the refinancing incentive, seasoning of the mortgage loans, the burnout rate, the geographical location, month of the year etc. and is a separate field in itself. Out of these so many variables, the refinancing incentive is the one which is affected by the prevailing interest rates. But there are other sub-factors as well that influence the incentive to refinance like an economy boom and rising house prices.

Interest Rate Derivative products such as Swaps and Interest Floor and Collars can be used to hedge against a fall in interest rates. But till date there has been no considerable research that can give a single function stating the relationship between the affect of change in interest rates on the prepayment speeds. Without such a relation it is very difficult to determine the specifics of the interest rate floor like its price, the principal amount and the payoff. So such an evaluation is beyond the scope of this paper and we would not delve into it further.

An important point to note is that, as observed in the previous section, the prepayment risk for a Residual owner is not as severe as the default risk. So this paper makes an attempt to suggest other strategies that can be used by the residual owner to hedge its prepayment risk.

STRATEGY I - SHORT NIM (NET INTEREST MARGIN) SECURITIES[7]

NIMs are relatively new products but have gained a high liquidity in the market in recent times. They are issued on the excess interest that is earned after paying all the fees and interest to the tranches. The structure of these securities is such that both interest and the principal on them are paid with the excess interest that would have otherwise gone to the residual owner.

After using CDS to hedge the default risk of the residuals as explained in the previous section the prepayment risk gets aggravated, especially at high prepayment speeds. To hedge this, the residual owner can short NIMs in the market that are issued on a pool balance with similar characteristics as this one. This will make sure that as excess interest reduces with an increase in prepayments the residual owner will remain unaffected as hit will be taken by the purchaser of the NIM, and will provide a stable yield to the residuals even at high prepayment speeds.

STRATEGY II - INVEST IN PO (PRINCIPAL ONLY) SECURITIES

These are stripped Mortgage backed securities that are created by paying the whole principal to one bond class. If the current mortgage rates[8] drop then there is a jump in the value of these securities as low interest rates lead to an increase in the prepayment speeds that implies an early redemption of the Principal amount and hence an increase in the value of the PO. This will compensate for the loss on residuals because of high prepayments.

STRATEGY III - INVEST IN THE BUSINESS OF MORTGAGE ORIGINATORS

As people prepay their loans they simultaneously buy other loans which are more attractive. So, as the prepayments increase the business of the mortgage originators also increases. Hence investing in the business of mortgage originators acts as a natural hedge for prepayments. The validation of the extent of this relationship through relevant data and analysis is beyond the scope of this paper.

[7] Acknowledgement to Nikhil Malik, Ocwen Financial Solutions, Bangalore for extending help on this subject
[8] Frank J. Fabozzi, *Bond Markets, Analysis and Strategies*, p-285

CONCLUSION

Residual Equity is a high risk high return kind of investment, but in order to make it more viable and bankable, strategies need to be developed which would ensure a steady return, neutralizing part of the risk associated with the investment.

This paper has attempted to achieve this objective by linking residual equity investment with interest rate and credit derivative products. It was shown that the use of CDS was an effective method to hedge the Default Risk, wherein the yield for a given default rate was much more stable using a CDS hedge. CDS also have high liquidity in the market which makes them even more viable, but this kind of hedge normally aggravates the prepayment risk of the investment.

The paper then moved on to analyze the Prepayment Risk, which depends on a number of exogenous factors and can be hedged using Interest Rate Derivative products such as Swaps and Interest Floor and Collars, but empirical models for incorporating this relationship has not been developed. Thus suggesting a concrete strategy is beyond the scope of this paper, although an attempt was made to qualitatively look at some of the strategies which can be used to hedge the Prepayment Risk. Some of these strategies included shorting NIM securities, investing in PO securities and taking long positions in stocks of mortgage originators.

While most of these strategies to hedge Prepayment Risk have a sound logic behind them, but the exact payoff function that can be obtained has to be evaluated. All in all, a portfolio consisting of residual equity, CDS and interest rate derivatives can be an effective investment strategy, giving competitive returns depending on the risk appetite of the investor.