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Reverse MBS

A Look at a Burgeoning Agency MBS Asset Class

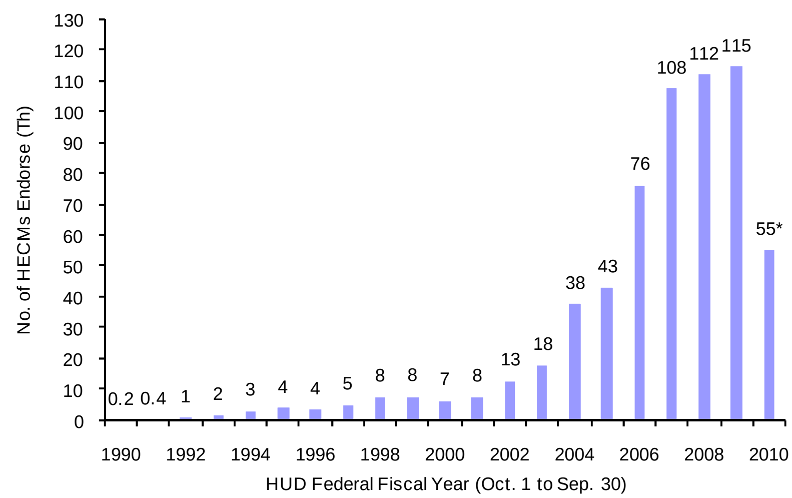
- Reverse mortgage loans have been around in guaranteed form for over twenty years, with agencies providing endorsements since that time and, more recently, Ginnie Mae wrapping securitized pools. Reverse mortgages are offered to older borrowers as a way to access equity in their homes, but instead of paying principal and interest on a regular basis, reverse mortgage loans negatively amortize and typically repay when the borrower dies or permanently leaves the property.
- In 1987, FHA began offering insured Home Equity Conversion Mortgages (HECMs), with the first loan granted in 1989. In 2007, Ginnie Mae was authorized to begin offering pass-throughs backed by HECMs. Under this program, security holders receive principal and interest payments when the borrower dies, or permanently leaves the property or when the loan reaches 98% of the maximum claim amount (effectively the lower of appraised house value at origination and the maximum amount HUD will insure in a particular location). This last feature helps to provide more cash flow stability and more predictability of the life of the security.
- As a result, we believe that Ginnie Mae HECM-backed securities (HMBS) may offer investors outsized returns *vis-à-vis* agency securities with less prepayment/extension risk than found in comparable securities.
- The predominant securitization vehicle for reverse mortgages has been the HMBS program. From 2006 to 2008, private-label CMOs backed by HECMs were issued by a number of Wall Street firms as well as a few backed by proprietary/jumbo reverse mortgages that were backed by uninsured reverse mortgages and issued from 1999 to 2007 by Lehman Brothers. The total issuance of these private-label securities is relatively small compared with issuances under the Ginnie Mae HMBS program.
- Today, HMBS represents a $15.5 billion market in outstandings according to our calculations. Though still a very small segment when compared with other agency securities, the sector represents one of the fastest-growing in the mortgage market – a growth that we believe should continue given demographic trends.
- One feature in HMBS is unique, in that the underlying HECM loans include a put back to FHA once the loan reaches 98% of the maximum claim value (an amount that is the lesser of the appraised value of the borrower's home and in the maximum amount that FHA will insure in the borrower's area), if the loan has not already reached a maturity event (i.e., borrower dies or exits from the property).
- As such, reverse mortgage-backed securities offer investors agency securities that have less interest rate sensitivity than traditional agency mortgage-backed securities. Under certain circumstances, HMBS may actually shorten with a rise in interest rates, especially those backed by floating-rate loans given the FHA put.
- The bulk of this paper will focus on HMBSs and how they function.

What are Reverse Mortgages?

Reverse mortgages are generally offered to older borrowers as a way to access built-up equity in a borrower's own residential property. Instead of monthly payments made to pay off the loan, the loans negatively amortize and typically repay when the borrower dies or permanently leaves the property.

Reverse mortgages have risen in popularity as retirees face financial pressures or seek to unlock equity in the home for cash in the US. This mortgage product has been around since 1989 in a FHA-guaranteed form, but loan originations have grown in the last several years with economic uncertainty and increased product acceptance (see Figure 1). Reverse mortgages are also well-known outside the US and have been generally sold with residual house price risk or risk tails that are privately insured.

Figure 1. Reverse Mortgage Loan Origination by Year, 1990-2010YTD



*Year to date through 31 May 2010. Source: HUD and Knight.

Since the first HECM loan made in 1989, HUD has endorsed more than 600,000 reverse mortgages. The HECM program finally became a permanent program with the HUD Appropriation Act of 1998. The combination of growing product awareness, longer life expectancy, and economic pressures from longer retired life has boosted the number of loans originated.

Monthly insured loan production has been growing stronger each year, but fiscal year 2010 (which began in October) showed initial slower monthly endorsement volume. However, production has begun to accelerate recently, according to recent HUD data.

The Federal Housing Administration Modernization Act within the Housing and Economic Recovery Act of 2008 (HERA) shifted the HECM program out of the General Insurance Fund into the Mutual Mortgage Insurance Fund effective in fiscal year 2009. Under the FHA Modernization Act of 2008, limits were raised to $417,000 and a temporary stimulus was provided with higher limits in "high-cost" areas.[1]

[1] The Act set the FHA loan limit for an area to the lesser of (1) 115% of the median price of a 1-family residence, as determined by HUD, or (2) 150% of the Freddie Mac conforming loan limit, except that the limit for an area may not be less than 65% of the Freddie Mac conforming loan limit.

Under the American Recovery and Reinvestment Act of 2009 (ARRA), HECM loan limits were raised to a maximum of $625,500 (150% of the conforming limit) in late February 2009, but each area is subject to its own limits that are capped at 150% of the conforming limit applicable in each area.

Figure 2. Borrower and Loan Requirements for FHA-Insured Reverse Mortgages (HECMs)

Borrower Requirements	Mortgage Amount Basis
Be 62 years of age or older	Age of the youngest borrower
Own the property outright or have a small mortgage balance	Current interest rate
Occupy the property as principal residence	Lesser of appraised value or the HECM FHA mortgage limit
Not be delinquent on any federal debt	
Participate in a consumer information session given by an approved HECM counselor	

Source: FHA.

Under the program, a homeowner must be 62 years of age or older to be eligible, own a home outright or have a low or zero existing mortgage balance (that must be paid off with the HECM), but these reverse mortgages also may be used for home purchases. Prior to finalizing the reverse mortgage, the borrower must have received reverse mortgage counseling by a HUD-approved service, to help ensure that the borrowers fully understand the implications of the mortgage.

Unlike traditional mortgages or home equity loans where borrowers must qualify based on income and other outstanding debt and must make monthly mortgage payments, borrowers need only be qualified based on the age of the borrower, interest rates and the appraised value of the property. No payments are required prior to house sale. Loans are non-recourse and generally have no impact on, or from, Social Security or health care programs.[2] These key differences make the product attractive for retirees with little current income as loans negatively amortize. The typical reverse mortgage requires no monthly payments but is due when the borrower dies or the house is no longer the borrower's principal residence for more than 12 months.

Figure 3. Types of Distributions

Payment Plan:	Structure:
Tenure	equal monthly payments as long as at least one borrower lives and continues to occupy the property as a principal residence.
Term	equal monthly payments for a fixed period of months.
Line of Credit	unscheduled payments or in installments, at times and in an amount of the borrower’s choosing until the line of credit is exhausted.
Modified Tenure	combination of line of credit plus scheduled monthly payments for as long as the borrower remains in the residence.
Lump Sum	full advance of loan.

Source: HUD

HUD has established certain parameters by which borrowers may qualify for reverse mortgages, including principal amounts that are dictated by age of the youngest borrower, the appraised value of the home and the interest rate applied, dictated by Principal Limit Factors, or PLFs. However, borrowers may use the proceeds for a

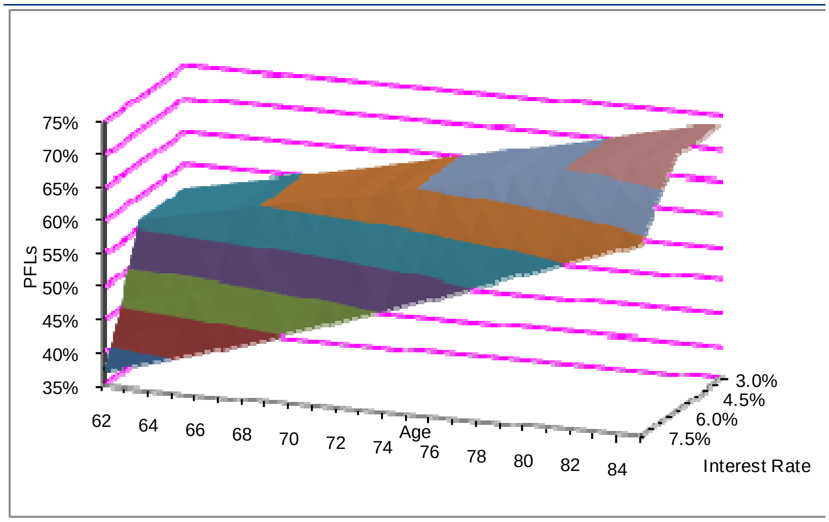
[2] Certain types of reverse mortgages may impact the borrowers’ ability to access Medicaid, Supplemental Security Income or other programs.

variety of purposes, including home improvement, paying off existing bills or debt, or other living expenses.

PLFs were established by HUD to provide a conservative borrowing limit consistent with life expectancy, voluntary move-out, or refinancing expectations. These factors were determined by evaluating types of terminations, plus an examination of home price appreciation and projections of loan balances, based on interest rates and borrower cash drawdown patterns.

In October 2009, PLFs were reduced by 10% of their previous factor, cutting potential funds available to borrowers to withdraw and likely reducing refinancing risk.

Figure 4. Principal Limit Factors for Various Borrower Ages at Different Interest Rates



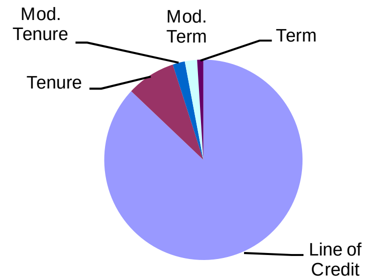
Source: HUD.

The maximum claim amount is the lesser of the appraised value of the mortgaged home and the HUD limit applicable in each geographic area. The principal limit factor applicable to any borrower is dependent upon the youngest borrower's age and initial effective loan rate. The amount available to the borrower would be reduced further by servicing fee, upfront mortgage insurance premium, origination fees, other financed costs, and any lien costs. Depending upon when the participation is securitized and how much of the loan already was advanced to the borrower, would determine the amount of the net participation in the loan.

If we use an example of a $500,000 appraised home value and a $625,500 HUD limit, the maximum claim amount would be $500,000. Under the guidelines from HUD, a 62-year old would be able to borrow up to $281,500, or 56.3% principal limit factor times the maximum claim amount, including capitalized costs and fees. HECM loans are capped at $625,500 at the very top level, but private, jumbo mortgages are available through certain lenders. According to *Reverse Mortgage Guides*, there is only one jumbo program open at this time, but loan limits as a percentage of home values are significantly lower than under the HECM program.

The PLFs show some interesting patterns when studied (see Figure 4). First, there is a floor that begins at a 5.5% interest rate. Second, the slope of the PLFs increases over a given age at a more rapid rate than that for lower rates. The existence of the

Figure 5. HECM Loans by Payment Option, as of May 2010



Source: Ginnie Mae.

floor however provides less incentive for refinancing, especially given a slowly recovering or soft housing market as well as the reduction in PLFs that occurred last September. This issue will be discussed further in the later section on prepayment dynamics. Third, the PLFs are gender blind, meaning that male and female borrowers receive the same PLF, despite differences in average life expectancies.

As of this writing, no further PLF changes have been announced, despite discussion around the time of the early negotiations of the Appropriations Bill that PLFs may have to be decreased without further subsidy of the HECM program. User groups feared that a further reduction in PLFs would lead to less interest in HECMs. Other proposals circulated that suggested borrowers could be divided into needs-based categories and have loan terms dependent upon into which needs-based category borrowers might fall. In July, the House Appropriations Committee passed a bill that included $150 million in HECM subsidy, less than the $250 million requested by the President Barack Obama Administration, and a similar amount was approved by the Senate Committee. If finally approved, we believe that PLFs likely would not have to be reduced in the near term.

Under the terms of HECM program, borrowers may withdraw cash in various forms, including lines of credit, lump sum drawdown, or monthly annuities. These differences in withdrawal affects the HMBS structuring and cash flow trends, but most borrowers tend to use much of the available credit at the outset of the loan.

A recent study showed that most borrowers tend to draw the majority of the principal within the first month.[3] Generally, younger borrowers tended to draw larger amounts than older ones, in part because of lower amounts available under appraised values that are a result of longer life expectancies for those borrowers.

Figure 6. First Month Borrower Cash Draw as a Percentage of Initial Principal Limit

		Initial Principal Limit		
Age Group	**Number of Loans**	**0-40%**	**40-80%**	**80-100%**
62 – 70	39,698	16%	25%	58%
70 – 80	33,074	24%	25%	51%
80+	13,757	32%	23%	45%
Total	**86,529**	**22%**	**25%**	**54%**

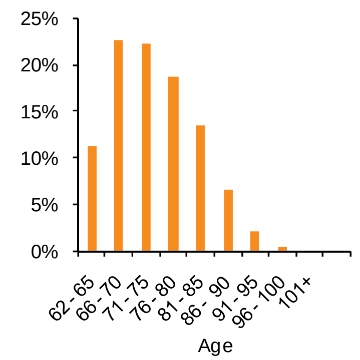
Source: IBM Global Business Services/HUD, and Knight calculations.

Borrowers may use reverse mortgages to purchase homes or to refinance purchase mortgages but the closing for the purchase mortgage and refinancing with their reverse mortgage must occur simultaneously.

HECM costs include several different components, apart from interest. Origination fees to compensate the lender for processing can range up to $2,500, if the home is valued at less than $125,000. For homes valued at more than $125,000, the fee is generally 2% of the first $200,000, plus 1% of the amount over $200,000, with a cap at $6,000. Similar to other mortgages, closing fees are also payable, including appraisals, title search and insurance, surveys, inspections, recording fees, mortgage taxes, credit checks and other fees. Mortgage insurance premiums (MIP) are charged up front at closing out at the rate of 2% of the lesser of the home's value or the FHA

[3] See IBM Global Business Services Prepared for U.S. Department of Housing and Urban Development, *An Actuarial Analysis of FHA Home Equity Conversion Mortgage Loans in the Mutual Mortgage Insurance Fund Fiscal Year 2009*, IBM Global Business Services, October 2009.

Figure 7. Pct. of HECM Loans by Age at Origination, as of May 2010



Source: Ginnie Mae.

HECM limit for the particular geographic area. In addition, a monthly MIP is assessed that equals 0.5% of the mortgage balance.[4] Lastly, a servicing fee is assessed monthly at $30 per month for fixed rate and $35 for adjustable rate mortgages, though there is a recent trend by lenders to eliminate these fees for competitive reasons.

HECM loan origination traditionally had been targeted toward the mid-70s year old age group, or more recently, loans have been increasingly targeted to younger borrowers. This shift has resulted in changes within the complexion of the age blending in HMBS as well (see Figure 7).

Servicing Issues

Under the terms of the loans, homes must be kept in good repair and the servicer must verify the condition of the mortgaged property. If needed, servicers must ensure that repairs are completed before funds are disbursed to the borrower. The servicer may deem the loan note due and payable for failing to complete repairs, but it must first seek, and receive, HUD approval.

Each year, the servicer must obtain a written certification from the borrower that the property is still the borrower's principal residence. In the event that the borrower no longer occupies the property, the servicer may request a deed in lieu of foreclosure, but, in any event, it must obtain HUD approval before calling the loan note due and payable for an occupancy violation.

Borrowers are also obligated to pay taxes and insurance. Borrowers may elect to pay taxes and insurance on their own or allow the servicer to pay on his or her behalf. In the event that the servicer pays the taxes and insurance, either a portion of the monthly payments is withheld to advance against taxes and insurance or a portion of the line of credit is set aside for those advances. In most cases, borrowers have to pay their own taxes and insurance, but this method may create problems with real property tax deferrals and tax lien transfers. Therefore, servicers are required to ensure that payments are made regularly and completely.

A Look at the Securitized Market

Until the introduction of Ginnie Mae-guaranteed HMBS in 2007, Fannie Mae was the principal investor in HECMs, purchasing them as whole loans and providing liquidity to approximately 90% of the loan origination. Since its start in 2007, the Ginnie Mae HMBS program has grown significantly, and market reports suggest Fannie Mae's share fell dramatically.

In the late 1990s, Lehman issued several private reverse mortgage-backed securities, and in 2007 and 2008, several other private issuers placed HMBS in the market.

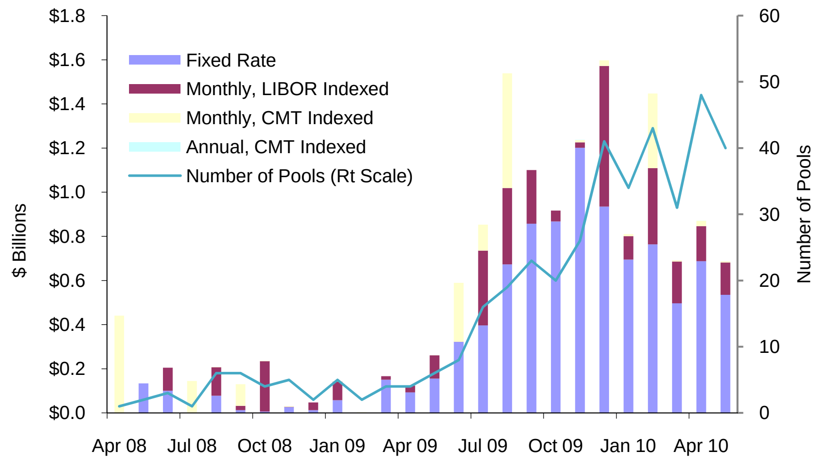
Ginnie Mae-backed HMBS issuance has grown over the last several years, but the bulk of the growth has really come in the last year. While $12.8 billion of HMBS issues over the last twelve months represents less than 5% of GNMA II issuance and a miniscule portion of total agency MBS, the rate of growth has been strong and has begun to attract considerable investor interest. The pace of transactions has grown too, and since January, an average of 40 deals has come to market monthly.

Under Ginnie Mae's current rules, pools are limited to single issuer; therefore, the average deal sizes are relatively small ($44 million), ranging from just over $1 million

[4] There has been some recent discussion at HUD to examine reducing the initial insurance fees but raising monthly payments. Reductions in initial fees could reduce some frictional costs of refinance.

to $518 million. Under the program, participations in loans are securitized. In fact, multiple participations in the same loan may be sold across different deals, especially when the borrower takes a floating rate loan or a line of credit, and further increases in loan balances create the need for additional lender funding.

Figure 8. Ginnie Mae HMBS Issuance: April 08–May 10



Source: Bloomberg LLP and Knight.

The bulk of issuance has been fixed-rate product but monthly LIBOR adjustable-rate mortgage pools have also grown in popularity. Monthly-adjusted CMT floating-rate mortgage pool issuance has become sporadic, while very little of annually-adjusted CMT floating-rate mortgage pools have been issued. As of the end of June, we have observed that $15.5 billion was outstanding, up from a standing start in April 2008.

One product that has not yet seen traction in securitized pools is a monthly adjustable rate, LIBOR-indexed mortgage with a 2%/5% cap structure. If rates become more volatile, more loans will likely be originated in this type of product and therefore securitized, though fixed-rate origination has been on the increase.

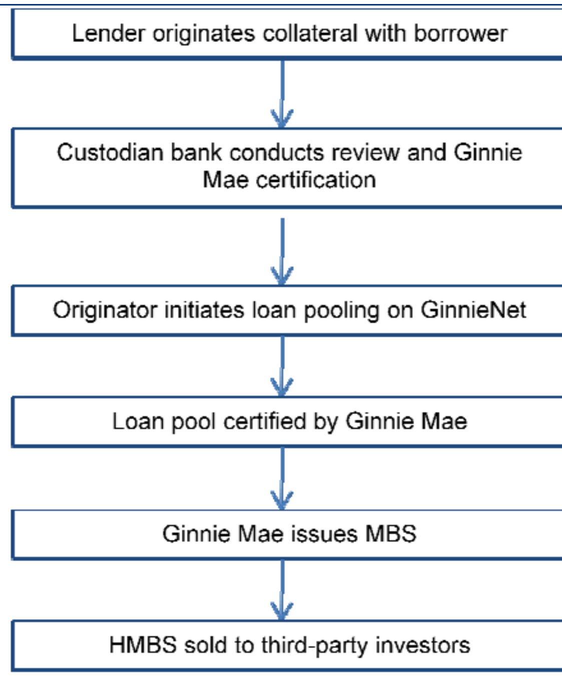
Most HECM loans fall into three types of interest rate forms: fixed-rate, CMT-indexed and LIBOR-indexed adjustable rates. Prior to 2007, the market was dominated by CMT-indexed rates that were adjustable monthly or annually.

Following the HERA authorization in 2008, LIBOR and fixed-rate options were added. LIBOR-based rates may be offered in several forms (based on one-month or one-year LIBOR); however, most were and are originated with fixed interest rates. Until mid-2006, CMT-based rates were offered with a 150bp margin, and then early- to mid-2007, loan margin dropped to a 100bp margin. In late 2007, the market growth accelerated when HUD introduced the fixed-rate and LIBOR-based rates programs.

Under the Ginnie Mae terms, fixed-rate loans may only be offered in closed-end form and must be fully drawn at closing. Floating-rate products are generally offered in the form of a line of credit, but may be offered in lump-sum or annuity form.

For the future, several important changes are contemplated. Today, Ginnie Mae II securities are only available in single issuer/servicer formats. Discussions around multiple issuer formats are being considered. As an interim solution, re-REMICs, known as H-REMICs, have been introduced, combining several securities to gain the benefit of more diversified pools and thus attracting more investor interest.

Figure 9. Simplified HMBS Securitization Process



Source: Knight.

As the HECM loan market expands, the HMBS market is expected to also grow alongside. Further advances in prepayment analytics will likely attract more investors who are seeking additional yield on government-backed MBS. Underlying loan information in securities has been fairly robust, providing a wealth of variables to study against a new housing dynamic. New investors need to grow comfortable with the differences in payment speed versus traditional mortgages, but these differences often are rewarded with better characteristics in the form of convexity.

How the Structures Work

HECM HMBS structures are relatively straightforward. Deals are constructed as pass-through securities – principal is passed through to investors as principal, and interest is passed as interest. Reverse mortgages do not pay interest or principal until a maturity event, so principal windows on HMBS may not begin immediately.

To accommodate multiple drawings on HECMs, loans are securitized via participation. Only the funded portion of reverse mortgage is securitized at a given time via participation. However, there may be many participations representing multiple draws from one reverse mortgage, but at this time, each participation can only correspond to one HMBS.

Participations consist of advances made to borrowers, monthly insurance premium paid to FHA, servicing fees and accrued interest. Interest on the loans is accrued daily and is added to the remaining principal balance at month end. No interest or principal payments are due on the mortgage until a maturity event occurs or the loan is refinanced.[5]

Key Terms and Definitions

There are several key terms that are important when evaluating reverse mortgages and the pools that are backed by them.

Maturity Event – A reverse mortgage becomes due and payable under certain circumstances:

- One of the borrowers (if originated to joint occupants) dies and the property no longer is the principal residence of at least one of the surviving borrowers;
- The property no longer stays the principal residence of any surviving borrowers
- If all of the property title is sold and no other borrower retains title
- A borrower does not physically occupy the property for a period longer than 12 consecutive months
- Obligations under the security instrument are not performed, i.e.,
    - A borrower fails to pay taxes and insurance
    - A borrower fails to maintain the property up to a minimum maintenance level

Gross Principal Limit – The maximum funds that a borrower may draw at origination. This amount is determined by three factors: the age of the youngest borrower; the expected average mortgage interest rate; and the maximum amount the FHA will pay under its insurance. This limit increases monthly and represents the maximum loan amount the borrower may receive.

Net Principal Limit – The Gross Principal Limit less all payments made to or on behalf of the borrower, including Mortgage Insurance Premium (“MIP”) payments, origination fees/closing costs, servicing fee set asides, repairs, etc.

[5] In the case of a loan purchase event as result of the loan reaching 98% of the maximum claim amount (defined here as FHA Put Option), the borrower is not affected by – or even notified of – the event.

Maximum Claim Amount – The maximum amount of mortgage insurance that the FHA will provide, derived from the lesser of the appraised value of the mortgaged property and the maximum mortgage amount that HUD will insure in that area.

FHA Put Option – When the outstanding amount of a HECM equals 98% of the Maximum Claim Amount, or if a draw on a line of credit on a HECM loan will equal or exceed 98%, the loan can be assigned to HUD via the FHA in return for a payment not greater than the maximum claim amount. This option may be exercised only if a maturity event has not occurred.

Crossover – Point at which the loan balance equals the appraised home value. Under HECM guarantees, the agency will buy out loans once they reach 98% of the Maximum Claim Amount if a maturity event has not occurred.

There are two types of purchase events for reverse mortgage securitizations: a mandatory purchase event and an optional purchase event.

In a mandatory purchase event, the issuer is required to purchase all Ginnie Mae participations related to HECM loans when the principal balance of the mortgage is equal to or greater than 98% of the maximum claim amount.

Under an optional event, the issuer may purchase a pooled participation if:

1) any mortgagor's additional funded advance would result in the principal balance exceeding 98% of the Maximum Claim Amount threshold;

2) any mortgagor's loan remains due payable at the end of the reporting month, either through death of any remaining mortgagor and no other mortgagor retains the property as his or her principal residence, or a mortgagor conveys title in the mortgaged property and no other mortgagor retains title;

3) the mortgaged property ceases to be the principal residence of any mortgagor (other than for death) and the property is no longer a principal residence of any surviving borrower;

4) the borrower does not occupy mortgage property for a period longer than 12 consecutive months (due to physical or mental illness) and the mortgage property is no longer the residence of at least one other borrower;

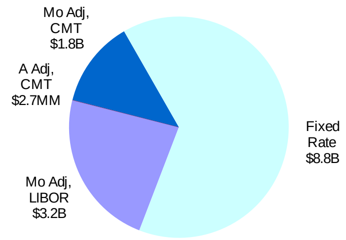
5) the borrower fails to perform on any of his or her obligations (such as payment of taxes or Insurance premiums due) as described in the loan terms and conditions.

FHA is required to purchase all participations at par (which includes all capitalized interest and any fees or payments due).

Lenders may perform servicing or sell servicing rights to third parties. Large banks participating in the market generally service their own loans, but others have turned to specialist servicers to manage loans and ensure that borrowers meet all of their obligations due under the terms of the mortgages.

Characteristics of Reverse Mortgage HMBS

Figure 10. Outstanding Ginnie Mae HMBS by Coupon and Type, as of May 2010



Source: Bloomberg and Knight.

Ginnie Mae reverse mortgage-backed securities offer investors interesting value: an intermediate maturity profile with excess yield versus similar credit and with considerably less negative convexity than other mortgage-backed securities. The number of transactions is quickly ramping up, and more dealers are making two-way markets.

The most prolific product in the reverse mortgage sector has been that from Ginnie Mae, commonly known as HMBS. For FHA-backed loans – the ones used in Ginnie Mae HMBS – the youngest borrower must be at least 62 years of age.

HECMs were generally limited to fixed-rate, closed-end loans that were fully drawn at loan origination but more recently have expanded with floating rate securities due to changes in borrower demand (see Figure 10).

Most loans (and the securities that are backed by them) have a long potential final maturity, but the Ginnie Mae program has features on the underlying loans that tend to shorten security lives. As noted earlier, loans are structured with a negative amortization schedule, with loan balances capitalizing interest over time. This product comes with specific features that make it attractive to investors, including both fixed and floating rate coupon formats. Following the borrower's death or his/her long-term exit from the property, loans become due and payable.

Figure 11. Investment Characteristics of HMBS

	Commentary
Spreads	+115-120bp to swaps
Weighted Average Life	5-7 years (principal window of approximately 2-7 years)
Risk	GNMA for house price risk; prepayments
Liquidity	Limited, but growing
Convexity	Subject to prepayments, but adjustable rate loans can be positively convex as a result of the FHA put at 98% of maximum claim value
Prepayments	Subject to factors including those based on age and health of underlying borrower, interest rates on loans, and house price appreciation.

Source: Knight.

Under the program, servicers of loans are required to put guaranteed loans back to FHA once they accrete to 98% of maximum claim value – the lower of the appraised value at origination and the maximum loan amount in the given area provided that there has not been a maturity event on the loan. Given the expected longevity of the average 62-year-old (approximately 20.5 years), these put requirements likely provide a significant source of prepayments and create a more easily predictable maturity and cash flow profile.

Using an average interest rate of 5.5% and 56.3% loan-to-value (the maximum amount a 62-year old might expect with interest rates below 5.5%), the interest and fees should cause the loan value to accrete to 98% within 9.3 years (11 years less than the average life expectancy). Therefore, loans are likely to be put to FHA and redeemed, prior to the lifetime expectancy. For the 73-year old, the available amount is higher at 64.4%, but using the same rate, the mortgages accrete to 98% at around 7 years, or 51% of an average 73-year-old's remaining life expectancy.

Therefore, CPR vectors based on mortality or mobility for reverse mortgage pools have more impact on those transactions backed by loans that do not carry the FHA put. Certainly, factors such as ethnicity, gender and age have impact when evaluating pools, but also accretion of interest to the maximum claim value can be a major consideration when analyzing HMBS backed by loans with the FHA put option. Historical analysis helps in evaluating some of the securities; however, since most of the bonds have been in existence only since 2008 with a different product mix than historically, little history is available to guide valuations of these cash flow influences.

While certainly not impervious to refinancing risk, loans underlying HMBS are increasingly difficult to refinance under the HECM program, despite the fact that a number of lenders have come out with programs offering no servicing or origination or other fees and charges. Refinancing risk recently has been lessened by several factors, including house price declines but more directly a decrease in principal limit factors used to determine maximum advanceable proceeds. Other frictional factors such as MIP premiums likely reduce refinancing appetite, though changes in these fees may influence future prepayments. Also, most borrowers do not actively manage loans on a monthly basis similar to forward mortgages, as terms are set at origination and there are no monthly payments and loans are due and payable for mortality or mobility reasons.

Given the relative resilience against refinancing risk, we believe that these securities offer an attractive alternative for investors looking for excess yields on agency MBS. In the extreme without Ginnie Mae guarantees, reverse mortgage HMBS may offer a hedge for investors with longevity risk.

Prepayment Dynamics

Several factors can cause the average life of a reverse mortgage-backed security to change from expectations: a) an acceleration or deceleration in mortality; b) acceleration or deceleration in mobility of borrowers; c) a change in refinancing opportunities as a function of costs or interest rates; and d) shifts in interest rates for securities backed by adjustable-rate mortgages.

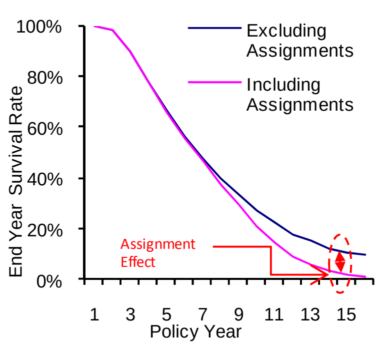
The first and second factors may be broken down into several sub-analyses, by examining health patterns, gender distribution, and availability of alternative care.

Too, the failure to meet obligations has an impact on prepayments, as once a breach is detected a foreclosure process may begin, subject to HUD approval. Once the foreclosure process is complete, the property may be sold. The timeline behind this factor tends to be longer than for mortality or mobility.

The third factor, change in refinancing opportunities, is muted by the lack of available options, plus the negative amortization of mortgages generally outpaces the LTV differential for different age cohorts. However, some frictional costs are being reduced or contemplated to be reduced.

The fourth factor, changes in interest rates and their effect on floating-rate loans, has perhaps the biggest impact on prepayments due to the FHA put option on floating-rate HMBS. A significant rise in interest rates would cause loans to negatively amortize at a faster pace, more quickly approaching the 98% mandatory put to the FHA via Ginnie Mae and making securities more positively convex rather than negatively convex as in most other mortgage-backed securities.

Figure 12. Influence of FHA Loan Assignments on HECM Loan Survival Rates, All Borrowers 62 and Older



Source: HUD Study and Knight.

In 2009, there were several significant changes to the product that shape prepayment dynamics related to refinancing risk. First, PLFs were reduced by 10%, offering borrowers less available funds to withdraw. Second, certain loan originators introduced zero-cost servicing and origination fees. Despite the elimination of these fees, the new PLFs reduced the propensity of borrowers to refinance by lowering the available limit, especially as loans negatively amortized in a softer house price market environment. While the PLFs are not expected to change in the near term, these two factors probably wash against each other but the bias is likely a net reduction in refinancing risk. As discussed earlier, a reduction in initial MIP may impact borrower behaviour.

The other factors have more impact on prepayments than refinancing risk, and the FHA put option offers one of the more predictable of the factors.

With the reduced PLFs impacting the refinancing ability of the borrower and more HECMs subject to adjustable rates that would accelerate a potential FHA put option at 98% of the maximum claim amount, loans underlying the deals are likely positively convex, or certainly less negatively convex than traditional mortgages.

A HUD study in 2007 of 235,000 HECMs, issued between 1989 and 2006, clearly demonstrated the influence of assignments on prepayments over time.[6] Using differences in loan survival rates between pools including and excluding assignment as a proxy, we determined that assignments could shorten the average life of a typical pool by as much as 1.3 years, whereas the average life of a HECM loan pool was likely approximately 5 years, given mortality, mobility and assignment. However, gender, age and single versus couple status had significant influence over the likely average life of a pool. This “assignment effect” was most pronounced for single female borrowers, who benefit from higher longevity than even for loans to couples.

Over the lifetime of the HMBS, the proportion of termination by assignment to FHA grew, according to the study. In the early years, death and mobility accounted for a substantial proportion of loan terminations, but negative amortization did not reach an assignment termination until year eight.

Figure 13. Differences in Loan Paydowns by Year 8 Attributable to Assignment

Age at Origination	All	Couples	Single Female	Single Male
64-66	0.1%	0.0%	0.1%	0.0%
74-76	3.9%	3.5%	4.0%	4.5%
84-86	7.0%	8.0%	6.5%	7.6%
All Borrowers 62 and Older	3.9%	3.3%	4.3%	3.7%

Based on data from HUD's HECM Study in 2007. Source: HUD, Knight calculations.

By year eight after origination, loan assignments form a greater proportion of payments. Virtually all the younger borrowers saw little difference among total terminations and those attributable to mobility or mortality, suggesting that the predominant reason for termination lies in mortality or mobility rather than compounding of interest. Intriguingly there were significant differences in older

[6] See Edward J. Szymanoski, James C. Enriquez, and Theresa R. DiVenti, “Home Equity Conversion Mortgage Terminations: Information to Enhance the Developing Secondary Market”, *Cityscape: A Journal of Policy Development and Research*, HUD, 2007.

borrowers, more so than the typical 74-76-year-old borrowers, and in some cases over twice the difference.

The potential benefit of assignment becomes more visible by year ten, though still less apparent in younger borrowers. During the period of the study, borrowers were subject to higher principal limit factors than exist today, suggesting that *ceteris paribus* maximum claim values should take longer to reach thereby triggering an assignment.

By year twelve, the difference between termination for assignment and mortality or mobility is maximized as loans paydown well below a loan factor of 10%. By this point, younger borrowers have begun to catch up to the broader group in all categories. By year fourteen and fifteen, the differences begin to level out, but by then most HECM loan pools would have been extinguished or nearly extinguished.

Figure 14. Differences in Loan Paydowns by Year 12 Attributable to Assignments

Age at Origination	All	Couples	Single Female	Single Male
64-66	6.5%	8.7%	5.1%	5.4%
74-76	12.2%	13.9%	12.3%	8.2%
84-86	4.2%	7.2%	3.2%	4.7%
All Borrowers 62 and Older	9.2%	11.6%	8.6%	6.3%

Based on data from HUD's HECM Study in 2007. Source: HUD, Knight calculations.

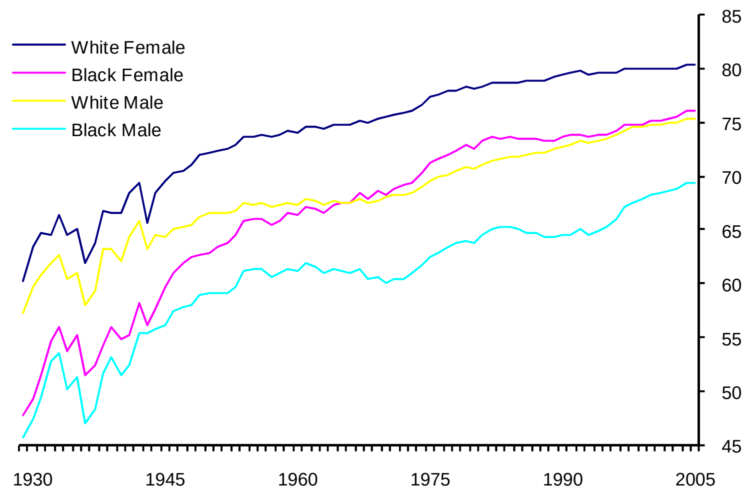
In analyzing several of the sub-factors contributing to termination, several interesting conclusions may be drawn. First, loans taken out by couples generally experienced the highest amount of terminations due to assignments. Part of the difference is likely related to the fact that a survivor may stay on in the house, therefore mobility and mortality rates for couples should be lower than for single borrowers. Second, younger borrower HECM loans seemed to have longer average lives than older borrowers, not unsurprisingly. However, the difference between loan paydown for assignment versus mortality or mobility did not become apparent until much later in the loan life than that for older borrowers. This finding could be due to self-selection of loans, which may appeal to younger borrowers in poorer health than for older borrowers, and was particularly acute for single male borrowers in that age category.

Demographic Trend Impact

Longevity has been steadily increasing since the post-war period, with big strides made in the late 1970s and 1980s (see Figure 15). More recently, this trend has been slowing, especially among women, but it remains a significant change over time.

The race gap has been narrowing as well, though substantial differences still remain. The gap likely will continue to narrow.

Figure 15. Estimated Life Expectancy at Birth in Years by Sex and Race, 1929-2005



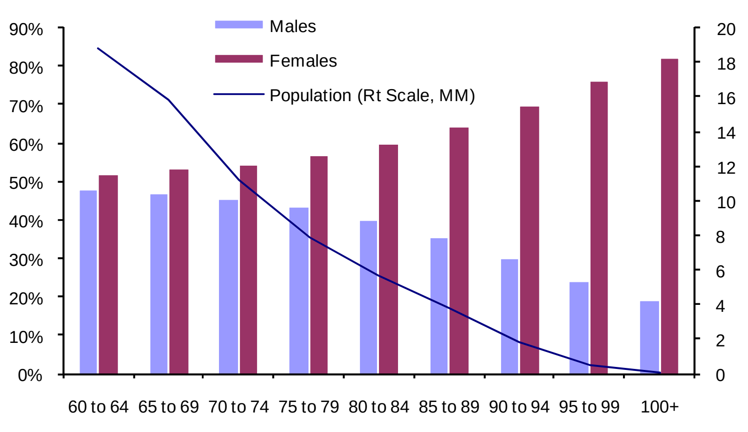
NB: Beginning 1970 excludes death of nonresidents of the United States. Life expectancies for 2000-2005 were calculated using a revised methodology and may differ from those previously published. In 1972, deaths based on a 50% sample. In 1962 and 1963, data excludes residents of New Jersey.
Source: US Census

Improvements in healthcare and more healthy, active lifestyles have led to longer lives. With this improvement in longevity, the need for post-retirement, alternative sources of funds has grown, lifting the demand for reverse mortgages.

This increased longevity will have an impact on prepayment analysis as when borrowers live longer lives or are more able to stay in their own homes, the prepayment driver of assignment becomes even more valuable in assessing the cashflow signatures of HMBS.

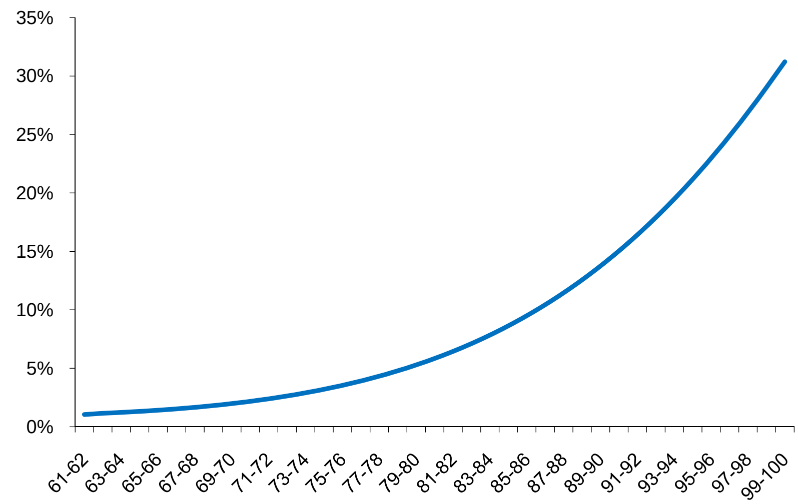
Women clearly outlast men as the population ages (see Figure 16). The factor will influence prepayments due to mortality. As noted elsewhere, most borrowers in reverse mortgages are women, meaning that the likelihood of prepayments due to mortality is even further lessened.

Figure 16. 2010 Projection of Population by Age and Sex, by Age 60+ Years Cohorts, as of 2008



Source: US Census

Figure 17. Probability of Dying Between Ages x to x+1 Total US Population, as of 2005



Source: US Census, Knight.

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