Submission Number: 03

Group Number: 37

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Mortgage Backed Securities (MBS)

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Abstract

Mortgage-backed securities, taking their basis from the Pfandbrief of 18th century Prussia as one of the earliest form of debt securities. In this paper we analyse the general uses and occasional misuses of MBS, which seemed contradictory, especially for the case of Global Crisis of 2008. We also analyze different types of MBS i.e. the tranches, classiffied accoring to their risk degrees. Regarding their time dependent values, we gave calculation of related call and put prices via Black-Scholes and binomial models with a model MBS as the underlying. We also discuss that how MBS assets be used in discretion as form of debt securities.

Introduction

Mortgage-backed securities, one of today's important structured finance products, take their basis from the Pfandbrief of 18th century Prussia. After the Seven Years' War, King II. Friedrich introduced a new mortgaged housing finance system in order to increase the liquidity in the assets of the landed nobles whose financial power was worn out as a result of the wars, and in its simple form, he paved the way for the issuance of mortgage-backed securities. (Schwarcz, 2011)

About two hundred and fifty years later, mortgage-backed securities in housing finance enable lenders to obtain funds from the secondary mortgage markets at low cost, and through securitization, the lender's low-liquidity long-term mortgage loans turn into liquid capital market instruments. These instruments remain on the balance sheet of the issuing institution and thus various risks such as default and prepayment are not transferred to investors, which can be qualified as investor friendly. (Yıldırım, 2021)

Mortgage-backed securities (MBS) often offer higher yields than treasury bonds, but they also carry several risks. MBS prices tend to increase at a decreasing rate when bond rates are falling; they tend to decrease at an increasing rate when rates are rising. This characteristic is the opposite of how traditional bonds change as interest rates move up and down, working against the investor as interest rates fluctuate, and is referred to as "negative convexity." (Kenny & Brock, 2022)

Use of MBS as a financial asset

MBS can useful financial instruments because of following reasons:

- Providing funding by issuing mortgage-backed securities from capital markets increases the liquidity of mortgaged houses, thus reducing the risk of both housing finance institutions and consumers.
- Capital markets provide long-term resources by issuing these securities. It provides a service that allows an asset to be saved for a reasonable period and value, which is a very important factor for its periodic use.
- Providing access to long-term funding sources, liquidity risk in the system and increases the ability of home buyers to repay their loans.
- Mortgage securities allow increased competition in primary markets. Establishment of funding sources in the capital market, prevents financing institutions from prefering expensive funding sources (e.g., branch networks) to raise funds.
- Increasing competition and expertise increases the effectiveness of the housing finance system, reduces costs and margins. Capital market funding instruments extend the loan maturities. Financial institutions with short term liabilities generally provide short-term mortgages.
- Long-term housing loans, especially in a low-interest environment, can increase solvency of individuals. (Özince, 2005)

Role of MBS in Global Financial Crisis of 2008

Securitization has undoubtedly been one of the main causes of the 2008 global financial crisis. Derivative securities especially mortgage-backed securities-MBS and collateralized debt obligations-CDO constitute the primary starting points of the crisis. Overvalued asset prices caused the crisis not to be limited to the USA, but to spread all over the world and to be a part of the mortgage crisis also led to a global credit and liquidity crisis.

In addition to the unbelievable rate of valuation, the derivative products created as MBS lacked supervision and surveillance in almost all economies, especially in the contributed to the emergence and deepening of the crisis.

Former Fed Chairman Greenspan said the crisis was not just about loans, he stated that the main reason was that these loans were “packaged and resold”. Between 2000 and 2006, the period of abundant liquidity in the USA, with the effect of securitization, individuals used more loans than normal. Subprime mortgage loans increased from 94 billion dollars to 685 billion dollars between 2001-2006. (Yıldırım, 2021)

Benefits of MBS versus their effect in 2008 crisis

Potential benefits of MBS	Effect in 2008 Crisis
Providing funding by issuing mortgage-backed securities from capital markets increases the liquidity of mortgaged houses, thus reducing the risk of both housing finance institutions and consumers.	When FED started to increase interest rates, by this effect, MBS became overvalued before and during the crisis and more people tend to favor MBS, thus overall risks grew instead.
Capital markets provide long-term resources by issuing these securities. It provides a service that allows an asset to be saved for a reasonable period of time and value, which is a very important factor for its periodic use.	As risks of MBS grew they become more and more lquid and short term assets. Term "Reasonable period" became obsolete for the MBS.
Providing access to long-term funding sources, liquidity risk in the system and increases the ability of home buyers to repay their loans.	Same as above.
Mortgage securities allow increased competition in primary markets. Establishment of funding sources in the capital market, prevents financing institutions from prefering expensive funding sources (e.g. branch networks) to raise funds.	This was the most truthful fact, open to competition with other assets, MBS becaming more risky, gradually lost their property of being a secure and backed-up asset.
Increasing competition and expertise increases the effectiveness of the housing finance system, reduces costs and margins. Capital market funding instruments extend the loan maturities. Financial institutions with short term liabilities generally provide short-term mortgages.	Same as above.
Long-term housing loans, especially in a low-interest environment, can increase solvency of individuals.	It increased solvency in the beginning, however it increased the overall house expenditure and MBS overrided the system by becoming more risky with respect to their underlying asset obligations.

Different tranches of MBS

Tranche, in its very definition, refers to the numerous slices of or a larger whole. In this regard we refer to funding regarding Mortgage-backed securities it refers to the funding that makes up the comprising mortgages. Investors can decide how to invest in these Collateralized Debt

Obligations or "pooled" securities, with the mortgages or their interest being the backing asset itself. There are several types of tranches listed below in advancing levels of security:

1. Equity tranche: Where these are based on equity injections by the investors where they have little to no security. They take on the **Highest Risk** and **HIGHEST RETURN**

   Advantages
   - Highest returns are expected from these to compensate for the risk incurred by the equity tranche.
   - Higher exposure to the upside.
   - Cashflows realized sooner for the investor not interested in a long-term horizon as they get bigger returns sooner, so the ROI is realized sooner

   Disadvantages
   - Highly exposed to increasing interest rates.
   - The most subordinated tranche.
   - They take the biggest hit win when borrowers default as their share gets hit first while the others maintain their share until the equity is completed. i.e., the Equity tranche returns can end up being lower than those of the Junior or Senior tranches depending on the quantum of losses.

2. Junior Tranche: Sometimes referred to as Mezzanine Financing, which has combined features of both Debt and Equity financing. This is the middle tier of capital structures. There is **Moderate Risk** and **Moderate Return** in comparison to Equity and Senior Tranches.

   Advantages
   - Moderately higher level of security than an Equity Tranche
   - Slightly higher returns than Senior Tranches
   - Increased ROR due to the Equity-like features.
   - The interest paid on Mezzanine financing is tax deductible thus significantly reduces the overall cost of debt.

   Disadvantages
   - Subordinated debt to Senior Tranche investors and as such will have reduced security and higher exposure to the downside.
   - May have restrictions on further credit positions

3. Senior Tranche: This is **generally** the safest of the tranches as they have first claim on the collateral. There is **Low Risk** and **Low Return** in comparison to Equity and Junior Tranches.

Advantages

- Least risky, as they are often collateralized (Principal and interest).
- Have first claim in the even that the underlying assets default.
- Consistent cashflows in a steady state environment.
- Less exposure to interest rates reduction or defaults if change is moderate.

Disadvantages

- Lowest Returns of all the tranches
- More Expensive than the other tranches
- Takes on the biggest capital outlay.

MBS with very low default correlation

As there is an increase in correlation the higher rated tranches (Senior Tranche) become more expensive meaning their risk has reduced. At correlation of 0, it implies that the probability of experiencing defaults across the assets is severely reduced and as such, any possibility of any of the assets defaulting is unlikely to affect senior tranche at all. Thus, at zero correlation, the senior tranche is considered relatively safe.

As there is an increase in correlation the lower rated tranches (Equity Tranche) become less expensive meaning their risk has increased. At correlation of 0, it implies that their probability of experiencing defaults across the assets is severely reduced and as such, any possibility of any of the assets defaulting is going to hit the equity tranche hardest. Thus, at zero correlation, the equity tranche is considered relatively high-risk.

MBS with very high default correlation

The senior tranche: The senior tranche is rated most of the time triple-A (AAA) this creates marketability and certainty, receives payment before any of the tranches, and crystallizes loss after all other tranches' losses had been crystallized. This seems good but in terms of safety is not safe because if something goes wrong, the senior tranche is subjected to default, and because default correlation is 1 in this case, the probability of a default is high because if one default all default. The senior tranche will become more expensive and have a higher spread. Although the senior tranche is expected to be a relatively safe investment, a strong correlation of default reversed this.

The equity tranche: The Payment of principal and interest are not guaranteed. The equity tranche is more likely to lose part of its principal, and less likely to receive the promised interest payments on its outstanding principal, than the other tranches. The Equity tranche is not rated. However, considering a correlation of 1, which implies that the constituents either survive together or fail together. The probability of no default is very high. The equity tranche becomes less expensive and has a lower spread. The probability of default, in this case, reduces dramatically. In this case,

we may say is not a relatively high-risk investment because the probability of default is very low, which implies that, the probability of receiving payment is equally high.

Calculation of pricing of call / put options

Using the Black Scholes Merton model and Binomial models we calculate the price of European call and put options. (Please see attached excel file for details of calculation.)

Assumptions:

S	29.81
k	35.37
T	1
sigma	0.014
r	0.042

S/N	OPTION	BLACK-SCHOLES PRICE	BINOMIAL OPTION PRICE
1	CALL	0.00	0.00
2	PUT	4.1052	4.46496

Discussion

Mortgage backs securities introduce investors a securitized version for mortgage payment obligation of home owners. Even they seem to be of low risk at the beginning of the payment period, because of their negative convexity i.e. high sensitivity to change in interest rates fluctuations, they tend to change their risk attitude in the long term as significantly witnessed in global crisis of 2008, thus MBS have at all times be used with some degree of caution in long term investor portfolios.

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