

FactSet's Japan Prepayment Model

Mido Shammaa, FactSet Fixed Income Product Development



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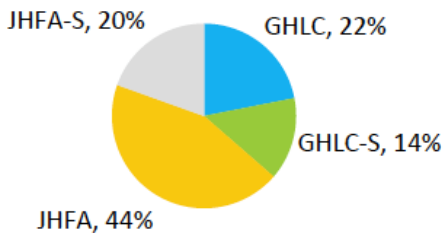
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Introduction

The FactSet Japan Prepayment model applies to the Japanese mortgage market, which has about \$350 billion (Y 40 Trillion @ Y115=\$1) in total loans outstanding. The market is very small compared to the size of the Japanese housing market and in relation to the size of the U.S. mortgage market relative to the U.S. GDP. However, interest in these securities is growing as investors look for Japanese domiciled investments with a higher yield than the Japanese government bonds and as the list of AAA securities shrinks.

Figure 1: Issued Amount Outstanding by Type

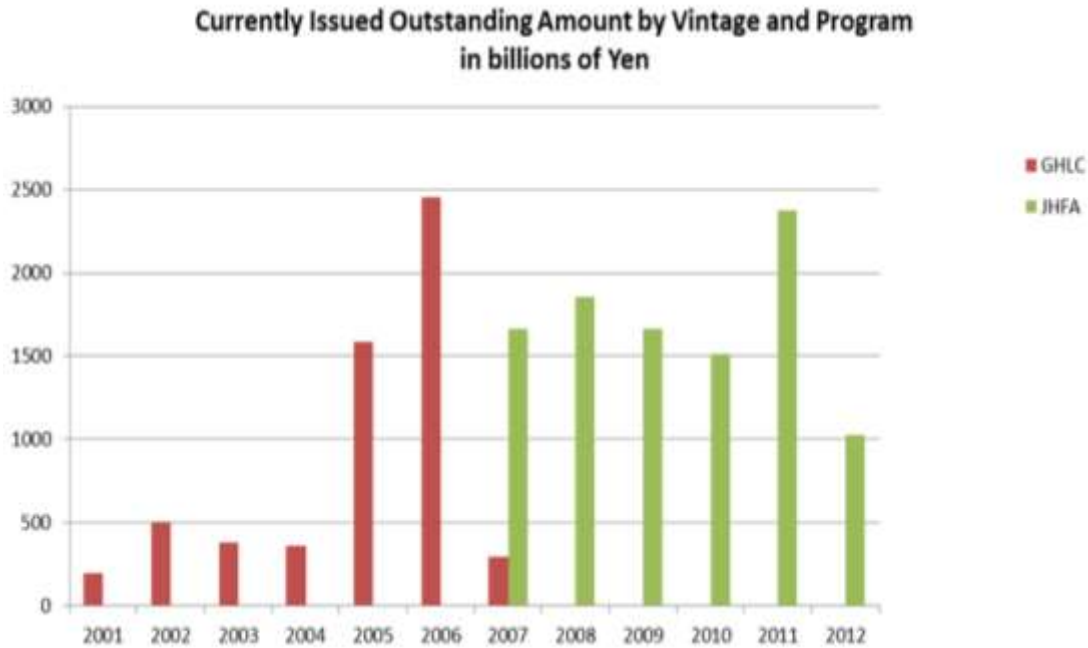
Issued Amount Outstanding by type as of June 2012



Source: JHFA, FactSet Fixed Income Research

In estimating this model, we used data from all the mortgages issued by the Government Housing Loan Corporation (GHLC) and its successor, the Japan Housing Finance Administration (JHFA) spanning the period from 2001 to 2011. The S series represents seasoned collateral issued by each issuer.

Figure 2: GHLC vs. JHFA Outstanding Amount by Vintage

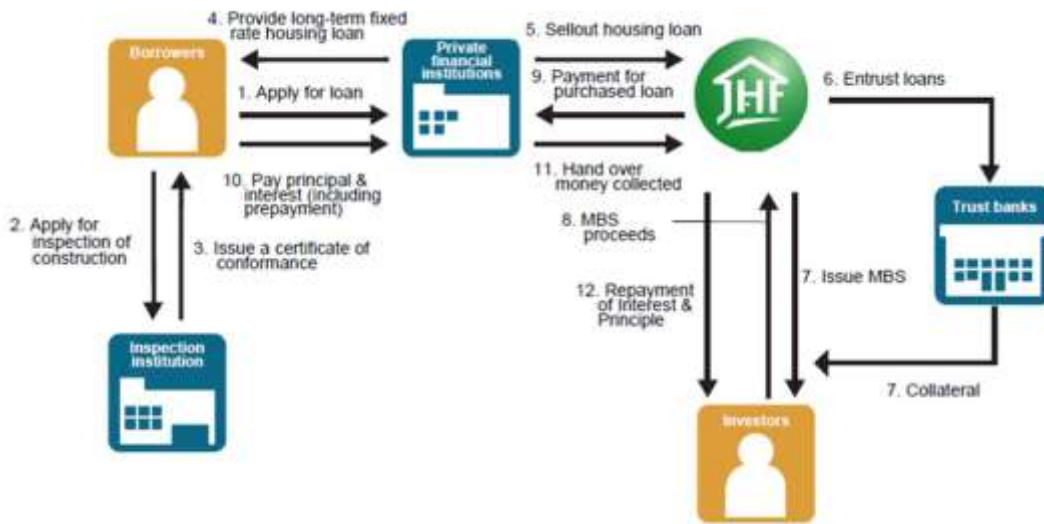


Source: JHFA, FactSet Fixed Income Research

Japanese Mortgages

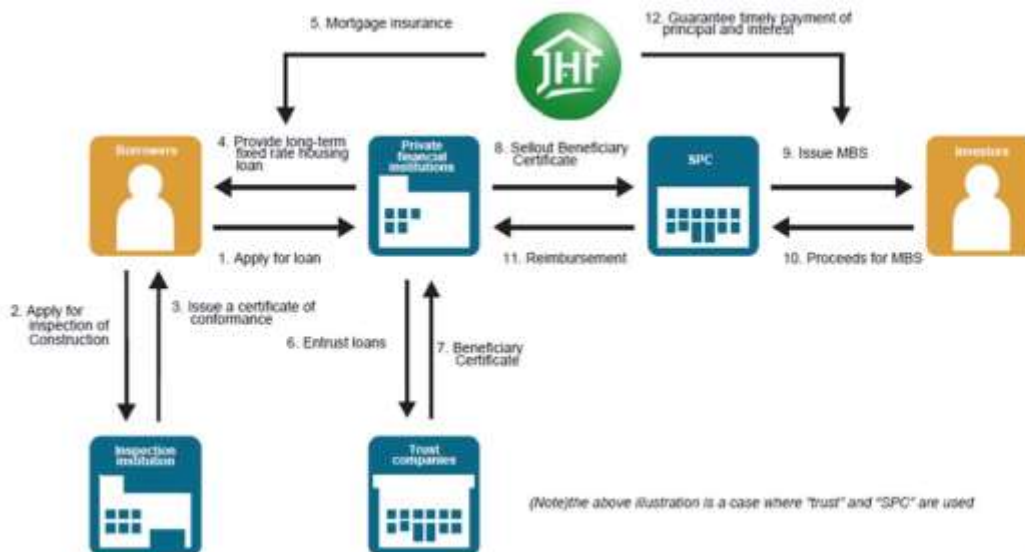
The JHFA acts both as a lender and an insurer of mortgages against losses. JHFA hence combines the functions of all the U.S. mortgage agencies into one.

Figure 3: JHFA as a Lender and Insurer



Source: JHFA

Figure 4: JHFA as an Insurer

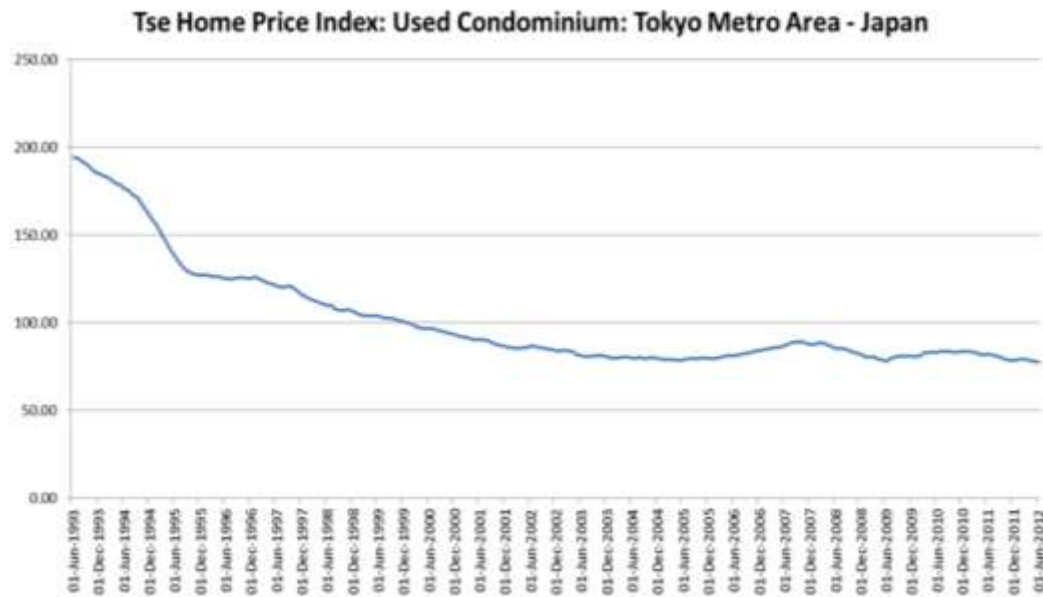


Source: JHFA

The mortgages themselves are fixed rate mortgages with an amortization period that ranges between 20 to 40 years. However, a 35-year amortization period is most common.

The individual mortgages are grouped into pool according to age, term, loan size, LTV, first lien status and debt to income (DTI). The average LTV is about 80% and the average DTI is around 22%. Furthermore, the average loan size is 23 million Yen (\$200,000), but it has been declining due to the asset deflation that has been gripping Japan for the past two decades. The aggregated pools have a 10% clean up call provision.

Figure 5: Tokyo Metro Area Home Price Index



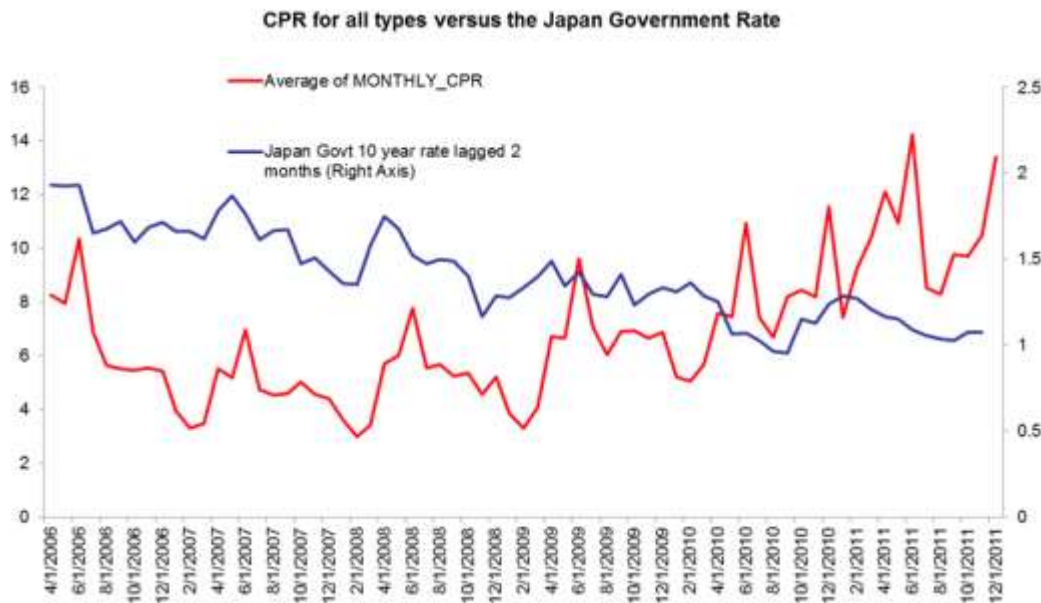
Source: Tokyo Stock Exchange, FactSet Economics

Prepayment Profile of Japanese Mortgages

We examined historical one month CPRs observed each month for the pools in our estimation universe and noted the following trends and characteristics:

The first characteristic is the relatively low prepayment sensitivity of the pools to interest rates, compared to the U.S. mortgage market. Figure 6 shows how a nearly 100 bp drop in the level of the JPY 10 year benchmark rate results in only a moderate increase in prepayment rates.

Figure 6: Prepayment Trend vs. Japanese Government 10- Year Rate



Source: FactSet Fixed Income Research

Consistent with how FactSet’s U.S.-based mortgage prepayment models are structured, we accounted for the impact of underwriting standards on the pool specific refinance incentive calculation. We did this by adjusting the 10-year government rate to account for differences in the credit quality of specified pools. We adjusted debt to income of the pool and the LTV with parameters specific to each type:

$$\begin{aligned}
 \text{Adjusted Rate} &= a(\text{type}) \times (10 \text{ year Japan govt rate, lag}) + f3(\text{type}) \times DTI \\
 &+ y(\text{type}) \times LTV
 \end{aligned}$$

A higher *DTI* value resulted in a higher adjusted rate for all types, and a higher *LTV* resulted in a higher adjusted rate for all except the *JHFA* program. As a proxy for the available mortgage rate, we estimated a refinancing component of prepayments as the difference between the pool’s gross weighted average coupon (*GWAC*) and this adjusted value of the Japan government 10-year rate. A higher adjusted rate results in a lower rate incentive and a lower projected prepayment. We observed a lag of two months between a rate observation and subsequent prepayment event.

The rate incentive is the difference between the *GWAC* and the adjusted rate. The refinance portion of the prepayment projection is a function of that number:

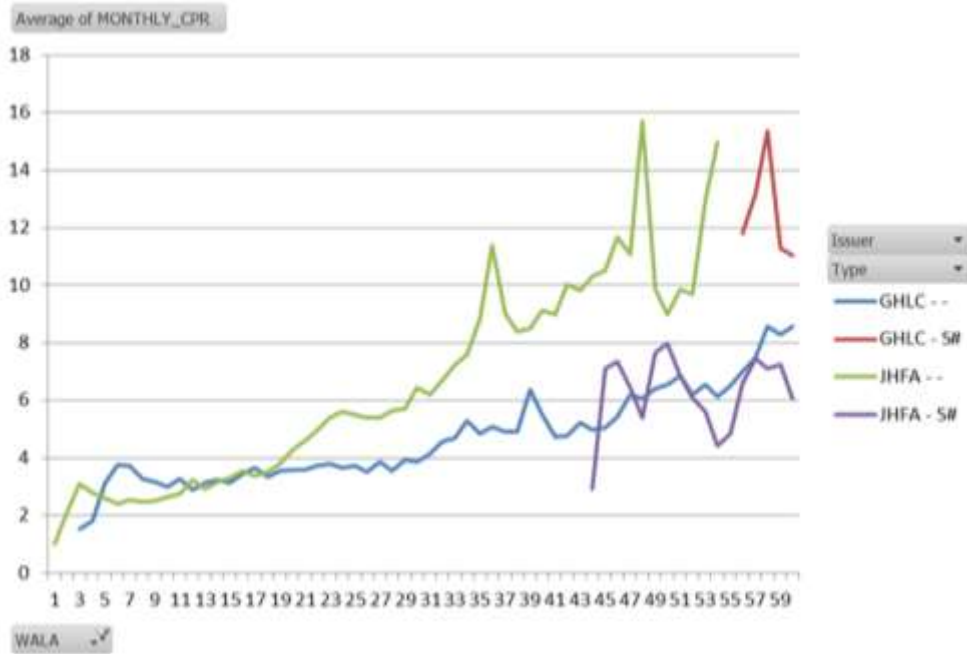
$$\text{Refinance}(t) = f(t, \text{GWAC} - \text{adjusted rate})$$

We estimated a turnover component for rate insensitive pools for each of the issuers and types and is a ramp function driven by:

$$\text{Turnover}(t) = t \times f(\text{GWAC}, 10 \text{ year Japan govt rate, lag, issue date}) \times a(\text{type}) + f3(\text{type})$$

We used the $f(\text{GWAC}, 10 \text{ year Japan govt rate, lag, issue date})$ as a way to estimate spread at origination of the pool. Each issuer and program type has a distinct rate insensitive prepayment profile.

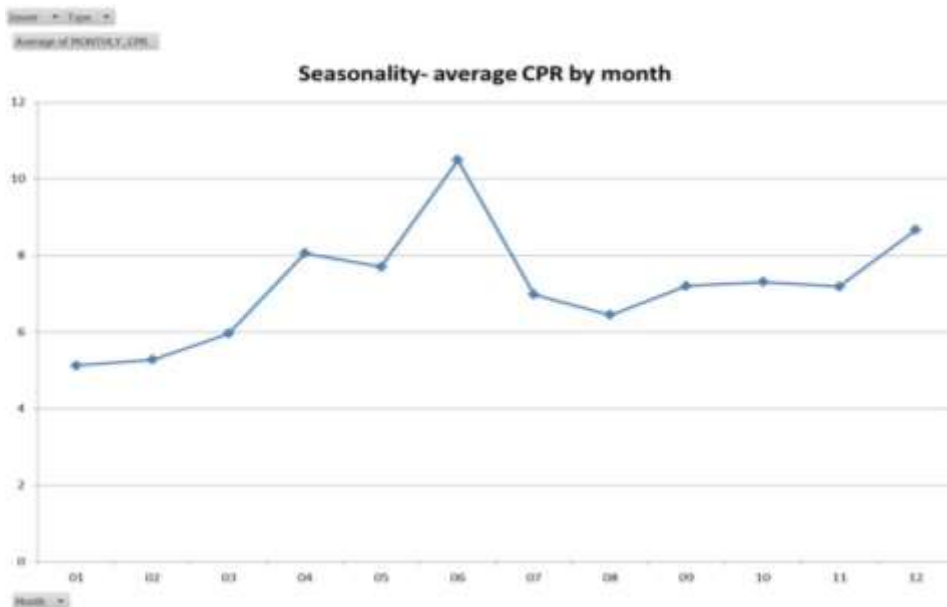
Figure 7: Prepayment Seasoning by Issuer and Program Type



Source: FactSet Fixed Income Research

We also saw a strong seasonal pattern when looking at prepayment trends by calendar month:

Figure 8: Seasonality of Prepayments for all Collateral Types



Source: FactSet Fixed Income Research

A seasonal factor was applied to the sum of the refinance and turnover components.

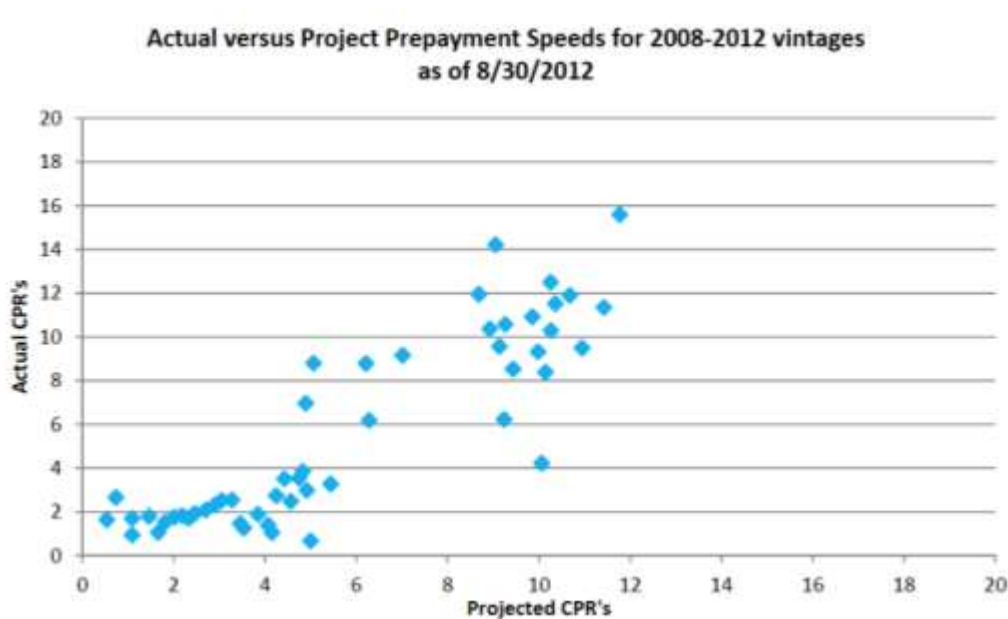
$$Prepayment(t) = f(calendar\ month) \times (Refinance(t) + Turnover(t))$$

Both the refinancing and the turnover components have multipliers that allowed us to produce refinancing and turnover sensitivities for the Japanese Prepayment Model. Additionally, an elbow shift variable window allowed us to slide the adjusted rates up and down to get the sensitivity of the security to a change in the adjusted rate (elbow shift duration) and a general prepayment multiplier to produce a prepay duration.

Model Performance

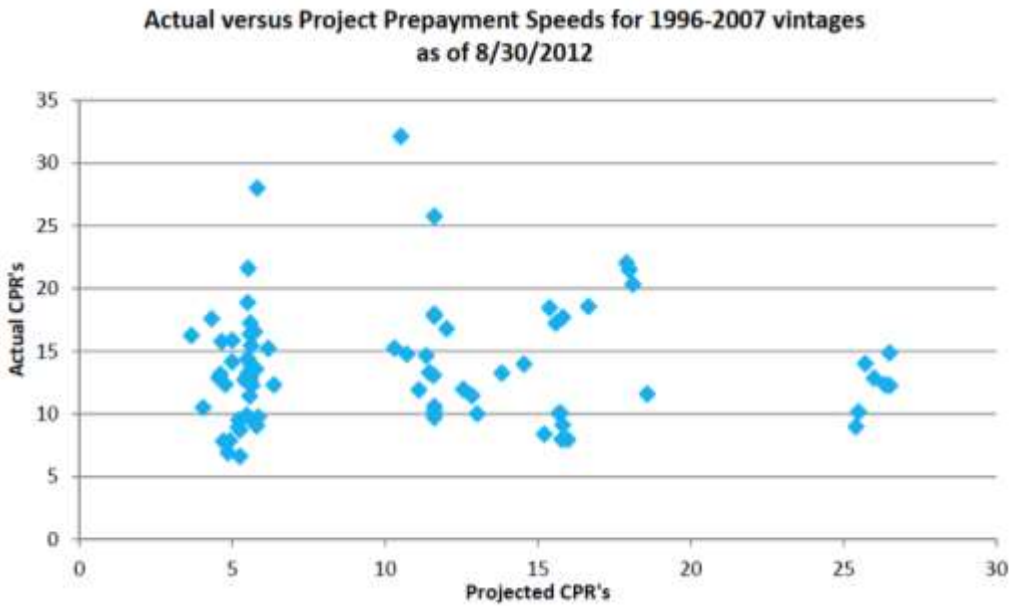
The model's performance varies for different vintages. It does quite well projecting the speeds for pools that were issued in the past five years, but not as well for older vintages.

Figure 9: Model Performance vs. Actual Results



Source: FactSet Fixed Income Research

Figure 10: Model Performance



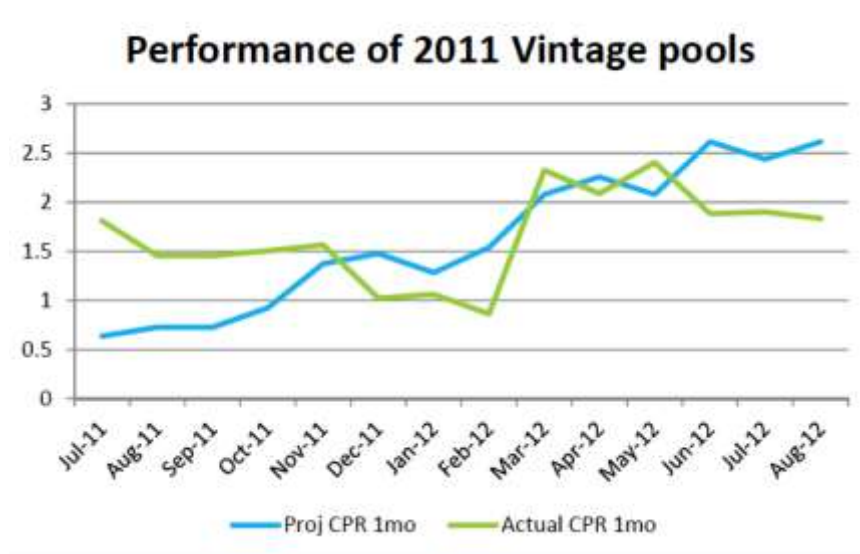
Source: FactSet Fixed Income Research

The model performed reasonably well over the past year, as the figures below show its projections relative to actual observations by vintage. Performance reports for all vintages are presented in the appendix.

Appendix

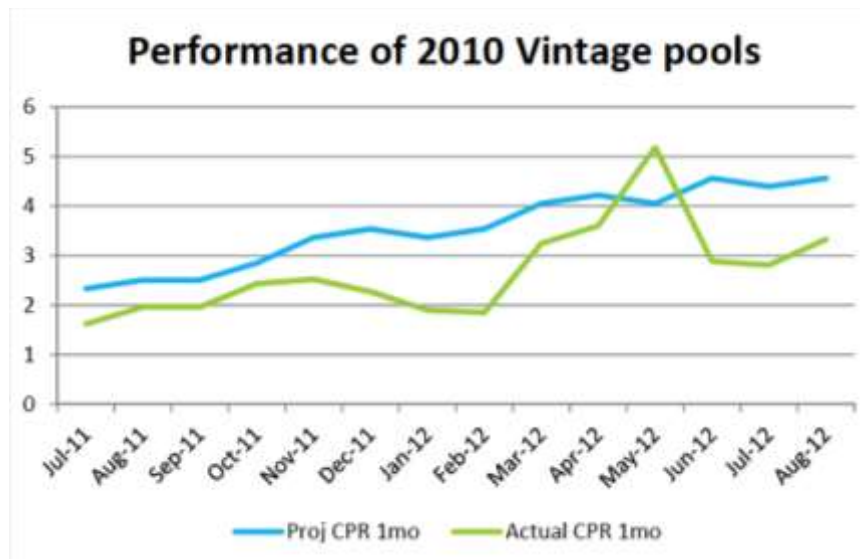
Performance Reports by Vintage

Vintage Pool Performance 1



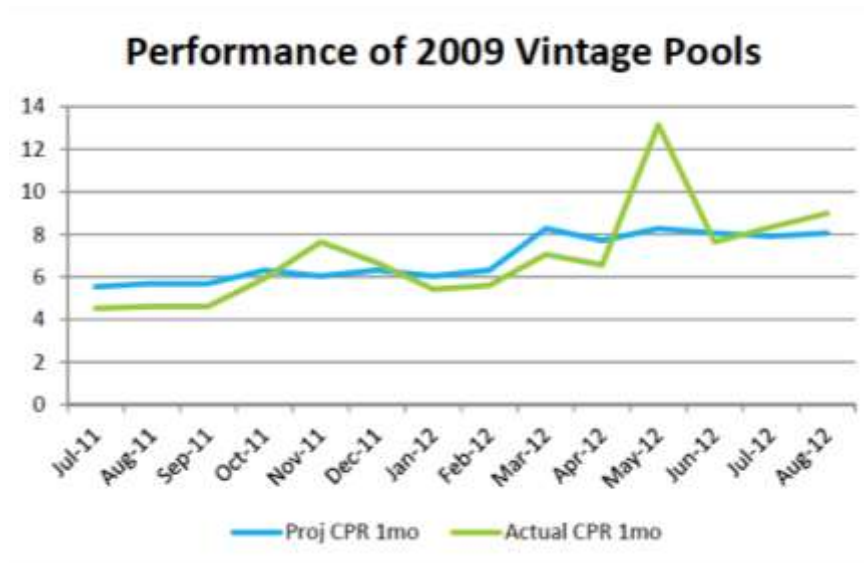
Source: FactSet Fixed Income Research

Vintage Pool Performance 2



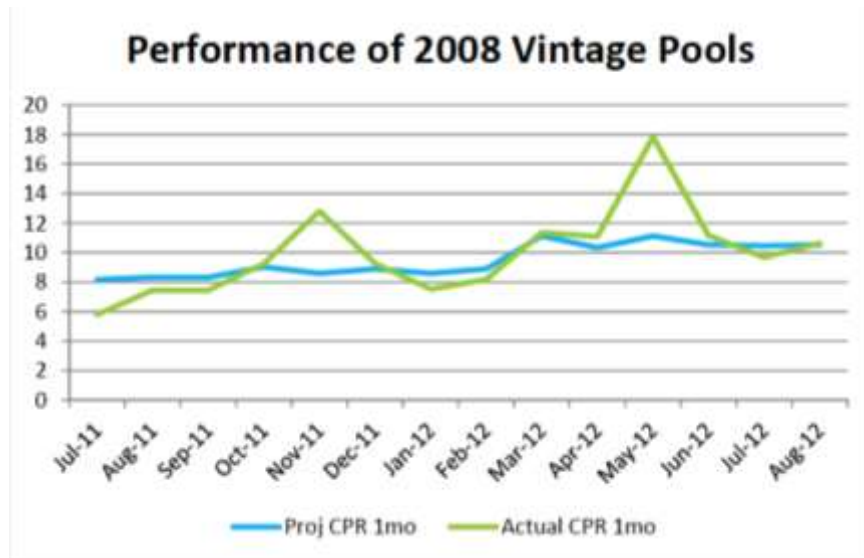
Source: FactSet Fixed Income Research

Vintage Pool Performance 3



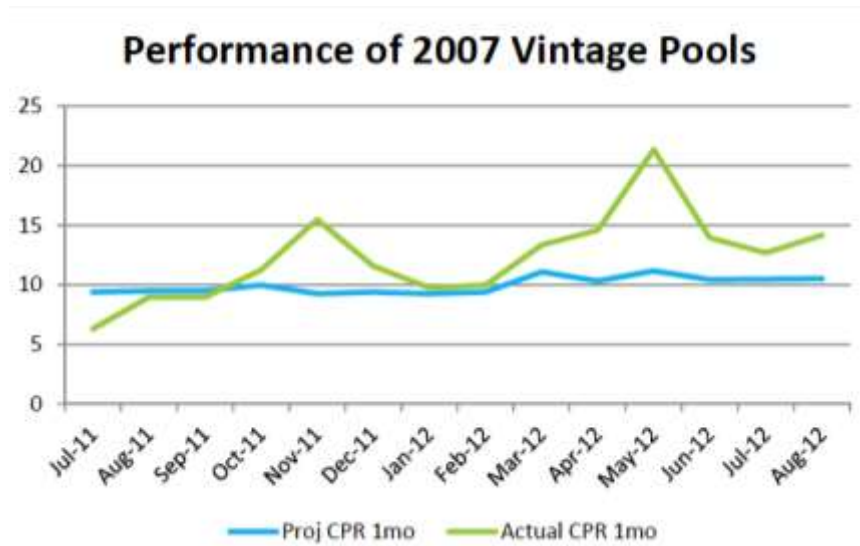
Source: FactSet Fixed Income Research

Vintage Pool Performance 4



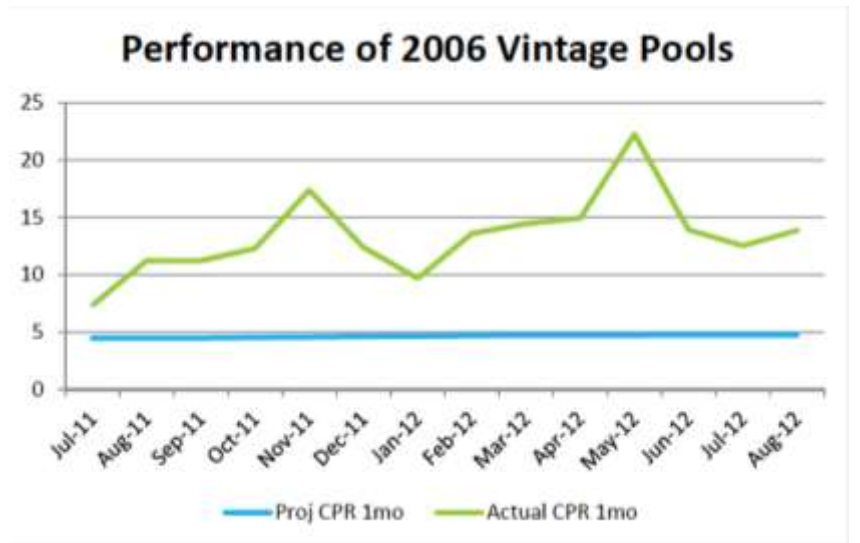
Source: FactSet Fixed Income Research

Vintage Pool Performance 5



Source: FactSet Fixed Income Research

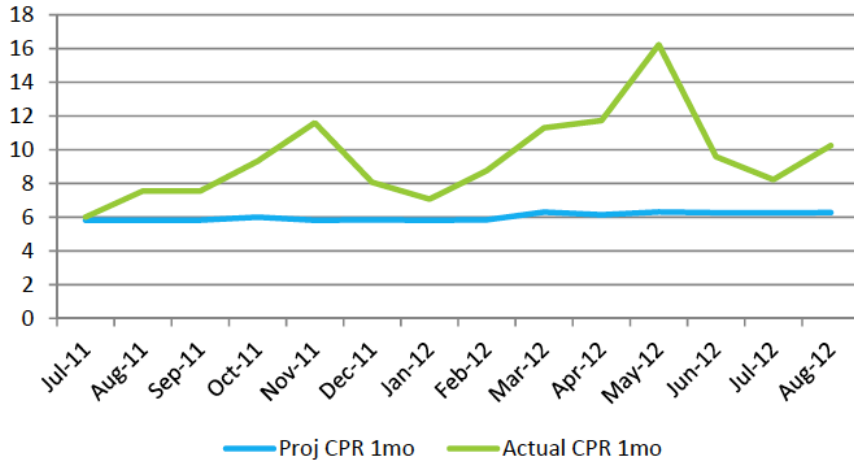
Vintage Pool Performance 6



Source: FactSet Fixed Income Research

Vintage Pool Performance 7

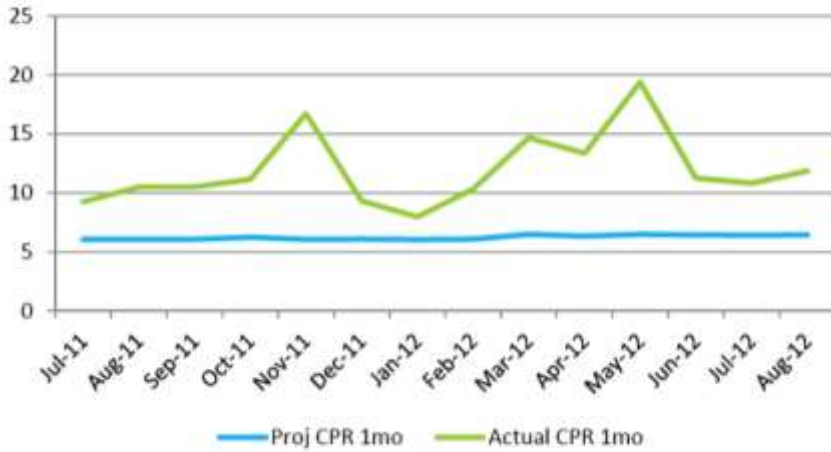
Performance of 2005 Vintage Pools



Source: FactSet Fixed Income Research

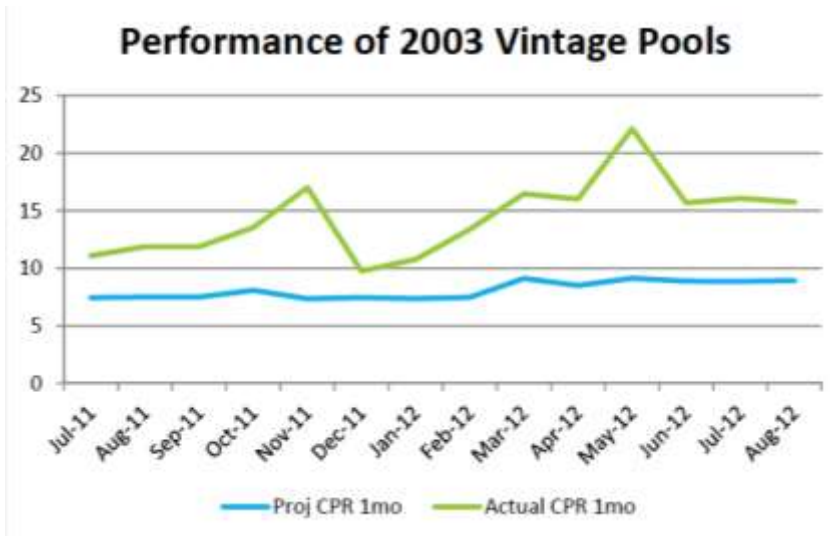
Vintage Pool Performance 8

Performance of 2004 Vintage Pools



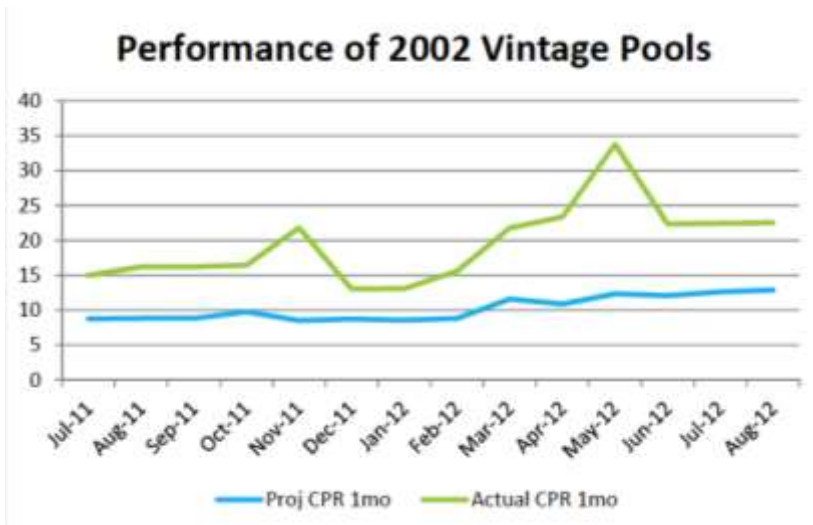
Source: FactSet Fixed Income Research

Vintage Pool Performance 9



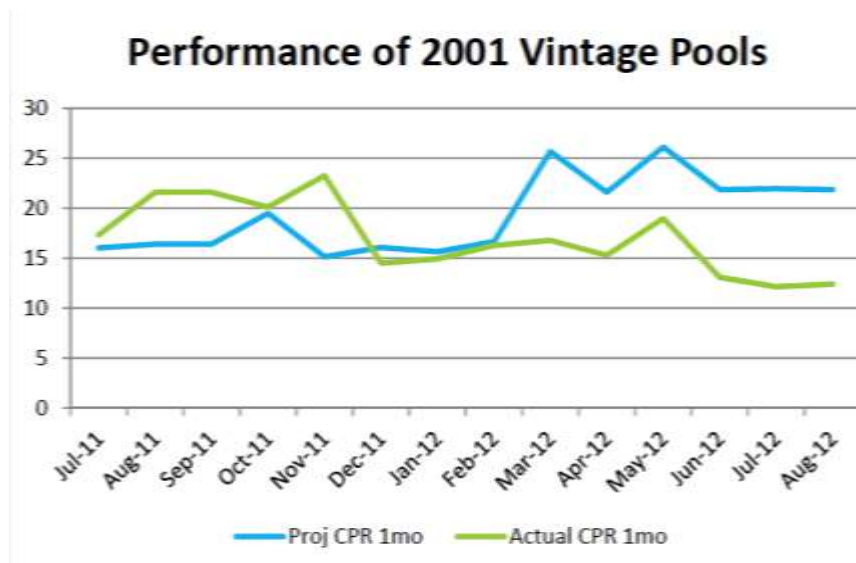
Source: FactSet Fixed Income Research

Vintage Pool Performance 10



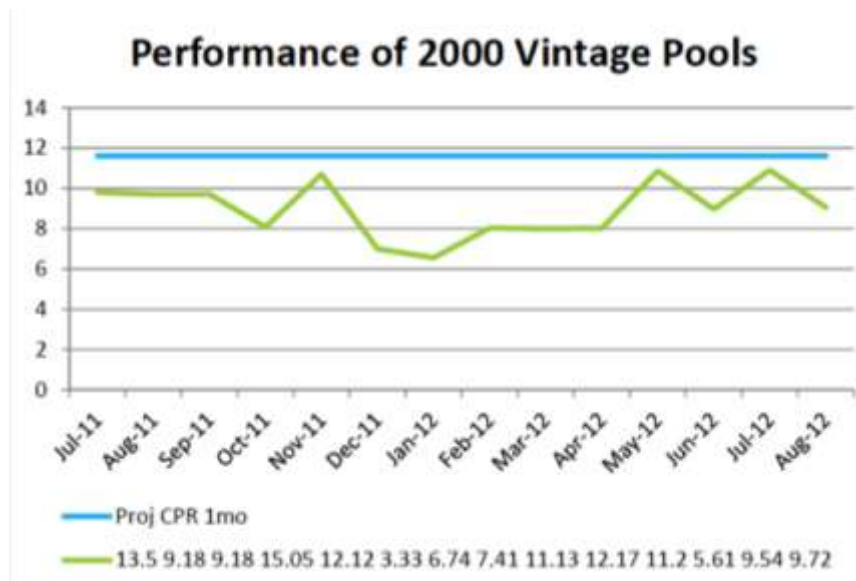
Source: FactSet Fixed Income Research

Vintage Pool Performance 11



Source: FactSet Fixed Income Research

Vintage Pool Performance 12



Source: FactSet Fixed Income Research

Vintage Pool Performance 13

Performance of 1997 Vintage Pools



Source: FactSet Fixed Income Research

Vintage Pool Performance 14

Performance of 1996 Vintage Pools



Source: FactSet Fixed Income Research