2020

How Announcements of the Qualified Mortgage Patch Expiration Have Impacted the United States Housing Market

Connor Gaskin

Claremont McKenna College

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Submitted to

Professor Eric Hughson

by

Connor Gaskin

for

Senior Thesis

Fall 2019

December 9, 2019

Abstract

This study analyzes the impacts of different announcements of the Qualified Mortgage GSE Patch expiration, set for January 10, 2021. The Qualified Mortgage GSE Patch was introduced in January 2014 to allow for the GSEs, Freddie Mac and Fannie Mae, to originate loans above the monthly Debt-to-Income ratio of 43 percent with the same protections as a Qualified Mortgage. To analyze these impacts, I measure the changes in the number of loans the GSEs obtain and weighted average home price before the announcement to after the announcement. In order to test for significance, I use a five-year benchmark period to compare against these announcement periods, conducting Student t-tests and difference in differences tests. The results of this study show that there were some significant positive changes in home price after an announcement period; however, there were no significant positive changes in the number of GSE loans. The results highlight that although both loan count and home prices were increasing in the announcement periods, there is a lack of significance in the short-term announcement periods.

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Acknowledgements

I would like to thank Professor Hughson for all of his help and guidance throughout the duration of my thesis. Thank you to Professor Finley for providing me with great ideas as to how I can improve my writing and research. I am incredibly grateful for Richard Koss and the entire Recursion Co. team for allowing me access into their database and the time spent teaching me how to use the database. Also, thank you to my mom, Joanne Gaskin, for the love and support throughout my time writing this thesis.

Introduction

This paper examines how multiple announcements of the expiration of the qualified mortgage GSE patch ("QM GSE Patch") have affected the residential real estate market of the United States. The qualified mortgage patch has allowed for the government-sponsored enterprises, Freddie Mac and Fannie Mae, to purchase loans that exceed the 43 percent monthly Debt-to-Income ("DTI") ratio established for a qualified mortgage loan. This ruling by the Consumer Financial Protection Bureau ("CFPB") has caused for a lot of discussion regarding what will happen to the residential real estate market after this expiration.

There has been plenty of literature and research conducted on the impact of the Qualified Mortgage Patch on the housing market over the last five years, as well as research on what will happen when it expires in January 2021. Most of the research and literature focusing on the expiration is about the long-term impact of it, rather than the short-term, current-day impact. This paper contributes to the understanding of current-day impacts of the announcement to let the patch expire through an event-date study. Through this study, I look at changes in the number of loans that Freddie Mac and Fannie Mae originate or purchase surrounding two different announcement dates as well as the change in weighted average home price.

In order to identify these housing market reactions, I use Recursion Co.'s Cohort Analyzer, a loan level querying tool that pulls monthly data from all GSE loans that have been originated since 1990. I use their data to identify the changes to loan count and home price for a month prior to an announcement date and a month after to measure any reaction from the market. Also, I look at the full period from the first announcement date up until the most recently published data (October 2019) to see if there are actual announcement reactions or if it's just a market trend.

I expect to see immediately following these announcement periods that there will be an increase in the number of loans the GSEs obtain over the DTI cap as well as an increase in the weighted average home price in reaction to the announcement of the expiration of the QM GSE Patch. As the GSEs will no longer be the only ones able to obtain these non-QM, over the 43 percent DTI cap, with the current protections laid out for them by the patch (Kaul et al., 2018), I expect to see them increase their loan count in this field before other firms are allowed to enter this non-QM market. The view that weighted average home prices will increase is based upon research done by Pinto et al. (2019) that shows higher increases in home price appreciation for borrowers over the DTI cap of 43 percent. Pinto et al. (2019) also explain that with looser lending standards, such as lending above the DTI cap, when there's already a shortage of housing, it tends to lead to higher prices. With this information, I expect to see a continuous trend in upward home prices, especially immediately following these announcement periods.

In order to obtain my results, I used a Student t-test and a differences in differences test against a five year benchmark period outside of the date ranges I test. This shows whether or not the changes in loan count and changes in weighted average home price during these two announcement periods, as well as during the eight month potential trend period, were statistically significant against the benchmark rates. The first date in the study is March 27, 2019, when President Donald Trump released a presidential memoranda regarding housing finance reform, which included his support for allowing the patch to expire. The second date in the study is July 25, 2019, where the

Consumer Financial Protection Bureau formally announced their plan to allow the QM Patch to expire. The results from the first announcement period show that there were increases in both loan count and weighted average home price; however, when comparing against the benchmark, there were no statistically significant results. The second announcement period shows that the increase in loan count was not significant, but the change in the weighted average home prices were predominantly significant. When looking to see if there was a continuous upward trend in the eight month period from first announcement date to October, it can be seen that the increases in loan count and weighted average home price were also insignificant against the benchmark period, showing that there is no significant trend in the results.

In regard to the broader literature surrounding the QM Patch, my findings provide information regarding the short-term effects of these announcements. Prior to this study, there was no literature regarding the short-term effects of these announcements, but instead literature on what have been the effects of QM since its establishment and the future of QM post-expiration in 2021. I am the first to contribute to announcement date studies for the QM Patch and have shown that these announcements have had no significant impact on the short-term housing market. Along with this, my results contribute to the existing knowledge that the QM Patch has contributed to a rise in home prices across the country, and that an expiration of the patch could put downward pressure on home prices.

Institutional Background and Literature Review

After the Global Financial Crisis of 2008, there were numerous pieces of financial reform legislation passed, one of which was the Dodd-Frank Wall Street Reform and

Consumer Protection Act. Passed in 2010 as a response to the impacts of the Global Financial Crisis in the United States, it included the establishment of the Consumer Financial Protection Bureau ("CFPB"). According to this act, the establishment of the CFPB was to protect consumers from "unfair, deceptive, or abusive practices" (CFPB 2019) and increase consumer knowledge of the loans they sign up for. In order to protect consumers further against predatory mortgage lending, the CFPB established the qualified mortgage rule ("QM Rule") in January of 2014.

The QM rule was designed by the CFPB in order to protect consumers from loans that they could not afford (Kaul and Goodman, 2018). There are mandatory requirements that have to be fulfilled in order for a mortgage loan to meet the definition of a qualified mortgage. They are as follows: The loan cannot have negative amortization, interest-only payments, or balloon payments; Total fees cannot exceed 3 percent of the loan amount; the mortgage term cannot exceed 30 years. Along with these requirements, a borrower's total monthly debt-to-income ratio must typically be 43 percent or less. However, this is not necessarily the case with the CFPB establishing the qualified mortgage government sponsored enterprise patch. This QM GSE Patch allows for mortgage loans to be purchased or originated over the DTI cap of 43 percent as long as they are able to be purchased by either Freddie Mac or Fannie Mae. This has given both Freddie Mac and Fannie Mae a clear advantage in the real estate market, which has helped them secure a large market share of originations. As of the end of 1H 2019, GSE market share was 40.2 percent, which has been increasing tremendously under the patch (Urban Institute, 2019). Along with their large market share, without this patch, approximately 19 percent of the loans originated by the GSE's since 2014 wouldn't have been possible (Goodman, 2019), as well as 16 percent of all loans originated in 2018 (Carroll, 2019). This patch, established along with the QM rule, is set to expire on January 10, 2021, or the day the GSEs exit the Federal Housing Finance Agency conservatorship, whichever comes first (Kaul and Goodman, 2018). However, the CFPB announced on July 25th, 2019 that they plan to let the QM GSE Patch to expire in 2021. With that announcement, there are lots of questions as to how this will impact the housing market today and in the long-run, as well as what a potential new QM rule could look like.

Since the beginning of 2019, there have been a multitude of articles and papers published on the idea of allowing the Consumer Financial Protection Bureau ("CFPB")'s Qualified Mortgage ("QM") Patch to expire in January 2021. There is literature that is both for and against the expiration of the patch, as well as literature as to how the market should react following the announcement of the expiration. Pinto (2019) has reviewed the expiration of the QM Patch, where he identifies that since the ruling was implemented in 2014, it was a major cause for housing prices to boom in the time period from then until 2019. Along with Peter (2019), the two have looked at home price appreciation and how GSE-sponsored loans above the 43 percent Debt-to-Income (DTI) cap have performed. Their research shows that home prices with the insertion of the QM Patch have increased, especially at lower price segments. Pinto (2019) also provides evidence that with the bureau's announcement of letting the GSE QM Patch expire, the market will adjust prices lower with the expiration of the patch. This is due to an increase in credit standards, which would reduce the demand for homes, especially starter homes, leading to a reduction in home prices (Pinto, 2019). Along with the pricing adjustment, Pinto (2019) also explains that the earlier the announcement of the plan to let the QM Patch expire, the better off lenders and other market participants will be once it actually expires and the market opens back up to the public.

Along with this research done by Pinto (2018) and Peter, Kaul, and Goodman (2018), have shown that with the rising prices of homes from 2014 when the patch was established through 2018, the number of GSE loans originated over the DTI cap have increased extraordinarily over the amount of non-GSE loans originated that meet the QM requirements. Pinto (2018) would argue as well that because of the number of loans originated over the 43 percent cap, this causes for the GSEs to have too much power in the mortgage industry and has led to an un-level playing field. In addition to the research done by Kaul et al. (2018), Carroll (2019) examines the effects of loans originated over the 43 percent cap, as well as how the removal of the patch would impact those of low-income backgrounds, along with people from different ethnic/demographic backgrounds and how that can impact the housing market as well. Carroll (2019) writes that about 16 percent of the loans originated in 2018 (roughly $260 Billion) wouldn’t have been originated as QM eligible if it weren’t for the patch, showing how large an impact an expiration would be on those in need of the QM GSE Patch. He also adds that most of the people in this group of above the 43 percent cap are “younger millennials and retirees, Non-W-2 borrowers, low-income borrowers, and borrowers purchasing low-to-mid priced homes” (Carroll, 2019). Carroll (2019) shows in his research that these groups will be non-QM eligible with the expiration of the QM GSE Patch in 2021, meaning that people living in low-income and minority neighborhoods will be less likely to obtain a mortgage loan.

In their research of mortgage regulation, Bubb and Krishnamurthy (2019) provide evidence that underneath the current QM Patch regulation, we could continue to see an upward pressure on housing prices that could potentially cause for another housing bubble. The evidence shows that a continuation of allowing this patch to continue could contribute to another financial crisis, because as seen before, with asset appreciation from relaxed financial regulation, it can be a cause for unsafe housing bubbles, which can result in recession when they bust. Along with Bubb et al., McCoy and Wachter (2019), provide evidence in their research that shows that QM ruling is necessary in order to prevent poorly written mortgages and loans from causing another housing bubble, which may lead to a financial crisis. The QM Patch, being an exception to that rule, will fuel a bubble in housing prices according to the authors.

In their review of the planned expiration of the QM patch, Karayjan et al. (2019) of Kroll Bond Rating Agency (KBRA) explains how the private open market will be ready for this transition at the beginning of 2021. They believe that there will be no shortage of lenders willing to join both the QM and non-QM Market (loans that are above the 43 percent DTI cap and loans that don't meet Appendix Q requirements), as long as the QM definition remains stable. Karayjan et al. (2019) suggest that a lot of investors will be attracted to the high returns of the non-QM Along with Karayjan et al., Lane (2019) shows that there have already been financial groups joining the housing market once again, as PIMCO has bought loans originated by Capital One. However, there is evidence that also suggests that there won't be a shortage of lenders, regardless if these mortgages meet the definition of a QM. According to Finkelstein (2019), Non-QM issuance has grown ever since the QM Patch was established, and along with that growth, there is a larger demand for the product than ever before. With this literature, it suggests that there will be plenty of opportunities in the open market come 2021 when the patch expires.

In preparation for the eventual expiration of the QM Patch, I expect to see both Fannie Mae and Freddie Mac increase the number of originated loans above the current cap of 43 percent DTI. Knowing that there will be competition from other investors to obtain these loans after January 10, 2021, they will securitize more of these loans above the DTI cap now in order to maintain their large market share. As Fannie Mae and Freddie Mac continue to secure more of these loans, I'd expect the number of loans originating over the cap to increase as well, knowing that the GSE's still have that sole ability to obtain loans over the cap. Although we tend to see a rise in the number of loans originated over the DTI cap before the announcement (Pinto, 2018), I believe that we will see a larger reaction to these announcements than we have seen over last few years.

Along with an increase in the number of loans above the DTI cap, I also expect to see housing prices across the country to rise in reaction to the announcement of the expiration. As the GSEs utilize this patch to their advantage in the short term, the demand for these loans above the cap will increase, driving up home prices in the short-term. Due to the GSEs ability to cross-subsidize, borrowers that are above the DTI cap of 43 percent now will have a higher demand to purchase homes now with either Freddie Mac or Fannie Mae because of the lower rate they'll receive (Karayjan et al., 2019). Once private investors are introduced into the market with the expiration of the patch, they'll charge at higher rates since those above the DTI cap are inherently riskier. As the demand for these low GSE cross-subsidized rates increase, the demand to purchase a home in the short term will increase, which would lead to an increase in price. With evidence from Pinto (2019), there is already an increase in all home prices since the establishment of this QM Patch; however, similar to the reaction to number of loans increasing, I expect to see a sharper rise in home prices for those that are above the DTI cap. However, in the long term, I do expect that after the expiration of the QM Patch, there will be a depreciation in home price. As Pinto (2019) writes, the upward pressure that the QM Patch has brought to home prices will be relieved with the expiration, with prices to fall shortly. Other evidence from Karayjan et al. (2019) suggests that by reducing borrower leverage, prices across the housing market will also decrease in the long term.

Research Design

In order to look at the effects of the announcement of the QM GSE Patch expiration in 2021, I take a look at different possible event days where I could possibly see some change in the housing market. One of these dates is March 27, 2019, where a Presidential Memoranda was released regarding Federal Housing Finance Reform. In this memoranda, Donald Trump announced that he would be working with the Secretary of Housing and Urban Development and the Director of the CFPB to see if the QM Patch should be allowed to expire in January 2021 (Trump, 2019). The other event day is the actual announcement from the CFPB that says it plans to let the patch expire in 2021, which occurred on July 25, 2019.

These two dates appear to be the most influential dates in which there were announcements made about the expiration of the QM Patch. According to Bodie et al. (2014), market prices should reflect all currently available information, so the addition of new information to the market, such as these announcements, should also be reflected in market prices (2014). Using the announcement date theory suggested by Bodie et al. (2014), I would be able to see a change in the market prices of homes after the announcement was made that the CFPB would allow for the QM GSE Patch to expire.

Due to the housing market being heavily regulated and loan originations taking a longer period of time than most other market transactions, I look at the month before and the month after the announcement in order to get a more accurate representation of this market. This is due to the fact that the average amount of time it takes to get a mortgage is about 30 days. Along with this, Guntermann et al. (1991) suggest that the real estate market is less efficient than most financial markets, so I most likely wouldn't see a large change overnight. Giving a window of 30 days prior to announcement day as well as 30 days after gives me a better chance of seeing the real estate market reacting to the announcement.

In order to measure the impacts that these announcements had on the housing market, I look at a multitude of different factors. First, I look at the number of loans that were originated 30 days before and 30 days after the announcement date, breaking it down by different "buckets" of debt-to-income ("DTI") ratios. I look at loans originating at DTI less than or equal to 41 percent, 42 percent, at the 43 percent cap, 44 percent, 45 percent, and greater than 45 percent. This way, I was able to see the effects of this announcement on groups that are way above or below the cap, as well as those right around the DTI cap. I expect to see the number of loans above this 43 percent DTI cap to increase following each of the announcement dates that I measure, relative to those that are below the cap. After measuring the number of loans that are originated at each of these levels of DTI, I measure how this announcement affects house prices for each of these DTI buckets. Using LTV and the original loan amount, I'm able to calculate the price of the home in order to see how housing prices react to the announcements of the QM Patch expiration. Along with measuring these specific outcomes, I look at other possible factors that could affect these results or give me more information on what groups of people might be in these different DTI buckets. These factors include measurements such as original LTV, original loan amount, and FICO Score. The FICO Score is used as an indicator for willingness to pay, based upon prior credit history whereas DTI is focused more about a consumer's ability to pay because it reflects their current leverage or free cash flow. The FICO Score is a rank ordering tool to predict the likelihood of a consumer going 90-plus days past due over the next 24 months, with a lower score relating to a bad payer and a higher score relating to a good payer. All of FICO's data comes from the three major credit bureaus: Experian, Equifax, and TransUnion. The data they use does not include demographics or other prohibited factors. (FICO).

In order to calculate all of the data points I mention above, I use the Recursion Cohort Analyzer, which is an agency mortgage querying tool that allows access to all GSE loans at a loan level basis. This database contains all of the data that I need in order to test how many loans were originated in each time period for each different DTI bucket in the tables below. Along with this, I calculate the weighted average home price for each of these different DTI buckets. Through these measurements, I'm able to determine the percent change in each of these variables after the announcement date occurs. Along with looking at these different DTI buckets, I also use loans from the GSEs that are either below or at the DTI cap of 43 percent or above the 43 percent cap.

To determine whether these loans are significantly changing along these event days, I create a dataset that includes five years of GSE loans prior to the event dates. I use data from January 2014 until January 2019, which is also five years of data in which the QM GSE Patch was established. This benchmark consists of the mean percent change in loan count on a monthly basis over the five-year span, as well as the mean percent change in weighted average home price on a monthly basis. With this information, I'm able to calculate the variation in these results in order to determine statistical significance for my event dates to see if there is a true reaction to the different announcements of the QM GSE Patch expiration.

Along with analyzing the reactions to loan count and home price around these event dates, I also look at the market for these loans from the first announcement date up until the latest data published by Recursion. This way, I can properly determine if there is a true market reaction within those 30 days after the announcements, or if this is just a continuous trend in the market from the first announcement to today.

To determine if the differences in the means of percent change of loans or percent change of weighted average home prices, I use a Student's t-test. In this test, I use the five-year benchmark rates that I calculate at each of the DTI "buckets" as well as the rates for below/at the cap and above the cap. I use the t-test for both of the event dates to test for significance in reaction to the announcements as well by subtracting the mean percent change in loan count or home price against the benchmark mean, divided by the standard deviation of the benchmark means. Along with the two event days, I use the same t-tests to determine if the eight-month span between the first announcement and the last published data is a trend or not. For the t-test, since it is monthly reported data, I have 60 data points for the five-year benchmark, so I use 59 as my degrees of freedom and a significance level of α=.05, leading to a t-statistic of about 2. For the eight-month trend, I use the following formula to test for significance in results at each DTI bucket:

$$t = \frac{8 \times (r_{DTI\,\%} - \bar{r}_{DTI\ \%})}{\sqrt{8}\ \times \sigma_{DTI\,\%}}$$

Here, $r_{DTI\ \text{percent}}$ represents the mean percent change at the certain DTI bucket I test, whereas $\bar{r}_{DTI\ \text{percent}}$ is representative of the five-year benchmark mean percent change at the certain DTI level. $\sigma_{DTI\,\text{percent}}$ is the five-year benchmark standard deviation at the DTI level I am testing. Since this testing is over an eight-month period, I take this into account by multiplying the standard deviation by the square root of eight since there are eight observations. I multiply the numerator by eight as well because the return over the period is eight times larger than a single month return.

Along with the Student's t-test, I also conduct a difference in differences test to determine if the mean percent change in loan count above the DTI cap increases at a higher rate than the mean percent change in loan count below or at the DTI cap. I use the same test for the percent change in weighted average home price. The formula I use is the following:

$$t = ((r_{above} - r_{below\ or\ at}) - (\bar{r}_{above} - \bar{r}_{below\ or\ at}))/(\sigma_{above-below\ or\ at})$$

Here, r is representative of the rate of the time period I'm testing, whereas $\bar{r}$ represents the benchmark rate from the five-year period. σ is the standard deviation of the benchmark rate difference in means of above the DTI cap and below or at the DTI cap.

Results

In order to test for the significance in the changes in percent change in loan count as well as the change in weighted average home price, I use a five-year benchmark prior to the event dates as my control. Tables 1 and 2 below shows the results of the five-year time period (January 2014 through January 2019) prior to event dates, which includes the data required for the Student t-tests and the difference in differences tests that I run. Table 1 shows the results of the loan count changes for the GSEs over the five-year period and Table 2 shows the results of the weighted average home price changes for GSE loans over the same period. Both tables show loan information for the different DTI buckets that I test, from less than or equal to 41 percent DTI to greater than 45 percent.

TABLE 1

DTI (percent)	Mean Change	Variance	Standard Deviation	Standard Error	FICO
≤ 41	0.9537 %	1.59320E-05	0.003991494	0.00051965	754.73
42	1.4229 %	3.07458E-05	0.005544888	0.00072188	743.55
43	1.4808 %	3.48690E-05	0.005905002	0.00076877	742.30
44	1.5131 %	4.03432E-05	0.00635163	0.00082691	740.43
45	1.5347 %	2.97341E-05	0.005452898	0.00070991	738.25
> 45	0.9898 %	4.64007E-05	0.006811804	0.00088682	739.36

TABLE 2

DTI (percent)	Mean Change	Variance	Standard Deviation	Standard Error	FICO
≤ 41	0.0820 %	6.22438E-07	0.000788948	0.00010271	754.73
42	0.0652 %	5.02179E-07	0.000708646	0.00009226	743.55
43	0.0625 %	3.83975E-07	0.000619657	0.00008067	742.30
44	0.0546 %	3.39345E-07	0.000582533	0.00007584	740.43
45	0.0833 %	2.44901E-07	0.000494874	0.00006443	738.25
> 45	-0.3137 %	1.42218E-06	0.001192551	0.00015526	739.36

From Table 1, it can be seen that over the five-year benchmark period, we do see a continuous trend in growth in the number of GSE loans, with all percent changes in the mean at each bucket being above zero. Table 2 presents the data on weighted average home price changes over the benchmark period. As shown above, there seems to be very miniscule changes to weighted average home price amongst the different DTI levels that I test for. There is still an increase in weighted average home price at most levels of DTI; however, at the greater than 45 percent DTI level, there is a more significant decrease in home price, decreasing by -.3137 percent on average over the five-year period.

Tables 3 and 4 show the data on the same information as tables 1 and 2, but instead of breaking it down by individual DTI levels, it is broken into the two groups of below or at the DTI cap or above the DTI cap. In addition to the two groups, I add the group of above the DTI cap minus below or at the DTI cap for my difference in differences calculations. Table 3 shows the results from the five-year benchmark in regards to average percent change in loan count and Table 4 shows the results regarding the average percent change in weighted average home price.

TABLE 3

DTI	Mean Change	Variance	Standard Deviation	Standard Error	FICO
Below/At	0.9951 %	1.67626E-05	0.004094220	0.00052856	753.6357
Above	1.1942 %	7.18619E-06	0.002680707	0.00034608	739.2733
Above-Below	0.1991 %	2.7658E-05	0.005259084	0.00068467	-14.3625

TABLE 4

DTI	Mean Change	Variance	Standard Deviation	Standard Error	FICO
Below/At	0.0821 %	5.84158E-07	0.000764302	9.95037E-05	753.6357
Above	0.2172 %	4.89414E-07	0.000699582	9.10778E-05	739.2733
Above-Below	0.1351 %	1.99053E-07	0.000446154	5.80843E-05	-14.3625

Table 3 provides data on the mean percent change in loan count along with the variance, standard deviation, and standard error for the benchmark period. The results here show that over the benchmark period, the mean percent change in the number of loans greater than the DTI cap of 43 percent is larger than the mean percent change in the number of loans below or at the DTI cap by .1991 percent. Table 4 presents data on the weighted average home price change below or at the DTI cap and above the cap. In this table, it shows that there was an increase in weighted average home price above and below the cap. Similar to Table 3, the increase in home prices above the DTI cap is greater than the changes that are seen below or at the cap.

Event Date 1: March 27, 2019

To test for the significance of the results of the first event date, President Trump's Memoranda on Housing Reform, I calculated the mean percent change in loan count and weighted average home price for the month prior to the event and the month after the event. These calculations allow me to run the Student t-tests and the difference in differences test for this event date. Table 5 shows the results of the loan count changes for the GSEs over the event date period and table 6 shows the results for weighted average home price changes for GSE loans over the same period.

TABLE 5

Below/At						
DTI	% Change Around Event Date		% Change During Benchmark Period			Difference in means event vs. benchmark
	Mean	FICO	Mean	Standard Deviation	FICO	t-statistic
≤ 41	0.3845%	753.01	0.9537%	0.003991	754.73	-1.4261422
42	0.6420%	741.83	1.4229%	0.005545	743.55	-1.4083323
43	0.6353%	740.64	1.4808%	0.005905	742.30	-1.4319214
Avg. Below/at	0.4083%	745.16	0.9951%	0.004094	753.64	-1.4332889
Above						
DTI	% Change Around Event Date		% Change During Benchmark Period			Difference in means event vs. benchmark
	Mean	FICO	Mean	Standard Deviation	FICO	t-statistic
44	0.6042%	738.51	1.5131%	0.006352	740.43	-1.4309578
45	0.7464%	735.98	1.5347%	0.005453	738.25	-1.4456068
> 45	1.0438%	740.00	0.9898%	0.006812	739.36	0.07921383
Average Above	0.8866%	738.16	1.1942%	0.002681	739.27	-1.1475852
Difference in means Below/at vs. Above						
t-statistic						
0.530864452						

TABLE 6

Below/At						
DTI	% Change Around Event Date		% Change During Benchmark Period			Difference in means event vs. benchmark
	Mean	FICO	Mean	Standard Deviation	FICO	t-statistic
≤ 41	0.1220%	753.01	0.0820%	0.000789	754.73	0.506059706
42	0.1113%	741.83	0.0652%	0.000709	743.55	0.650297482
43	0.1392%	740.64	0.0625%	0.00062	742.30	1.238358879
Avg. Below/at	0.1242%	745.16	0.0821%	0.000764	753.64	0.550959157

Above						
DTI	% Change Around Event Date		% Change During Benchmark Period			Difference in means event vs. benchmark
	Mean	FICO	Mean	Standard Deviation	FICO	t-statistic
44	0.0860%	738.51	0.0546%	0.0005825	740.43	0.5394846
45	0.1316%	735.98	0.0833%	0.0004949	738.25	0.9761467
> 45	0.2269%	740.00	-0.3137%	0.0011926	739.36	4.5331618
Average Above	0.1489%	738.16	0.2172%	0.0006996	739.27	-0.975712

Difference in means Below/at vs. Above
t-statistic
-2.473785

Table 5's results show that after the event date, the mean change in loan count increases both below/at the DTI cap, as well as above the cap. Beyond that, it also shows that at each of the DTI buckets, loan counts are increasing. These results also show that the mean loan count change above the DTI cap is larger than the change below or at the cap by about .4783 percent. Table 6 presents results of an increase in the mean change of weighted average home price from before the event date to after the event date at each of the DTI buckets. These changes are much smaller than those seen in Table 5 but are still all increasing after the March 27^{th} event date.

I use these results from Tables 5 and 6 in order to determine if these mean percent changes over the event period are significant. Table 5 shows the results of the Student t-tests and difference in differences test for the loan count changes over the first event period. Table 5 shows that at each of the DTI buckets, the t-statistic is less than the benchmark value of t=2. These results go against my hypothesis that the percent change in loans would increase above the cap at a significant amount. Along with the t-tests, the calculation for the difference in differences test of mean percent change above the DTI cap against the mean percent change below or at the cap shows non-significance, with a t-value of .53086. Overall, the results from the first event date in regard to loan count are not aligned with my hypothesis.

Table 6 presents the results of the Student t-tests for the mean percent change for weighted average home price over the event period tested against the five-year benchmark, as well as the results from the difference in differences test. Above, the results from table 6 show that at the DTI buckets from less than or equal to 41 percent to

45 percent, the changes in home price from the month prior to the first event date to the month after the date are insignificant. However, at the greater than 45 percent DTI bucket, the changes are statistically significant, with a t-statistic of 4.533, greater than 2. This significant value at the greater than 45 percent DTI bucket is a result of the five-year benchmark mean percent change at that bucket decreasing while in the event period, mean percent change increased. In regard to the Student t-tests below and at the DTI cap and above the cap, neither of those results can be considered statistically significant. For the difference in differences test, the results show that it is technically significant; however, it is the opposite of my hypothesis. This shows that the rate at which weighted average home price increased above the DTI cap against those below or at the cap in the event period was less than the difference in the benchmark period. Like the results from table 5, the results from table 6 also do not align with my hypothesis, except at the greater than 45 percent DTI bucket for mean percent change in weighted average home price. The first event date study for March 27th, 2019 is mostly insignificant in support of my hypothesis of increases in the number of loans above the DTI cap and an increase in weighted average home price above the DTI cap.

Event Date 2: July 25, 2019

Similar to my first event date, I once again calculated the mean percent change in loan count and weighted average home price for the month prior to the event and the month after the event to test for significance around the CFPB's announcement to let the QM Patch expire in 2021. Table 7 shows the results for the mean percent change in loan count from the month prior to announcement day to the month after. This table shows that the loan count from the month prior to the announcement to the month after increased at every DTI bucket, with a higher percentage change in those buckets greater than the DTI cap of 43 percent. The table also shows that there is an increase in mean change in the below or at the DTI cap group as well as the above the cap group, with a difference of about .3547 percent between the above group and the below or at group.

TABLE 7

Below/At						
DTI	% Change Around Event Date		% Change During Benchmark Period			Difference in means event vs. benchmark
	Mean	FICO	Mean	Standard Deviation	FICO	t-statistic
≤ 41	0.7632%	753.25	0.9537%	0.003991	754.73	-0.477387777
42	0.8639%	742.07	1.4229%	0.005545	743.55	-1.008059899
43	0.8456%	740.89	1.4808%	0.005905	742.30	-1.075802406
Avg. Below/at	0.7718%	745.40	0.9951%	0.004094	753.64	-0.545396638
Above						
DTI	% Change Around Event Date		% Change During Benchmark Period			Difference in means event vs. benchmark
	Mean	FICO	Mean	Standard Deviation	FICO	t-statistic
44	0.8456%	738.74	1.5131%	0.0063516	740.43	-1.050916219
45	0.9141%	736.22	1.5347%	0.0054529	738.25	-1.138148891
> 45	1.3214%	741.32	0.9898%	0.0068118	739.36	0.486749865
Average Above	1.1265%	738.76	1.1942%	0.0026807	739.27	-0.252752011

Difference in means Below/at vs. Above
t-statistic
0.2957587

TABLE 8

Below/At						
DTI	% Change Around Event Date		% Change During Benchmark Period			Difference in means event vs. benchmark
	Mean	FICO	Mean	Standard Deviation	FICO	t-statistic
≤ 41	0.4289%	753.25	0.0820%	0.000789	754.73	4.396889142
42	0.2993%	742.07	0.0652%	0.000709	743.55	3.303138352
43	0.2650%	740.89	0.0625%	0.00062	742.30	3.268711911
Avg. Below/at	0.3300%	745.40	0.0821%	0.000764	753.64	3.243251468
Above						
DTI	% Change Around Event Date		% Change During Benchmark Period			Difference in means event vs. benchmark
	Mean	FICO	Mean	Standard Deviation	FICO	t-statistic
44	0.2650%	738.74	0.0546%	0.0005825	740.43	3.61293771
45	0.2768%	736.22	0.0833%	0.0004949	738.25	3.91108165
> 45	0.3555%	741.32	-0.3137%	0.0011926	739.36	5.61165382
Average Above	0.2997%	738.76	0.2172%	0.0006996	739.27	1.17904614
Difference in means Below/at vs. Above						
t-statistic						
-3.707206						

Table 8 presents the data on the mean percent change in weighted average home price from the month prior to announcement date to month after. The results from this table show that there was an increase in weighted average home price after the CFPB's announcement of their plan to let the QM Patch expire. At each different DTI bucket there was an evident increase, as well as in the two groups of below or at the DTI cap and above the DTI cap. However, it also shows that the weighted average home prices below or at the DTI cap increased more on average than those above the cap.

Using the results calculated in tables 7 and 8, I calculate whether or not these results can be considered statistically significant against the five-year benchmark. Table 8shows the results from the Student t-tests for the different DTI buckets as well as the difference in differences test of mean percent change above the DTI cap versus below or at the cap. Table 7 results show that at each of the DTI buckets as well as the two below or at the cap and above the cap groups are insignificant according to the Student's t-test, as all of the t-statistics calculated are below the t-statistic of 2. Along with the Student t-tests, the difference in differences test also shows to be insignificant as the rise in mean percent change in loan count during the event period was not as great as the rise during the five-year benchmark.

Table 8 presents the results from the t-tests and difference in differences test for the mean percent change in weighted average home prices during the second event period. I calculate the t-statistics for each of the DTI buckets and the two groups of above the DTI cap and below or at the cap. The results from Table 8 show that at each of the DTI buckets that there is a significant change in the mean percent change of weighted average home prices against the benchmark changes. This portion aligns with my hypothesis that there would be a significant change in reaction to the CFPB's announcement to let the QM Patch expire. However, when I run a t-test for the entire group that is above the DTI cap of 43 percent, it becomes insignificant against the benchmark. For the difference in differences test, the result that I calculate shows that it is significant; however, this result is the opposite of what my hypothesis is for the change in home prices. This result of a t-statistic of -3.7072 shows that the mean percent change in weighted average home prices below or at the cap increased at a higher percent in the event day period than those above.

The second event date of July 25th, 2019 shows some significance in regard to an increase in weighted average home price in the event window after the announcement. However, the difference in differences test for weighted average home price reacts in a different manner than I expect, where there is a negative, significant t-statistic. For the mean percent change in the number of GSE loans, there are no significant results aligning with my hypothesis.

Eight Month Trend:

To determine whether there were actual reactions or not to these different announcement dates, I use GSE loan data for an eight-month period, stretching from the first announcement period in February up until October 2019, which is the latest published GSE loan data. From this data, I calculate the mean percent change in loan count over the eight-month period for each DTI bucket as well as the mean percent change in weighted average home price. Table 9 shows the results of the calculations on mean percent change in loan count over the eight-month period.

TABLE 9

Below/At							
DTI	% Change Around Trend Period			% Change During Benchmark Period			Difference in means event vs. benchmark
	Mean	Standard Deviation	FICO	Mean	Standard Deviation	FICO	t-statistic
≤ 41	0.4690%	0.0013189	753.15	0.9537%	0.003991	754.73	-10.3948994
42	0.6429%	0.0015206	741.97	1.4229%	0.005545	743.55	-14.5077986
43	0.6315%	0.0013821	740.78	1.4808%	0.005905	742.30	-17.3804664
Avg. Below/at	0.4847%	0.0012931	751.91	0.9951%	0.004094	753.64	-3.52617496
Above							
DTI	% Change Around Trend Period			% Change During Benchmark Period			Difference in means event vs. benchmark
	Mean	Standard Deviation	FICO	Mean	Standard Deviation	FICO	t-statistic
44	0.6092%	0.001322	738.64	1.5131%	0.0063516	740.43	-19.341728
45	0.7324%	0.001445	736.12	1.5347%	0.0054529	738.25	-15.701914
> 45	1.0758%	0.002082	740.65	0.9898%	0.0068118	739.36	1.1680496
Average Above	0.9043%	0.001722	739.28	1.1942%	0.0026807	739.27	-4.7616915
Difference in means Below/at vs. Above							
t-statistic							
0.41920013							

Table 9 shows that the mean percent change in loan count was increasing across each DTI bucket during the eight-month trend period. Table 9 also shows that over the eight-month period, there was a larger rise in the mean percent change of loan count for those above the DTI cap (.9043 percent) than those below or at the cap (.4847 percent).

TABLE 10

Below/At							
DTI	% Change Around Trend Period			% Change During Benchmark Period			Difference in means event vs. benchmark
	Mean	Standard Deviation	FICO	Mean	Standard Deviation	FICO	t-statistic
≤ 41	0.2203%	0.0012353	753.14574	0.0820%	0.000789	754.73	4.955633989
42	0.1727%	0.0007942	741.96738	0.0652%	0.000709	743.55	4.286931144
43	0.1594%	0.0007261	740.77979	0.0625%	0.00062	742.30	4.422846002
Avg. Below/at	0.2146%	0.0011749	751.91108	0.0821%	0.000764	753.64	4.905110626
Above							
DTI	% Change Around Trend Period			% Change During Benchmark Period			Difference in means event vs. benchmark
	Mean	Standard Deviation	FICO	Mean	Standard Deviation	FICO	t-statistic
44	0.1430%	0.00087	738.64	0.0546%	0.0005825	740.43	4.29642054
45	0.1635%	0.000762	736.12	0.0833%	0.0004949	738.25	4.58895114
> 45	0.2402%	0.00159	740.65	-0.3137%	0.0011926	739.36	13.138025
Average Above	0.2079%	0.001226	739.28	0.2172%	0.0006996	739.27	-0.377889
Difference in means Below/at vs. Above							
t-statistic							
-3.1803668							

Table 10 presents the data on weighted average home prices for the same eight-month period. From this table, it can be seen that there is an increase in mean percent change of weighted average home prices during the trend period, with the largest increases coming from the DTI buckets less than or equal to 41 percent (.2203 percent) and greater than 45 percent (.2402 percent). Also, there is an increase at both the groups of below or at the DTI cap and above the cap, with a larger increase in the group below or at the cap by less than .01 percent.

Using results from Tables 9 and 10, I then run Student t-tests for each of the DTI buckets, as well as a difference in differences test for the mean percent change above the DTI cap minus the mean percent change below or at the cap. In Table 9, I present the results of these tests for the changes in loan count data over the eight-month period against the five year benchmark results using the formulas from the methodology section of this paper.

The results show that over the eight-month trend period, the mean percent loan count change for almost each of the DTI buckets is significant; however, these significant results are not in support of my hypothesis as these show that the mean percent change in loan count over the period was significantly less than those changes during the five-year benchmark period. Only in the DTI bucket of greater than 45 percent DTI was there a positive t-value, but the result is still insignificant. The difference in differences test also comes out to be an insignificant result, with a t-value of .4192.

Table 10 presents the results from the t-tests on the mean percent change of weighted average home price over the eight-month period against the benchmark period.

It also includes the results from the difference in differences test for mean percent change above the DTI cap minus the mean percent change below or at the DTI cap for the eight-month period. The results from Table 10 show that there is a significant trend over the eight-month period in mean percent change of weighted average home prices. At each of the DTI buckets from less than or equal to 41 percent to greater than 45 percent, there is a positive, significant t-value that shows there was a significant increase in the weighted average home price from the first announcement date to the latest published GSE loan data. When looking just at the group that is below or at the DTI cap, there is still a significant increase in weighted average home price over the eight-month trend period; however, when isolating the loans that are above the cap, the t-value for that group is insignificant, not aligning with my hypothesis. The difference in differences test for the mean percent change in weighted average home price above the DTI cap versus the mean percent change below or at the DTI cap is significant as well but goes directly against my hypothesis. This result shows that the change in weighted average home price below or at the 43 percent DTI cap increased at a higher rate than those above the DTI cap.

The eight-month trend period shows that there were increases in the mean percent change of GSE loans as well as in mean percent change of weighted average home prices. However, in regard to my hypothesis, the changes for mean percent loan count had negative t-value, which does not support my expectations. The mean percent change in loan count for the GSEs showed they were not increasing as much as they were during the five-year benchmark period. In regard to mean percent change in weighted average home price, there is significance when looking at individual DTI buckets over the eight month trend period. However, when looking at a combination of those above the DTI cap, it appears to be insignificant when testing against the benchmark period.

Also, a trend that I notice is that typically, those with lower DTI ratios have a higher FICO Score than those with DTI ratios above 43 percent. This seems to make sense as the FICO Score accounts for amounts owed, such as leverage and utilization, and makes up 30 percent of the calculated score (myFICO). Since a higher DTI ratio shows that one may be overextending on their credit, this could be a result of a lower FICO Score. However, when looking at the DTI buckets of greater than 45 percent, there is an increase in the average FICO Score for that bucket compared to the rest of the buckets greater than the DTI cap. Typically, the GSEs don't accept loans greater than 45 percent DTI, but there is an exception made for compensating factors that allow for these loans to be written by the GSEs (Fannie Mae, 2019). This is the reason for that increase in average FICO Score for the DTI Ratio, as one of the compensating factors required for when one's DTI ratio is greater than 45 percent is a higher required FICO Score than those below 45 percent.

Conclusion

In this paper, I examine the effects of the QM GSE Patch expiration on the GSE residential real estate market, specifically on the number of loans originated and weighted average home price. Using data from Recursion Co., which provides loan level data on all GSE loans, I'm able to calculate the number of loans originated and weighted average home price for the different time periods I'm measuring. The results I calculate show the differences between announcement dates of the QM Patch expiration and a five-year benchmark period from prior to the first announcement. I hypothesize that the mean percent loan count change and mean percent weighted average home price change for loans above the DTI cap would increase at a higher rate than those below or at the cap as the GSEs try to push through more loans now before competition joins this non-QM market. There is an increase around these event periods as well as during the eight-month trend, but according to Student t-tests and difference in differences tests of announcement periods versus the five year benchmark, there does not appear to be statistically significant results that support my hypothesis.

My findings contribute new information to literature regarding the QM Patch, specifically the expiration of the patch in 2021. Most information prior to this paper is surrounding what a future without a QM Patch will look like, whereas this research shows the immediate impacts of what occurred after announcements of the expiration. These findings may be of interest to those interested in the effects of announcements of the QM Patch expiring in 2021, as well as those who are interested in how the QM Patch has impacted the number of loans the GSEs are obtaining and the change in home prices in the non-QM market versus the QM market.

Overall, this study highlights that the QM Patch has been associated with a rise in weighted average home price and the number of loans Freddie Mac and Fannie Mae have originated or purchased, especially in the non-QM market. At the same time, we see that these increases during announcement periods are not significant compared against a five year, non-announcement, benchmark period.

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