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PRIMER

MORTGAGE-BACKED SECURITIES

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One of the greatest innovations in US credit markets in the past 30 years was the creation of the mortgage-backed securities (MBS) market. The securitization of mortgages brought new capital and led to more liquid assets and more efficient market pricing of mortgages. It also led to specialized intermediation of the mortgage market. Together, these improvements lowered mortgage rates for borrowers, broadened homeownership and eliminated regional disparities in the deployment of capital for home mortgage lending.

From investors' point of view, the MBS securitization process converted non-rated, illiquid loans into securities that are highly liquid, have low credit risk and offer competitive rates of return. With daily trading volume exceeding \$200 billion and outstanding debt more than \$5.3 trillion in 2003, the US mortgage-backed securities market today is one of the most liquid in the world.¹ MBSs offer higher yield than Treasury notes and corporate bonds.² This higher yield compensates partially for the higher credit risk, market risk and especially the embedded prepayment option.

The mortgage securitization process also helped to stabilize the US housing finance system by shifting the interest rate risk of mortgages from banks and thrifts to numerous investors. Furthermore, much of the credit risk is now held by enterprises like Fannie Mae and Freddie Mac. These large corporations are highly capable of diversifying credit risk because they package mortgages from across the whole nation, compared to most local banks and thrifts who deal primarily with mortgages from their region.

¹ The Bond Market Association, 2004. The outstanding MBS debt includes GNMA, FNMA, FHLMC private-label mortgage-backed securities and CMOs

² Hayre, Lakhbir. "Salomon Smith Barney Guide to Mortgage-Backed and Asset-Backed Securities", Wiley, 2001.

This primer will provide an overview of the several different types of MBS, the MBS market and its unique and unprecedented development. Further on, it will discuss the structure of MBS and the three major types of residential MBS: mortgage pass-through securities, collateralized mortgage obligations and stripped mortgage-backed securities.

HISTORY

The major issuers of mortgage-backed securities are Ginnie Mae, Freddie Mac and Fannie Mae. The *Federal National Mortgage Association*, now known as Fannie Mae, was created by Congress in 1938 to add new capital and liquidity to the US mortgage market. It was initially owned by the federal government through the Reconstruction Finance Corporation (RFC). In 1968, Fannie Mae was split into two corporations: Ginnie Mae, which stayed associated with the government, and Fannie Mae which became a private stockholder-owned corporation.³

The role of Ginnie Mae, since 1968, is to provide a secondary market for government-insured mortgages; it is on the federal budget and its programs are backed by the full faith and credit of the US government. Through Ginnie Mae, the federal government made its initial foray into mortgage-backed securities in 1970.

The *Federal Home Loan Mortgage Corporation*, also known as Freddie Mac, was established by Congress in 1970 to be a secondary market in mortgages for the savings and loans industry. It was privatized in 1989 into a private stockholder-owned corporation.

Fannie Mae and Freddie Mac are not backed by the full credit and faith of the US government. Both institutions were created by the federal government and have federal corporate charters. The market perceives an implicit guarantee by the US government, because like other giant financial institutions, such as Bank of America, the government is unlikely to let these institutions fail in the event of financial problems. As a result, these institutions pay low credit risk premiums when they borrow in private capital markets.

The first MBS was brought to market by Ginnie Mae in 1970. Throughout the 1970s and early 1980s the major type of MBS security was the pass-through security (discussed in details below). A major innovation for the MBS market occurred in 1983 when Freddie Mac issued the first Collateralized Mortgage Obligations (CMOs). These new instruments appealed to investors with special maturity and cash-flow requirements. However, the first CMO issues faced complex tax, accounting and regulatory obstacles. Much of those legal issues were resolved with the passing of the Tax Reform Act of 1986 which included the Real Estate Mortgage Investment Conduit (REMIC) tax vehicle. After 1986 the issuance of CMOs grew enormously. The new tax law also allowed for the creation of other mortgage

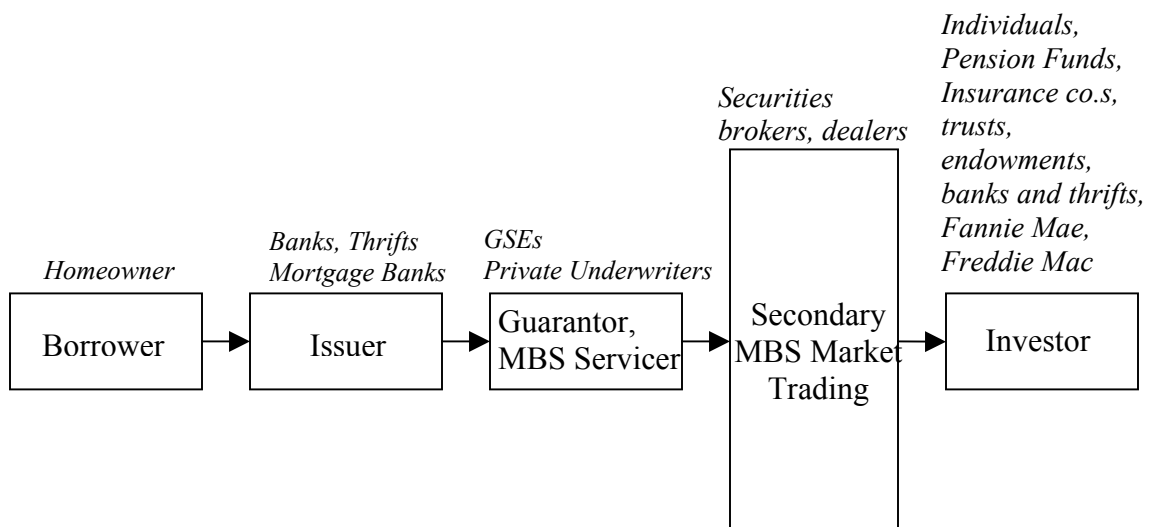
³ The President appoints some corporate board members, and the Treasury Department has the authority to advance \$1.25 billion to Fannie Mae and to Freddie Mac by purchasing their securities.

instruments such as STRIPs, floaters and inverse floaters (discussed in details below).

TERMINOLOGY

Before discussing the different mortgage-backed securities and how they work, the key terms need to be clearly defined. These features are common for all MBS and will help the reader understand how the whole mortgage market works.

- *Mortgage issuer* or initial lender is a mortgage lender, usually a bank, thrift or a mortgage banker. The issuer lends money to the homeowner who is the *borrower*.
- *Guarantor* guarantees the timely payment of interest and principal on the mortgage. In the case of Ginnie Mae, this guarantee is backed by the full faith and credit of the US government. Fannie Mae and Freddie Mac guarantee mortgages based on their own creditworthiness.
- *Mortgage servicer*: The main function of the servicer is to collect monthly payments from the mortgage borrowers and pass the cash flow to the mortgage pool or other mortgage purchaser.
- *MBS issuer* is the institution that issues the mortgage-backed security. It forwards the cash flow to the ultimate investor.
- *Primary market* is where new capital is raised. In the case of mortgages it is when the mortgage is first issued. In the case of MBS is when the securities are first brought to market.
- *Secondary market* is where the title of the asset is transferred, i.e. where existing mortgages or existing MBS are traded between investors. In the case of mortgages, there is *secondary mortgage market* where whole mortgages are sold to investors or enterprises such as Fannie Mae and Freddie Mac. In the case of MBS, the *MBS secondary market* is where the mortgage-backed securities are traded between investors.



PASS-THROUGH SECURITIES

The pass-through or the “participation certificate” (PC) is the most common structure for mortgage-backed securities. The MBS issuer acquires mortgages from original mortgage lenders. The agency then examines the mortgages to ensure that they meet the credit-quality guidelines. Loans with similar characteristics (yield and maturity) are pooled together and the servicer “passes through” a pro rata share of all interest and principal payments to the investors. For example if an investor owns 2% of the pool, she would receive 2% of all the payments of interest and principal received by the pool less fees. The actual packaging or “pooling” can be done by the government sponsored enterprises: Ginnie Mae, Fannie Mae and Freddie Mac, or by private enterprises. Payments to investors are made on a monthly basis.

Since not all the mortgages in a pool have the exact same mortgage rate and maturity, a weighted-average coupon (WAC) is calculated for the pool of mortgages backing the pass-through. However, investors receive what is called net coupon which is the WAC less the fees that the MBS issuer charges for guaranteeing the issue.

Prepayments

One of the features that distinguishes mortgage-backed securities from other fixed-income instruments is the embedded prepayment option. Borrowers may prepay their mortgages for a wide variety of reasons, such as moving, default or refinancing to take advantage of lower rates. If the borrower relocates or defaults on the loan, the house is sold and the whole mortgage is paid back (Ginnie Mae also allows for the mortgage to be assumed). The borrower might also choose to refinance if mortgage rates fall significantly lower than their contract rate. Furthermore, borrowers can choose to overpay their monthly bills, called curtailments, so as to save by retiring their debts early. In all cases, the prepayment results in a reduction of the outstanding balance of principal of the mortgage pool.

There are many models that try to predict prepayment behavior, but the most popular one is the model published by the Public Securities Association (PSA). It starts with the assumption of .2% prepayment rate the first month and rises by .2% each month, until it levels off at 6% at 30 months from the beginning of the mortgage contract. Prepayment speed is usually expressed as a percentage of the PSA model. For example, 100% PSA means the speed of prepayment is .2% until the 30th month, while 200% PSA suggests twice as fast speed of .4% monthly increase until it reaches 12% by the 30th month, where it remains until maturity.

What makes mortgage-backed securities much more difficult to price than conventional bonds is that the mortgage investor holds a short option on prepayment. Homeowners hold, and should hold, a long option position, because this allows for

more flexibility in decisions. It makes moving to another location less difficult. It also gives the chance to refinance.

Credit Risk

Like any debt instrument, mortgages involve credit risk. Credit risk arises from uncertainty over whether the borrower will perform as required to fulfill interest and principal payments. In order to reduce that risk on mortgages, the conventional mortgage contract, which was developed by Fannie Mae in the 1930s, requires borrowers to put down 20% of the house price as downpayment. This is expressed as 80% loan-to-value ratio when value refers to the market price of the home. Thus the collateral for the mortgage, the value of home, amounts to 125% of the debt principal. Mortgage insurance is provided by several federal government programs as well as by private mortgage insurance companies.

The Federal Housing Administration (FHA) was created under the National Housing Act of 1934. It insures mortgages of low- and moderate-income families to promote ownership for those people. The FHA insurance covers the whole amount of the loan, but there is a limit to what the size of the loan could be. If the borrower with FHA insurance defaults insurance, the FHA has two options. It can pay the lender the insured amount and let the lender take the title of the house. The FHA can also reimburse the lender for the entire loan amount and take the title of the house.

The Department of Veterans Affairs (VA) offers insurance on mortgages for veterans. Unlike the FHA, the VA insurance covers only a certain percentage of the loan, up to 25%.

The Rural Housing Service (RHS) offers limited insurance to single-family houses on farm properties.

Most loans are not insured by government agencies like FHA, VA or RHS. These are called *conventional* mortgages. Private lenders investing in these mortgages often require private mortgage insurance (PMI) if the loan-to-value ratio exceeds 80% (that is, if the home buyer puts down less than 20%). Such insurance can be obtained from a mortgage insurance company (MIC). The MIC industry was created in 1920s but collapsed in the 1930s. It gained popularity again in the 1950s. Recently, private insurers have been accused of abuses such as repeated sale of PMI insurance policies to borrowers with enough equity to not require mortgage insurance.

Investors in MBSs do not want to hold credit risk on the underlying mortgages, so MBS issuers provide guarantees. When Fannie Mae and Freddie Mac issue MBSs, they charge a guarantee fee that is currently between 20-30 basis points. This is taken from the gross yield on the loan so it is netted to the investor. These corporations are able reduce their risk of mortgage default by diversifying their large portfolios across the nation. Investors in these MBS thus have not the individual borrower, but Fannie Mae and Freddie Mac as a counter party to their credit risk. Therefore the credit risk of mortgage-backed securities issued by Fannie Mae and Freddie Mac reflects the credit rating of those corporations.

Pass-through programs

Ginnie Mae

Ginnie Mae offers three pass-through programs: Ginnie Mae I, Ginnie Mae II and Ginnie Mae Platinum. These programs are backed by the full faith and credit of the US government. Therefore, they have virtually the same risk as US treasury securities except for the prepayment risk. Ginnie Mae pass-throughs are backed by newly originated FHA and VA insured mortgages and their credit is further enhanced by Ginnie Mae's guarantee. Ginnie Mae I has the lowest servicing spread with 6 basis points for guarantee fee and 44 basis points for servicing fees. The majority of Ginnie Mae pass-throughs are issued under Ginnie Mae I, where the securities are backed by single-family fixed-rate 30- or 15-year mortgages and one-year adjustable rate mortgages.

Freddie Mac

Freddie Mac offers a pass-through program that offers full and timely payment of interest and principal. Like Freddie Mac notes and bonds, these pass-throughs are not guaranteed by the full faith and credit of the US government. However, some market participants view them as similar in credit worthiness to Ginnie Mae pass-throughs. Freddie Mac's pass-through pools consist of conventional mortgages as well as those from FHA and VA mortgages. Freddie Mac charges guarantee fee under 25 basis points and a servicing fee between 25-37 basis points⁴. Freddie Mac has implemented a contract feature that adjusts the guarantee fee up or down relative to the current level of security price spreads.⁵

Fannie Mae

Fannie Mae offers a pass-through program which, like Fannie Mae notes and bonds, is not backed by the full faith and credit of the US government. Fannie Mae's pass-through pools consist of conventional mortgages as well as those from FHA and VA mortgages. Fannie Mae's have similar fees as Freddie Mac's: guarantee fee under 25 basis points and servicing fee of 25 to 37 basis points.⁶ In 2003, the average effective guarantee fee that Fannie Mae reported was 20.2 basis points.⁷

COLLATERALIZED MORTGAGE OBLIGATIONS (CMOs)

Pass-through securities became a popular instrument by the early 1980s, but they held some major drawbacks to investors. The first and most important was that pass-throughs did not offer complete certainty of cash flow. Depending on the actual

⁴ "Mortgage Backed Securities" < <http://www.iadb.org/exr/bs/0603/KYoshinari.ppt>>

⁵ <http://www.freddiemac.com/news/archives/investors/2003/mvsrelease_102403.html>

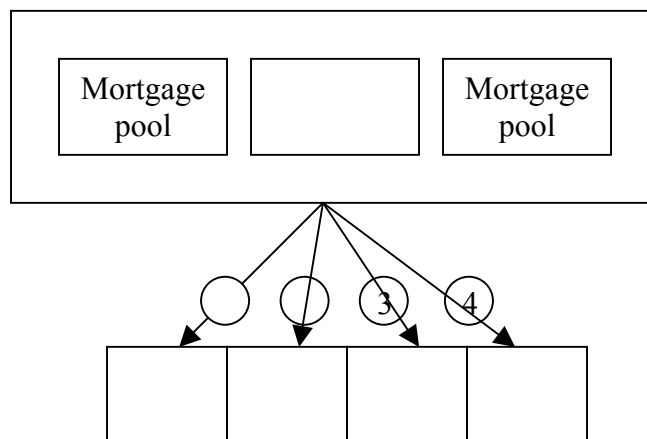
⁶ "Mortgage Backed Securities" < <http://www.iadb.org/exr/bs/0603/KYoshinari.ppt>>

⁷ Fannie Mae 2003 Annual Report

prepayment from borrowers, investors might end up with a security with different maturity than expected. Furthermore, pass-throughs did not fully address the different needs of investors for instruments with various maturities. While pension funds and life insurance companies looked for securities with long maturity, banks and thrifts wanted to invest in shorter term instruments. As an answer to those drawbacks and the demands of different types of investors, Collateralized Mortgage Obligations (CMOs) were created. CMOs provided less uncertainty as to the average life of the investment, and they offered a full spectrum of maturities that appeal to investors with different perspectives.

First issued by Freddie Mac in 1983, CMOs are in essence multiclass securities backed by a pool of pass-throughs or by mortgage loans. The mortgage cash flows are distributed to investors by the MBS issuer based on a set of predetermined rules. Some investors will receive their principal payments before others according to the schedule.

The issuer structures the security in classes, called *tranches*, which are retired sequentially. With the payments from the underlying mortgages, the CMO issuer first pays the coupon rate of interest to the all investors in each tranche. After that, all the principal payments are directed first to the bond class with the shortest maturity. When the first bond class is retired, the principal payments are directed to the bond class with the next shortest maturity. This process continues until all the tranches are paid fully and if there is any collateral remaining, the *residual* may be traded as a separate security. In the figure below class A is the class with the shortest maturity. After class A is retired, principal payments go to class B. The last class D has the longest maturity. The above described CMO is known as *sequential pay* or *plain vanilla CMO*.



Another CMO which was developed after the plain vanilla CMO is the Z-bond. This bond is usually the last tranche in a CMO deal, and it does not receive any interest until its principal payment starts. However, interest is accrued and added to the principal balance. Z-bonds help stabilize the cash flow of earlier classes, because the interest that should have been paid to the Z-bond is used to pay the other tranches.

PACs and TACs

Planned Amortization Class (PAC) and *Target Amortization Class (TAC)* were created to reduce the prepayment risk of investors. The PAC is structured so that investors receive a predetermined principal cash flow under a range of possible prepayment scenarios using a mechanism similar to a sinking fund. The investor will receive a fixed amount of principal no matter whether the prepayment rate increases or decreases, as long as it stays within the specified range, which is usually called *prepayment band* or *PAC band*. However, the additional stability of the PAC bonds is achieved by creating a less stable *support bond* also known as *companion bond* or *non-PAC bond*. The companion bond absorbs prepayments when prepayments are higher than expected, and it defers principal payments when prepayments are slower than expected. Because the average life variability is higher for companion bonds, they usually pay a higher yield. *TAC bonds* provide call protection only if prepayment speed increases from the projected, while *reverse TAC* bonds give protection only against slowdown of prepayments.

Floating-rate bonds

Floating rate CMOs or “*floaters*”, first issued in 1986, offer to pay a variable interest rate tied to an index, usually the London Interbank Offer Rate (LIBOR). This type of instrument is usually attractive to European and Japanese institutional investors and US commercial banks. In order to ensure that the cash flow from the collateral is sufficient to make the coupon payments on the floaters, MBS issuers also offer “*inverse floaters*”, which as the name suggests are inversely indexed to LIBOR. The floater and the inverse floater combined give the return of a fixed-rate instrument. Inverse floaters are attractive instruments for the purpose of hedging against interest rate risk.

STRIPPED MORTGAGE-BACKED SECURITIES

Stripped MBSs, first issued in 1986, are created by dividing the cash flows from the underlying mortgages or mortgage securities into two or more new securities. Each stripped security receives a percentage of the underlying security principal or interest payments. For example, the cash flow of a 6% pass-through can be used to make two new stripped securities, one with 4% coupon and another with 8% coupon, by directing more of the interest to the security with higher coupon. Stripped securities can be partially stripped, meaning that each investor receives some combination of principal and interest payments, or completely stripped. Strips can also be structured to be an Interest-Only (IO), which receives only interest from the underlying securities, and Principal-Only (PO), which gets only the principal payments without any interest. Both IOs and POs show substantial price volatility in an environment of changing mortgage rates.

Principal-Only

Principal-Only (PO) securities are traded at a substantial discount to par value. The return from the PO strip depends on the prepayment rate. Higher prepayment rate

would mean higher return, since the investor purchased the PO at a discount and gets back the face value faster. In an environment where mortgage rates decline, we expect to see faster prepayment rate, which will cause the PO price to increase. Conversely, if mortgage rates rise, the price of PO will fall.

Interest-Only

The Interest-Only (IO) securities are structured so that investors receive only interest on the amount of outstanding principal. Therefore, the return on IOs is inversely related to the speed of prepayments. When prepayments are made, the total amount of interest received will be less, due to the decline in outstanding principal. When mortgage rates decline, prepayments are expected to accelerate, which will lower the cash flow for the IO security. Therefore in an environment of declining interest rates, the price of IOs tends to decline. Conversely, when mortgage rates rise, prepayments slow down. This means that investors will receive interest payments for a longer time, which tends to result in a higher price of the IO (as long as slower prepayments outweigh higher discount rates). However, as interest rates keep increasing, prepayment speeds will eventually level off, and the effect of the discount rate starts to dominate, which brings the price of IO down.

CONCLUSION

The securitization of mortgages through the issuance of mortgage-backed securities have come to play an important role in the US housing finance system over the past 30 years. The government played an essential role in the development of this securitization process. The government owned Ginnie Mae and the government-sponsored enterprises Freddie Mac and Fannie Mae made the issuance of the first pass-throughs and CMOs possible. The MBS have provided investors with new classes of liquid assets, and in doing so it has helped raise more capital and at a lower costs so as to help American homeowners borrow at a lower interest rate. A good understanding of the MBSs is therefore essential for comprehending the US mortgage market today.

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