**Recursion Solutions Market Note**
**November 2018**

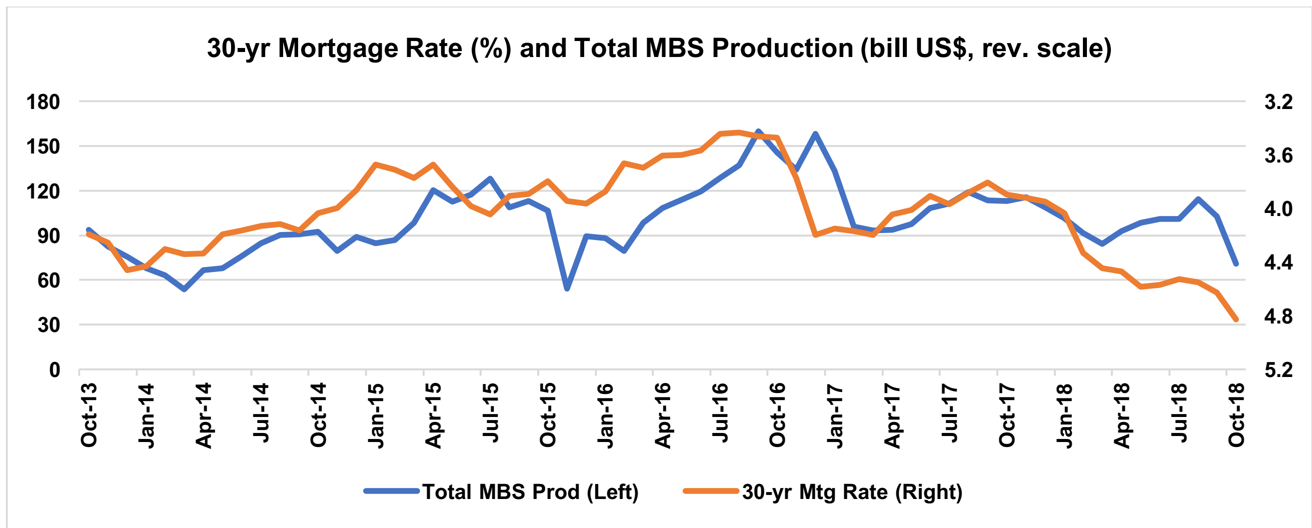
## Credit Crumbles[1]


Summary

For some time we have noted that despite headwinds from rising home prices and mortgage rates, total agency MBS securitizations have stayed within a broad band in place over the past five years (Chart 1). Borrowers are reluctant to move out of houses financed by mortgages with near record low mortgage rates nor are they looking into refinance opportunities to lower their monthly payments. How do originators and agencies manage to stay competitive and maintain their market shares? While there are many possible explanations, loosening credit standards is a natural suspect.

In this note, we develop metrics to measure trends in agency credit risk and benchmark the current environment against the time period prior to the Global Financial Crisis. As it turns out, this question is not at all simple to address. An adequate analysis depends on the use of advanced big data tools to drill down to the loan level across disparate large data sets. In this note we report the results of this exercise. Our findings are striking. Over the past year risks in the agency market by some measures have ballooned, reaching close to or surpassing the peaks attained in the mid-2000's. Our methodology and quantitative results are provided in the next section, and we conclude with some comments about the implications of these results.


**Chart 1**





[1] Recursion Co would like to thank Wesley Phoa for very helpful and insightful comments. All errors remain those of the authors.

## The Recursion Data

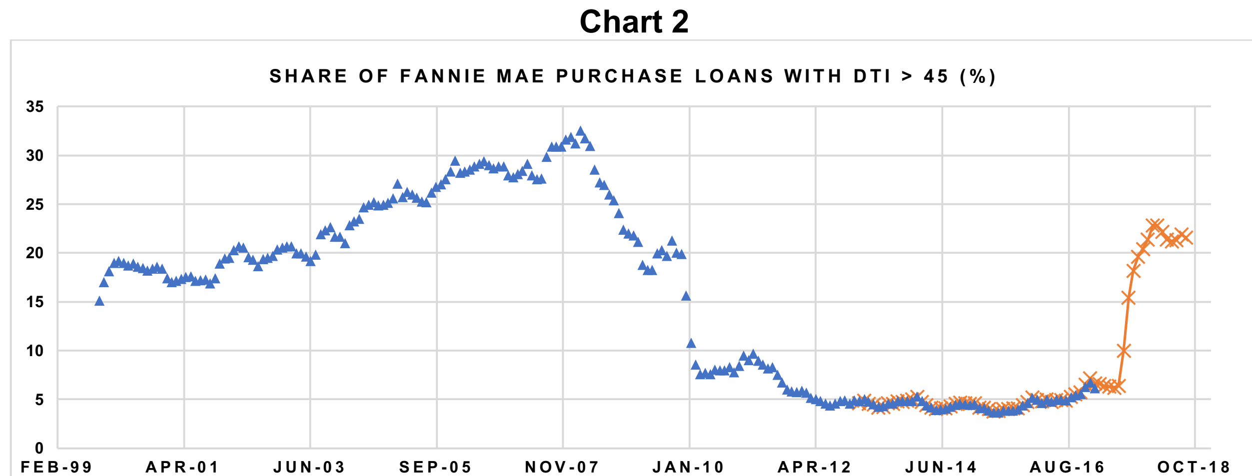
Our main data set is the 40+ million loans that reside in mortgage agency pools. These loans are obtained from our partner firm, eMBS, and contain billions of data points regarding loan characteristics, and information about the thousands of financial firms that underwrite and service them. A drawback of this data set is that the content is sparse prior to 2013, so long-term comparisons are challenging. However, a few years ago, the agencies released loan performance data in support of the credit risk transfer program that goes back as far as 1999. Its drawback is that the data are released with a long lag of as much as 18 months.

To make an up-to-date long-term comparison, we supplemented our pool data with the loan performance data. We did not match the individual loans, which is forbidden under the use rules of the loan performance data, but just looked at aggregate figures.

## The Long View of Mortgage Credit

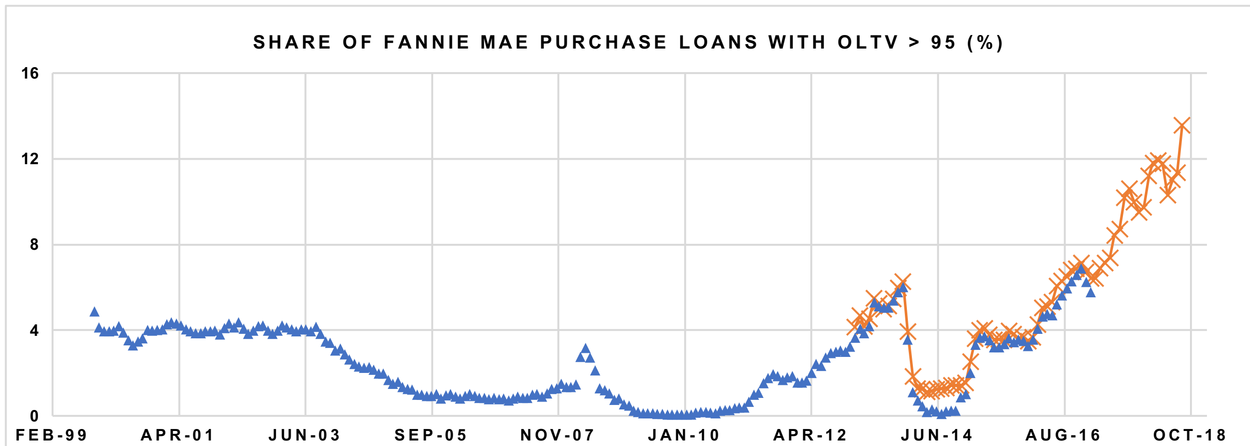
Mortgage risk is properly measured in the tail of the risk distribution, not at the averages. For the purposes of this note, we look at risk in newly-issued Fannie Mae securities as measured by the share of purchase loans with DTI>45, LTV>95, and both together (Charts 2, 3 and 4)[2].

**Chart 2**

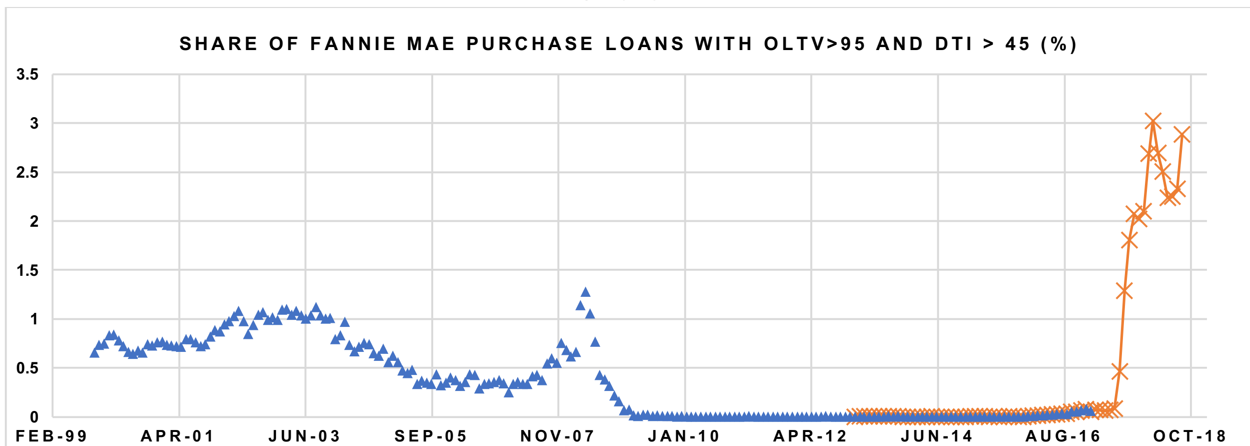



[2] DTI = "Debt to Income" at origination. That is, the share of a household's income that goes to servicing its debt. LTV = "Loan to Value", which is the share of the value of the mortgage at origination relative to the home's purchase price.

## Chart 3




## Chart 4




There are a few clear takeaways. First, during the 4-year overlap period (from Jan.2013 to Feb.2017) between the use of the pool data (the orange dots) and the loan performance data, (the blue dots) the series are extremely close, providing us confidence that a comparison of long term trends across data sets is appropriate. Second, in the case of DTI, the share of loans with DTI>45 has reached to about 22%, up from about 5% as recently as 2016, and recovering nearly 70% from the peak of 33% just prior to the bursting of the bubble. Third, in terms of LTV, the share of purchase loans with less than 5% down at origination has gone from 0% four years ago to 14% at present, far surpassing the pre-crisis peak of 4%[3]. And finally, the share of loans with both DTI>45 and LTV>95 is relatively small at 3%, but is unprecedented[4].

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[3] We note that high LTV's for refinance loans were quite common in the period immediately following the post-crisis period, supported by various government programs. What is different in the present situation is the willingness to enter into new mortgages with such characteristics.

[4] The deterioration of credit characteristics visible in Fannie Mae securities is in some ways mirrored in Freddie Mac pools, but to a lesser degree. For example, the share of purchase loans in Freddie Mac pools with DTI's greater than 45 in October is about 5% smaller than that for Fannie Mae. Similarly, the share of Freddie Mac loans

## The Institutional Landscape

We have written previously of growing risks associated with the shift of mortgage underwriting and servicing from bank to nonbank financial institutions[5]. It is natural to ask to what degree this sort of risk is correlated with the decline of lending standards. As it turns out, there is some correlation, but elevated risk tolerances can be viewed across both highly - and lightly - regulated firms (Charts 5 and 6).

**Chart 5**

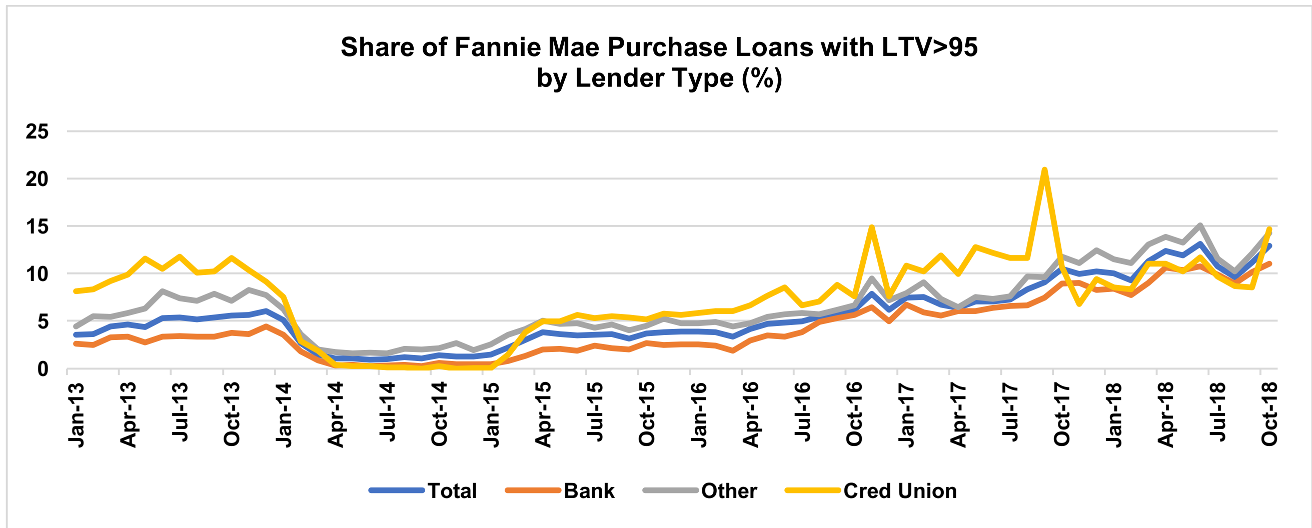
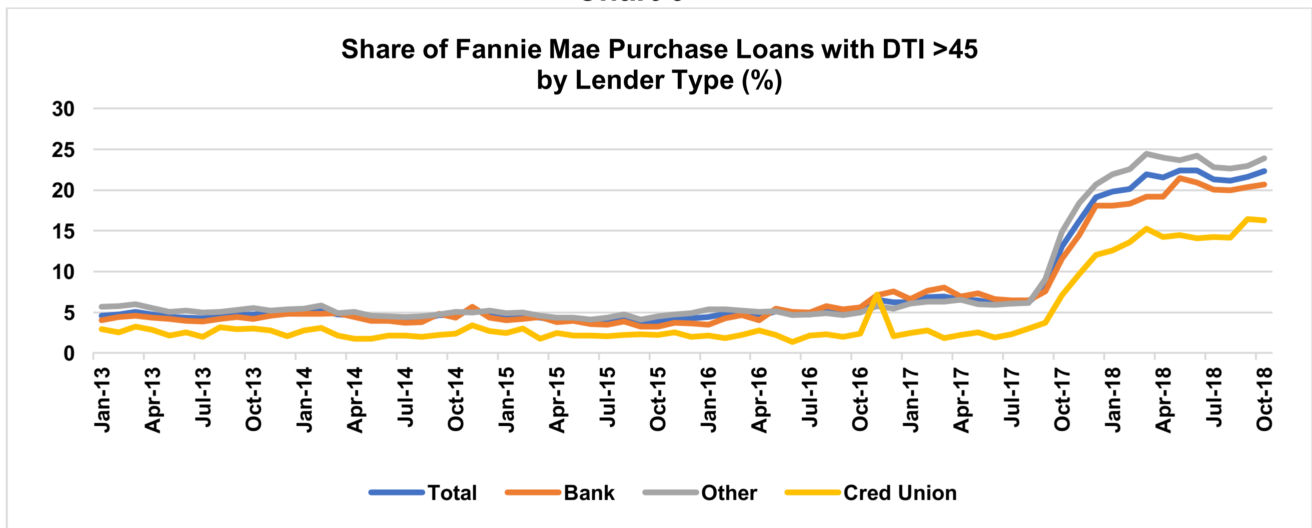



**Chart 6**

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with LTV's over 95 is about 4% lower than Fannie Mae. So far, the share of Freddie Mac loans with both DTI's greater than 45 and LTV's greater than 95 has remained under 1%.

[5] See https://www.bloomberg.com/opinion/articles/2018-02-23/mortgage-loans-the-market-is-moving-into-the-shadows

Lending standards are relatively looser among non-banks (excluding credit unions and S&L's) but the pattern of credit quality deterioration for our two main measures is quite similar for both banks and nonbanks.

Over the 12 months ending October 2018, sellers delivered about 21,000 loans to Fannie Mae with a credit profile of both DTI>45 and LTV>95. The top 10 selling institutions accounted for about 50% of the total. It's interesting to note that three out of the top five are large commercial banks (Table 1).

**Table 1**

| | | # Loans |
|---|---|---|
| 1 | WELLS FARGO | 4282 |
| 2 | UNITED SHORE FIN SERVICES | 3038 |
| 3 | US BANK | 2154 |
| 4 | GUILD MTGE COMPANY | 1332 |
| 5 | JP MORGAN | 1129 |
| 6 | IDAHO HOUSING AGENCY | 1039 |
| 7 | PENNYMAC | 851 |
| 8 | LAKEVIEW LOAN SERVICING LLC | 945 |
| 9 | MOVEMENT MTGE LLC | 989 |
| 10 | COLORADO H&F AUTHORITY | 641 |
| | | |
| | Share of top-10 Loan Count (%) | 48.6 |

Then, and Now

Now that we have established that credit conditions in agency mortgages are loosening, it is natural to ask how similar the current environment is to that in place to prior to the Global Financial Crisis. A common feature of financial cycles is that once memories of the last crisis fade, investors tend to reach far out the risk spectrum in exchange for very little extra return. The mechanisms through which this behavior is manifested are different, however, from cycle to cycle. A decade ago it was the Private-Label Securities (PLS) market where mortgage originating entities securitized poorly-underwritten loans into pools without a government guarantee. In a recent paper, Susan Wachter at the Wharton School "describes the fundamental problem of mispriced credit in nontransparent securitization that amplified the housing price bubble."[6] That market has been moribund over the last decade, although it is beginning to revive. This time, the mechanism for risk transmission is considerably different.

[6] http://realestate.wharton.upenn.edu/wp-content/uploads/2018/01/806.pdf

Finkelstein et al document the series of regulatory changes that were implemented to enhance and supplement the risk management tools in place that failed during the crisis.[7] Of key importance was the innovation for the GSE's to transfer residential mortgage credit risk to private investors in the form of the so-called "Credit Risk Transfer Program"[8]. This program is very large, so that by the end of 2017 the GSE's had transferred part of the credit risk on over $2 trillion of single family mortgages. While similar in structure to the PLS market in some respects, key differences are that the loans in the reference pools utilized by the CRT instruments are underwritten according to the standards set by the GSE's, and the GSE's maintain all catastrophic risk for the CRT program.

In order to validate that the deterioration we see in the underwriting standards of loans delivered to Fannie Mae is reflected in the risk that is passed along to investors, we look at the characteristics of the loans in the reference pools for each of the CRT securities issued by Fannie Mae since 2014.[9] Not surprisingly, when we apply the same measure (share of loans with both DTI>45 and LTV>95) to Fannie Mae high LTV CRT pools, we find a similar recent sharply increasing trend as we observe in the Fannie Mae pool the reference loans were drawn from (Table 2).

**Table 2**

| CRT Group (High LTV, purchase only) | Issue Date | LTV>95 (%) | DTI>45 (%) | LTV>95 & DTI>45 (%) |
|---|---|---|---|---|
| CAS 2018-C06 | 8/1/18 | 20.5 | 24.9 | 5.3 |
| CAS 2018-C04 | 5/1/18 | 21.4 | 20.7 | 4.5 |
| CAS 2018-C02 | 1/1/18 | 17.5 | 5.0 | 0.7 |
| CAS 2017-C07 | 10/1/17 | 14.9 | 2.6 | 0.2 |
| CAS 2017-C06 | 7/1/17 | 13.7 | 2.7 | 0.2 |
| CAS 2017-C03 | 4/1/17 | 13.2 | 2.0 | 0.1 |
| CAS 2017-C02 | 2/1/17 | 10.3 | 1.5 | 0.1 |
| CAS 2016-C07 | 10/1/16 | 7.0 | 0.6 | 0.0 |
| CAS 2016-C05 | 6/1/16 | 5.9 | 0.2 | 0.0 |
| CAS 2016-C03 | 3/1/16 | 5.6 | 0.1 | 0.0 |
| CAS 2016-C01 | 1/1/16 | 2.0 | 0.1 | 0.0 |
| CAS 2015-C04 | 9/1/15 | 0.0 | 0.2 | 0.0 |
| CAS 2015-C03 | 6/1/15 | 0.1 | 0.1 | 0.0 |
| CAS 2015-C02 | 5/1/15 | 6.9 | 0.2 | 0.0 |
| CAS 2015-C01 | 1/1/15 | 13.0 | 0.2 | 0.0 |
| CAS 2014-C04 | 11/1/14 | 12.0 | 0.2 | 0.0 |

[7] https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr838.pdf
[8] See https://www.fhfa.gov/aboutus/reports/reportdocuments/crt-overview-8-21-2015.pdf
[9] Fannie Mae refers to the financial instruments they issue under the CRT program as "Connecticut Avenue Securities" or CAS.

| | | | | |
|---|---|---|---|---|
| **CAS 2014-C03** | **6/1/14** | **7.2** | **0.2** | **0.0** |
| **CAS 2014-C02** | **4/1/14** | **5.8** | **0.2** | **0.0** |

## Summing Up

In this note we document the recent rapid deterioration in agency underwriting standards, and confirm that the risks associated with this development are distributed to private investors through the Credit Risk Transfer program. While there is data made available to the public that allows sophisticated investors to perform the types of calculations we present here, it is not clear that such techniques are widely applied, raising the specter of the possibility of mispriced credit risk in this market. This is not to say that the severity of the next downturn will necessarily mirror that of the last cycle a decade ago, as the regulatory and market environment is different across many dimensions. But the data indicate that investors, risk managers and regulators should not be sanguine.

Li Chang and Richard Koss