



# The Mortgage-backed Securities Market: Risks, Returns and Replication

By

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## Introduction

The securitized mortgage-backed securities (MBS) market has experienced tremendous growth over the last 10 years, and is now approaching \$3 trillion outstanding and accounts for 35% of the Lehman Aggregate Index.

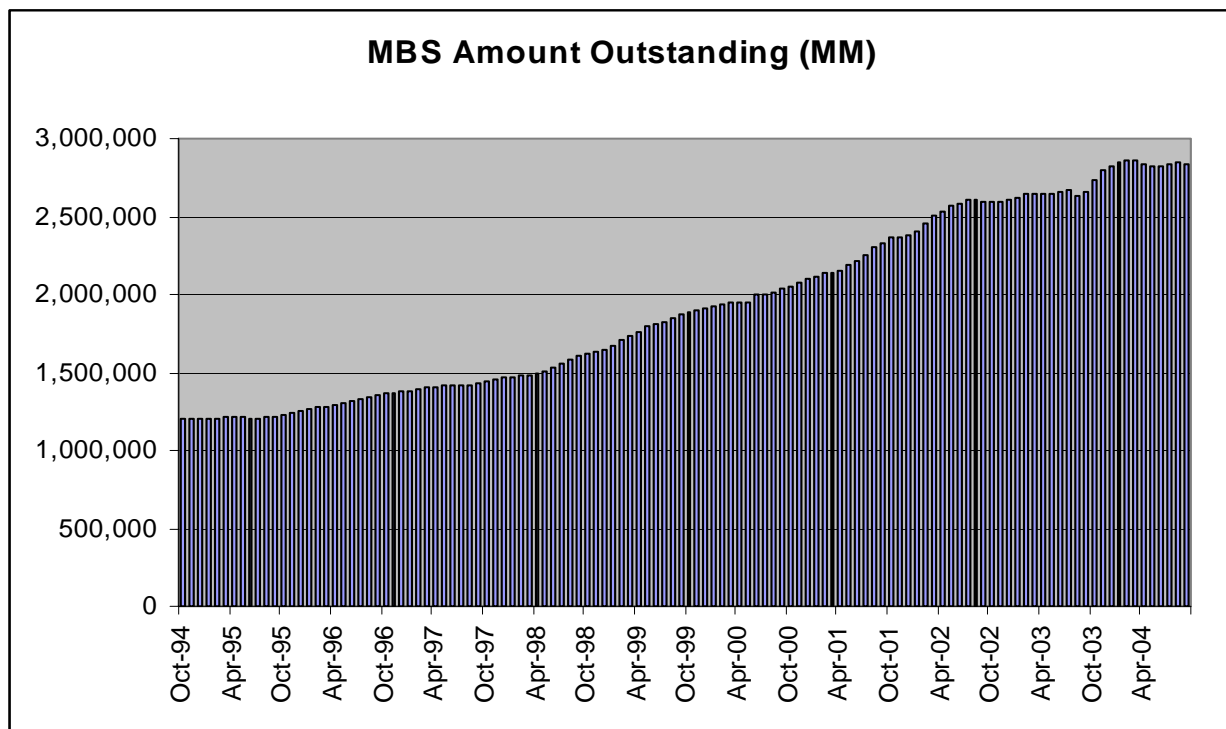


Figure 1

This growth has made this sector an important component of a fixed income allocation. While there are opportunities for enhancing the returns of a fixed income portfolio by allocating to the mortgage-backed sector, a deeper understanding is necessary in order to better manage the embedded risks and produce superior returns.

The following analysis will concentrate on the 30-year pass-through securities issued by Ginnie Mae, Fannie Mae and Freddie Mac, which account for almost 70% of the MBS component of the Aggregate index. The remaining 30% are 15-years, 20-years and balloons, with 15-years accounting for 25% of the remaining 30%.

These securities bear little credit risk as they are guaranteed by the issuing agencies, and are collateralized by the physical asset. Figure 2 shows the average spread of the Lehman MBS index over Treasuries. The measure presented is that of the Option Adjusted Spread (OAS), which will be discussed later.

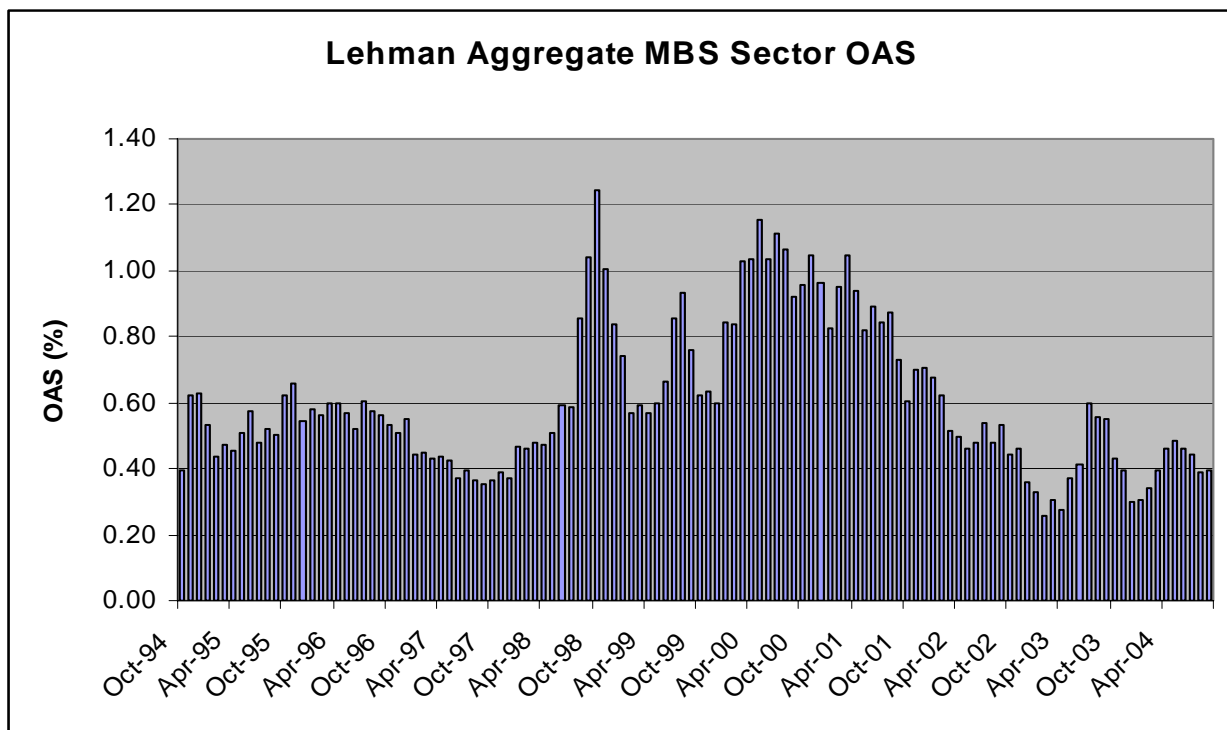


Figure 2

The obvious question in the absence of credit risk is why has the sector offered an average of 60 basis points of spread over the last 10 years? The answer is that the sector has uncertain cash flows; as the investors have in essence sold the homeowner a series of call options that allow the for the security to be called away (by refinancing) at the best time for the homeowner and the worst time for the investor. So part of the sector spread should be the call option premium that was sold, which is why we presented the OAS, the spread adjusted for the option premium.

If one looks at a static spread measure like the traditional yield to maturity, one sees that it is higher (currently, about 100 basis points higher) than the OAS. This is because, being static, the yield to maturity does not capture the volatility of interest rates and the cash flow dependency on the level of interest rates, which affect the level of refinancing. When rates decline, the homeowner refinances and a security that was at a premium is called away leaving the investor with the par proceeds to reinvest in a lower rate environment. Conversely when rates rise, refinance activity declines leaving the investor with a discount security and lower than expected cash flows to reinvest in the higher rate environment. Hence the “negative convexity” of MBS, which is expected as MBS are short call options that always have positive convexity.

Quantitative software like the Yield Book, which PIA uses, incorporates the volatility of interest rates and links the MBS cash flows with the level of interest rates, the shape of the yield curve, the age of the loan and the season of the year amongst other factors. Thus the Yield Book numerically values the short call options and adjusts for them, leaving us with the measure of the OAS. This remaining compensation has to do with the level of LIBOR rates used in the financing of such MBS holdings and it is also compensation for the model risk, in which a model could miscalculate the dependency of MBS cash flows to the level of interest rates.

The OAS is the average spread (and the best guess in any given environment) that the investor is expected to realize over the life of the security. If one dynamically hedges the duration will change, as interest rates move, which keep the duration at the purchase level. Also, the MBS market is an attractive place to sell call options, as homeowners are generally not very efficient in exercising them, providing additional returns to investors over the OAS.

The risks involved in investing in MBS are mentioned above. They are the model risk (compensated by the OAS) and the negative convexity (compensated by the option cost). It is the role of the investment manager to decide when the compensation is adequate and when it is not.

### **MBS as an Integral Sector in a Fixed Income Allocation**

The following will examine the risk/return profile of the MBS sector over the 10 year period ending in September of 2004. We are going to compare this with the profile of the other major domestic fixed income sectors; agencies, “A” rated corporates, “BBB” rated corporates and also with the long treasury sector.

Figure 3 shows the total rate of return produced by the various sectors versus their risk, measured as the annualized standard deviation of the returns over the same period.

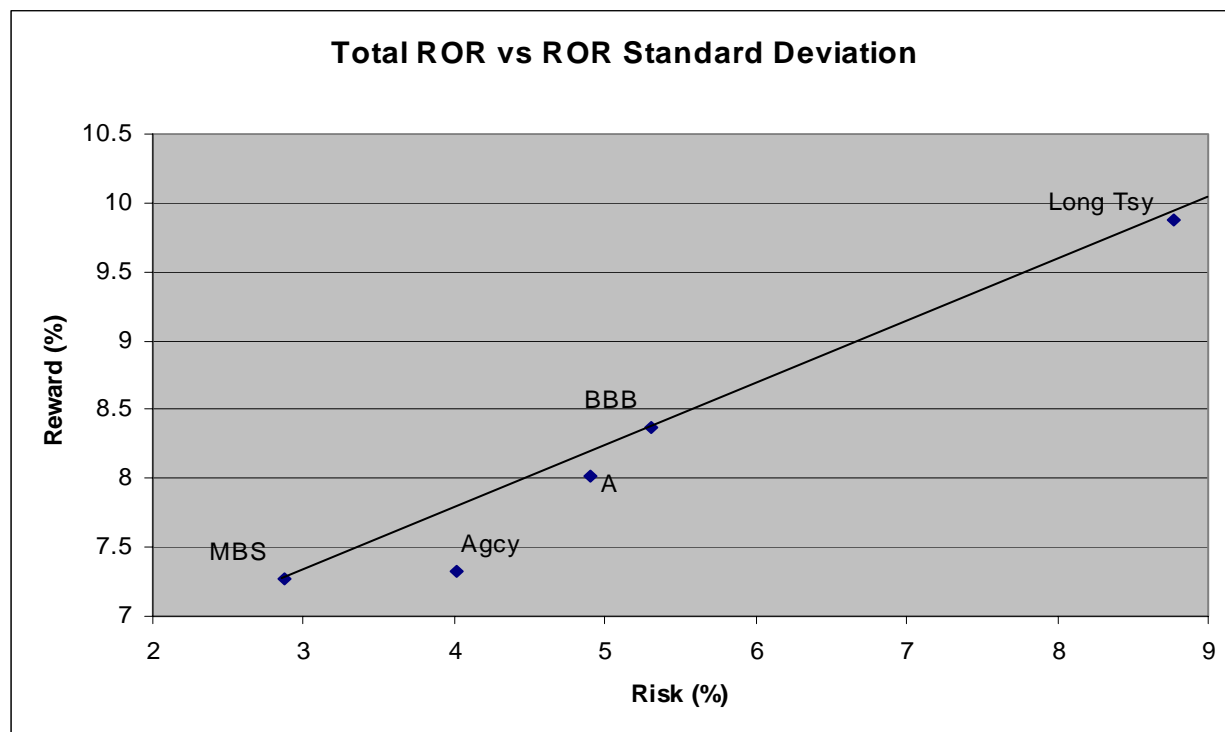


Figure 3

On the risk-reward plane we see that the MBS sector has produced almost the same annualized total return as the agency sector (7.3%) with much less return volatility (2.9% vs 4.0%). We clearly see that the agency sector is suboptimal, and so is the “A” rated corporate sector, though to a lesser extent. Of course, one must also examine the return correlations between the various sectors, since a sector can offer lower returns but if it has a negative correlation with the other sectors it can compensate for that lower return.

Since in the fixed income market the level of interest rates is the major factor driving returns, one has to look in the area of the exotic negative duration assets to find negative correlations. The way we prefer to look at the various asset correlations in the fixed income market is by comparing the price returns of treasuries and the excess returns of other sectors. Any time one invests in any sector outside of treasuries one is accepting either credit risk or negative convexity risk (assuming that interest rate risk is mitigated via similar durations). In return for that risk the sector offers excess returns, the correlation of which for the major sectors is presented below.

## Excess Return risk matrix

	Agency	MBS	A	BBB	Tsy PX ROR
Agency	<b>0.69</b>	0.65	0.37	0.32	0.20
MBS	0.65	<b>1.11</b>	0.36	0.32	0.01
A	0.37	0.36	<b>2.20</b>	0.90	-0.31
BBB	0.32	0.32	0.90	<b>3.39</b>	-0.34
Tsy PX ROR	0.20	0.01	-0.31	-0.34	<b>4.66</b>

The last row shows the correlations between the treasury sector and other sectors. The MBS excess return is almost uncorrelated to the treasury price returns, unlike the 0.2 correlation between agencies and treasuries. Corporate excess returns are negatively correlated and are desirable in the overall asset allocation, as are MBS, which dominate agencies both in a risk-reward and correlation consideration.

Finally as we can see from Figure 4, duration differences have not played a role in the generation of higher excess returns. Excess returns as such, are duration adjusted, but a sector that is longer in duration and thus, has greater price volatility, might offer higher excess returns to compensate for that. It is interesting that even though the MBS excess returns are again less than those of agencies by only 1 basis point, their average duration difference is 1.6 years. Also in this chart we see how “BBB” rated corporates dominate “A” rated corporates offering almost 20 basis points of higher excess returns with almost the same duration.

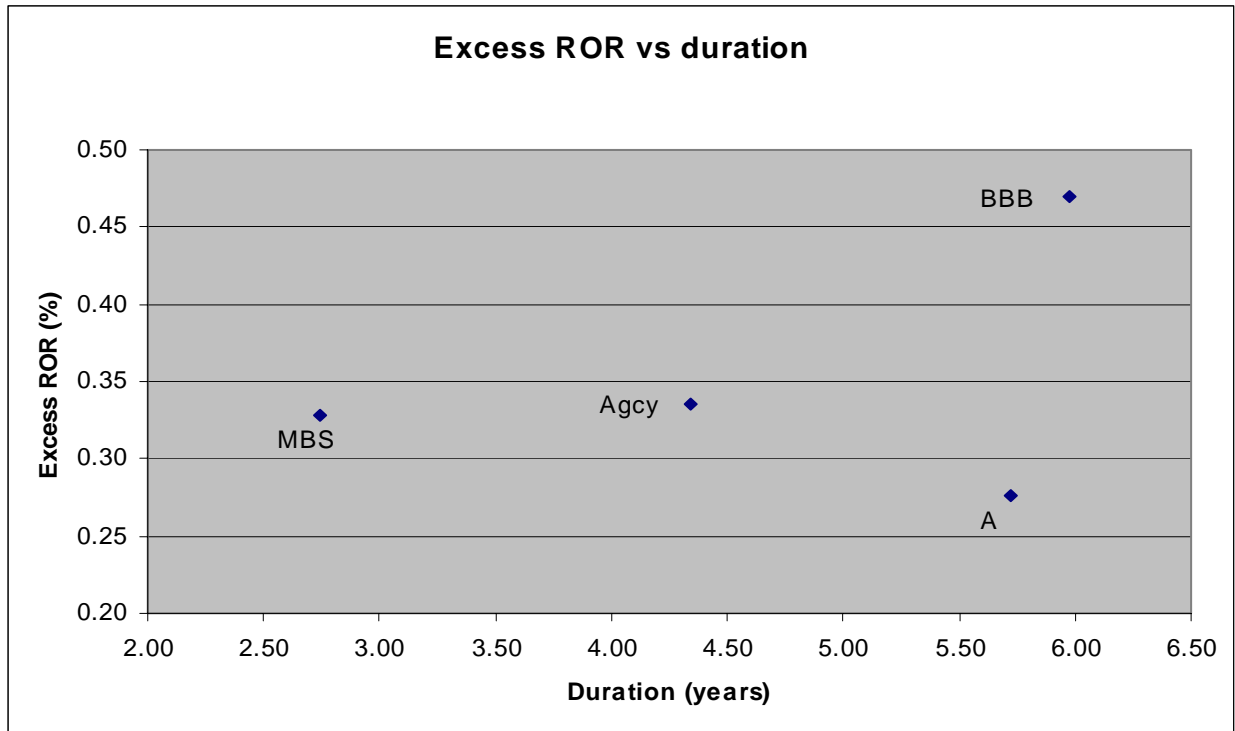


Figure 4

It is clear that by utilizing the MBS sector, even in portfolios benchmarked against the Government-Credit Index, either in addition to or in lieu of agencies, one can reduce the portfolio return volatility without any significant return give-up.

**Replicating the Lehman Aggregate MBS Index**

Replicating the Lehman MBS Index presents a different set of problems than that of the BBB rated credit index that PIA has already completed. In the latter case, each bond has a high volatility, but by adding more and more bonds in the replicating portfolio we can diversify away the non-systematic risk, creating a portfolio with a declining tracking error.

The MBS index is not using individual issues to track returns, but rather non-traded generics. Each of the hundreds of thousands of actual mortgage pools is mapped to a generic according to its program, origination year and coupon.

Figure 5 shows the distribution of the MBS market across the various coupons.

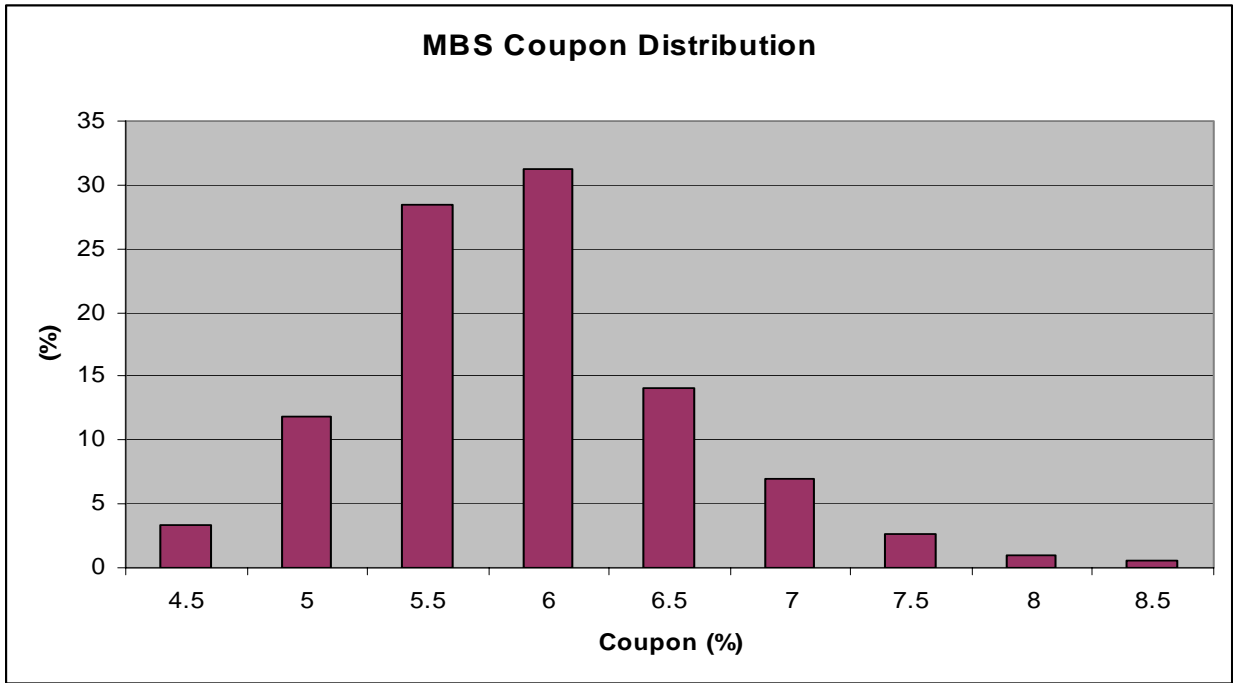


Figure 5

Matching this is straightforward, along with the effective duration of the coupon cells shown in Figure 6.

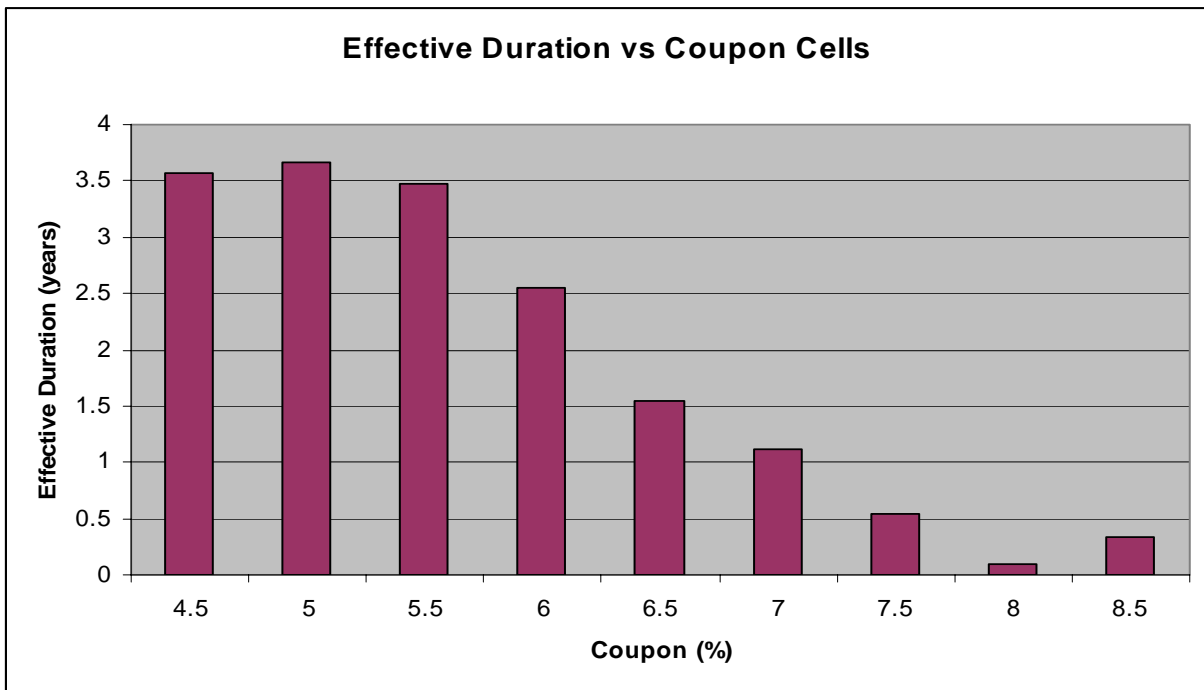


Figure 6

The main problem in replicating the MBS index stems from the differences in the origination year of the various MBS pools. Figure 7 shows the maturity distribution of the MBS index.

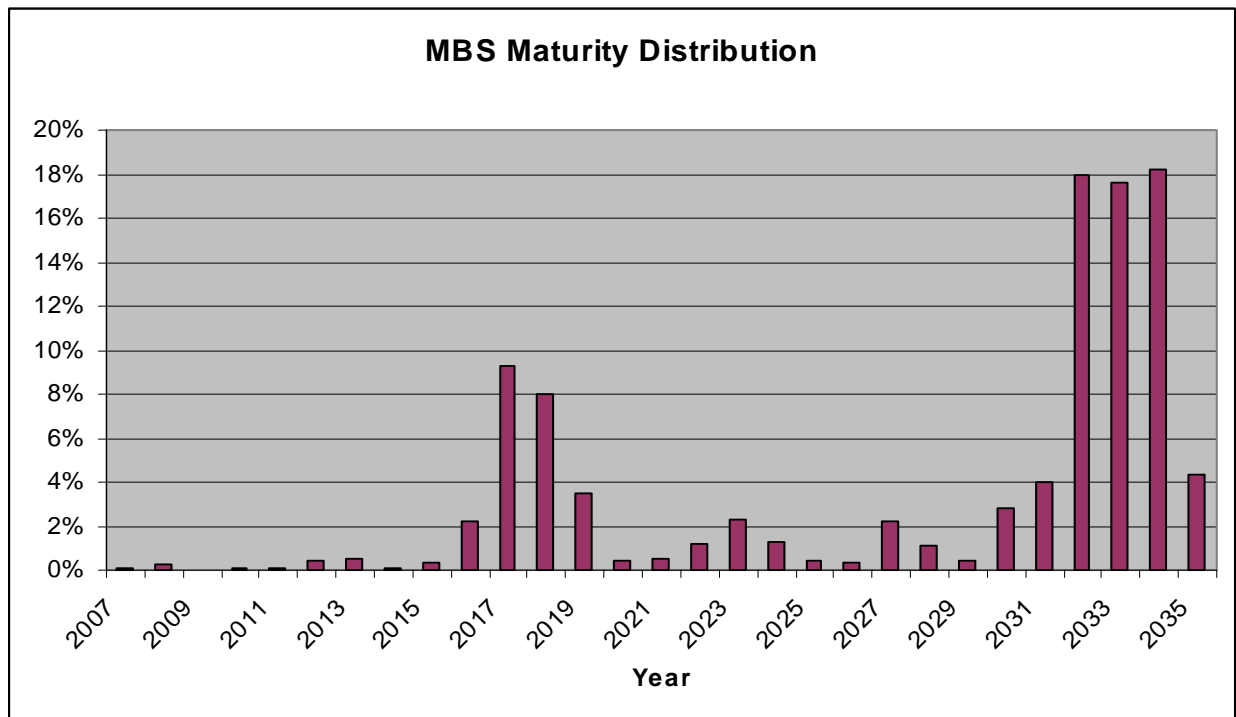


Figure 7

The year of maturity (or origination) of a given coupon is important in the index replication, as more seasoned pools tend to have more stable prepayment profiles than newly originated pools.

Older pools are generally not easily available for purchase, or entail paying high premiums, which tends to disappear in the generic pricing of the index, introducing additional sources of deviation from the index returns.

There are generally two different methodologies that allow one to structure a replicating portfolio.

The first involves the use of to-be-announced (“TBA”) contracts where one buys a specific program and a specific coupon of bonds that are yet to be created and they are delivered once a month. This allows one to utilize the very liquid TBA market to match the various coupon and program cells. Such a strategy is expected to produce a tracking error of about 20 basis points versus the benchmark (See the publication “Tradeable Proxy Portfolios for the Lehman MBS Index” by Dynkin,



Konstantinovskiy and Phelps, July 2001). If one takes delivery of the securities and allows them to age in the portfolio, this tracking error is expected to decline over time. Also, as one of the sources of tracking error, the seasoned pool difference declines over time, as the pools in the portfolio age, and some of the older pools in the index are paid down.

The second methodology purchases large pools with given characteristics to match the cell distributions and holds them in the portfolio allowing the aging process to work through. The annualized tracking error of this strategy is expected to be about 15 basis points, 5 basis points better than the TBA strategy. However, in certain market environments, the TBA strategy has advantages of its own, which will be described next, that enhance the returns versus the index. In general, a combination of these strategies should allow one to track the index within the 20 basis points tracking error, while at the same time providing opportunities for enhancing these returns.

### **Enhancing the Returns of the MBS Index.**

The use of MBS expertise allows managers with the experience, sophistication and analytical tools to add value relative to the index by either selecting attractively priced securities or utilizing the roll market for TBA securities.

A lot of times supply and demand conditions in the marketplace produce situations where investors are encouraged to delay taking delivery of the TBA purchase for an additional month. This is done by the investor selling the TBA for the current month, and at the same time committing to buying it back the following month at a lower price (called the drop). Implied in this there is a breakeven rate that the TBA buyer can invest the cash that will not be used to buy the securities in the current month. Several times, the actual rates available are higher than the breakeven rate offering the TBA investor the opportunity to enhance returns versus the MBS index.

As an example, on June 3 2005, the drop in FNMA 5% 30 years was 7/32nds, and the breakeven rate 2.04%. With the 1 month LIBOR rate at 3.1%, it is clear that rolling these TBA's and investing the unused cash in higher yielding instruments can enhance the MBS returns without introducing additional risk to the portfolio.

The most efficient vehicle for investors to gain exposure to the all important MBS sector is by investing in an MBS index fund that matches the major characteristics of the MBS index, while allowing for the opportunity to enhance index returns via quantitative strategies.