

Setting a Principal to Interest Cap on the Issuance of Home Mortgages: a Proposed Change to Mortgage Underwriting Rules Designed to Control Housing Price Inflation

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Abstract

Traditionally most home buyers in the US need a mortgage and the current system of mortgage origination creates an incentive for borrowers to offer bids on homes far higher than would be possible without that system.¹ This has inflated home values, increased financial indebtedness, and has increased banking profits without extensively helping other players in the market. Over the past 50 years it has become easier to get a mortgage and it has become common for people to buy homes with little down and long repayment times. The result has been that for many borrowers almost all of the mortgage payment goes to pay for interest on the loan. In the 1950s, housing accounted for 22% of the household budget; that rose to 33% by 1980 and 43% today. The mortgage industry is supposed to help foster affordable home ownership yet, as currently instituted, it has resulted far greater expense leading to further hardships for those Americans with low incomes. This essay will explore how a rule to cap the principal to interest ratio in mortgage payments would impact the relevant institutions and offer an overview of how such a rule would guide society to a more socially desirable outcome.²

I. Introduction

A debt driven business cycle has its foundations within institutional thinking going back to Veblen. Recent work on a debt driven business cycle include both institutional thinkers and more mainstream theorists (Godley and Wray, 2000; Maki and Palumbo, 2001; Guttman and Philon, 2010; Kaboub et al., 2010; Watkins 2010; Wunder, 2012). Since the 2008 crisis household debt is not only entering into the discussion it is also entering into more mainstream models being used to describe the economy (Beaudry and Lahiri, 2009; De Antoni, 2010; Bhaduri, 2010; Kumhof and Ranciere, 2010).

The biggest part of household debt is mortgage debt and in exploring this topic there seems to be four general areas of analysis within recent literature: 1. some papers explore mortgage issues within a historical background (Green and Wachter 2005; Wheelok 2008). 2. A second group of papers explores who issued bad mortgage debt recently and explores some of the issues involved (Ben-David 2011; Nesiba, Sorenson, and Sturm 2012). 3. Another group of researchers offer insights into potential ways to deal with bad mortgages (Chang Et Al 2011; Zalewski 2011; Marshall and Choncha 2012; Zalewski 2012). 4. The last grouping of papers strives to explore the mechanics of how mortgage debt has impacted personal finances (Weller and Sabatini, 2008; Fisher and Gervais 2011; Holstein et al 2013). This paper will pull together strands from groups 2, 3, and 4 to suggest a new type of policy that could deal with the underlying issue of inflating home prices over time.

II. A Prisoner's Dilemma in Housing

At first glance the US mortgage system appears to help buyers by increasing borrowing flexibility but on

¹ Recently there has been a remarkable increase in the numbers of all cash purchases. Prior to 2008 20% of sales were all cash but current numbers suggest that cash sales have risen to as high as 60% of all home sales as of summer 2013 (Timiraos 2013). These cash sales seem to be coming from large investment companies buying up huge swaths of housing for investment purposes. Whether this trend will continue is questionable, and more recent numbers show that this trend is diminishing. Ultimately if the majority of all sales continue to be cash what type of home mortgage a household can get will be irrelevant as home ownership becomes out of reach for all but the highest income households.

² The author has no personal or professional links to the banking industry. This is original work not published elsewhere.

closer inspection it also creates a dynamic that may hurt buyers in the long run. The home mortgage system in the US allows a great deal of flexibility in obtaining funds by allowing buyers to pay back a loan over an extremely long period with fixed payments and a fixed interest rate. This flexibility enables individuals to borrow much larger amounts than would be possible without such flexibility, and this flexibility is often touted as helpful to lower income buyers. Lenders argue that by making it easier to get a mortgage low income households are able to borrow more and may be able to buy homes that would not be available without that ability to borrow. However this increased individual flexibility becomes neutralized once it is realized that all household have been granted access to this increased borrowing capacity.

It is simple to think about this negative pricing dynamic within a prisoner's dilemma framework. Consider two differing households that have identical credit scores, financial histories, and incomes. Both households are looking to buy the same house and both can afford the exact same amount in monthly payment. Now each of these households enters into the mortgaging process and they each are offered a choice of mortgages. Option one has stricter payment terms that forces more of the payment to go into paying off Principal and thus leads to a quicker payoff time and less money being paid to finance. Option two has easier payment terms wherein the borrowing household pays for a longer period, pays more in interest, but allows for a marginally higher amount to be borrowed.

From a financial perspective both households would be better off getting a strict loan thereby paying less for financing, however, if either borrowing household chooses the stricter loan, the amount they could borrow is diminished and that household will lose the bidding war for the home. Thus both households are forced to choose the easier terms resulting in both being able to borrow a marginally greater amount and both being able to bid up the price of the house. In the end the looser terms on the loan does not actually lead to any advantage in buying the house but rather simply forces both households into paying more to get the same housing product.³

It is not hard to extend this dynamic in an aggregate manner. It may seem like the looser terms would allow a household to move from buying a low priced home into being able to afford a mid or high priced home however if all households have equal access to easier credit then any gains for an individual household resulting from the looser terms are neutralized by those same terms being available to other similar households. In essence it is like taking steroids in sports. If only a single competitor takes steroids they could potentially do better than non-steroid takers, however if all competitors are taking steroids all individual advantages are neutralized. If any competitor has the option of cheating all competitors are forced to the cheating option simply in order to stay competitive.

It might be argued that this prisoner's dynamic makes home buyers worse off but this dynamic also makes home sellers better off, yet this is only true if the home seller is not also the prime user of housing services provided by the home. Consider a person moving from location A to location B wanting to get a similar house with identical characteristics. This seller gains from the prisoner's dynamic on the selling side of any transaction but any gain on the selling side is fully neutralized on the buying side as the house price at location B increases the same amount that the selling price increased by at location A. If a user of housing is going to use the same level of housing post transaction then the gains made on the sale of the house in terms of higher selling price will be exactly offset by the higher buying price that will be paid to get a replacement residence. So the only real gains to be made from higher home prices are being made by builders selling new homes which account for about 10% of home sales and those individuals no longer needing housing.⁴ The real gains being made from this issuance of these mortgages are being captured by the lenders.

The next section will explain how the prisoner's dilemma above finally is settled based upon

³ This prisoner's dilemma with respect to borrowing could be extended to the auto loan market. Since supply is much less elastic with respect to housing versus autos it may not be possible to make exactly the same case. In the US auto loans were limited to 2 years in the 1970s and, as of today, 7 year terms are commonly available. This suggests that perhaps a similar dynamic to the housing market is occurring in the auto market. Yet exploration of this topic must happen elsewhere.

⁴ A person reviewing this paper brought up the issue of the capital gains acquired by housing investors as a result of the looser mortgage rules. Yet on closer examination it should become clear that looser housing rules only result in a one-time capital gain as the housing price is pushed higher. The housing, investor looking for rental income, would not be better off due to looser lending rules since what they are selling is the housing services from the home. In all relevant ways the landlord is in the same position as is the homeowner/user. Only the land speculator would be benefitted from looser mortgage rules.

constraints set by banks upon how much can be borrowed. The upper end, or cap, on what the bidders are allowed to bid is currently being set by the banking industry and the industry is benefiting from setting a looser cap whereas homeowners are not. The paper will then explore the option of using a regulation to tighten that cap thereby diminishing the negative externalities created by the prisoner's dilemma described above.

III. The Price of Flexibility

In order to understand what is happening in the mortgage market it is best to consider the decisions being made at the time of mortgage origination. All mortgages are a stream of payments over an agreed upon time period made in exchange for a lump sum amount received immediately. Three choices are being made when taking out such a loan; how much of the Principal will be paid in each period, the interest rate, and how many payments will be made. For example, if the borrower agrees to make 360 monthly payment of \$1498.88, with an agreed upon interest of 6% the present value is \$250,000 and that is how much a bank will be willing to give the borrower.⁵ Under this agreement the borrower is implicitly agreeing to pay \$248.88 in Principal on the first payment and \$1,250 in interest, or instead it could be thought of in terms of the Principal interest breakdown.⁶ In this example the borrower is paying 16.6% Principal and 83.4% interest on the first payment. If the payment amount and interest rate are both kept constant, but term is shortened to 348 monthly payments, the amount borrowed shrinks to \$246,930.48 and the first payment is \$264.23 Principal and \$1234.65 interest (a 17.6/82.4 Principal to interest ratio). Conversely it is equally valid to consider that what is being done here is the borrower and lender are agreeing on an interest rate, a number of payments and a starting Principal to interest ratio. By altering any of these three terms the amount of the loan is altered.

This framework makes considering prisoner's dilemma above easier. If two bidders have the same ability to make a monthly payment, and the interest rate is set by the market, then the two bidders are really only looking at changing the number of payments and the starting Principal to interest ratio, which is actually the same decision. Each bidder can change the Principal to interest ratio by increasing or decreasing the total number of monthly payments they make. The prisoner's dynamic will result in each bidder increasing the number of monthly payments until they are met with the constraint set in the system, in this case the 360 monthly payments allowed by the bank. So the amount that can be borrowed is being set by a Principal to interest cap (PIC) that is implicitly being put in place by the bank as the bank limits the length of the mortgage to a maximum of 30 years.⁷

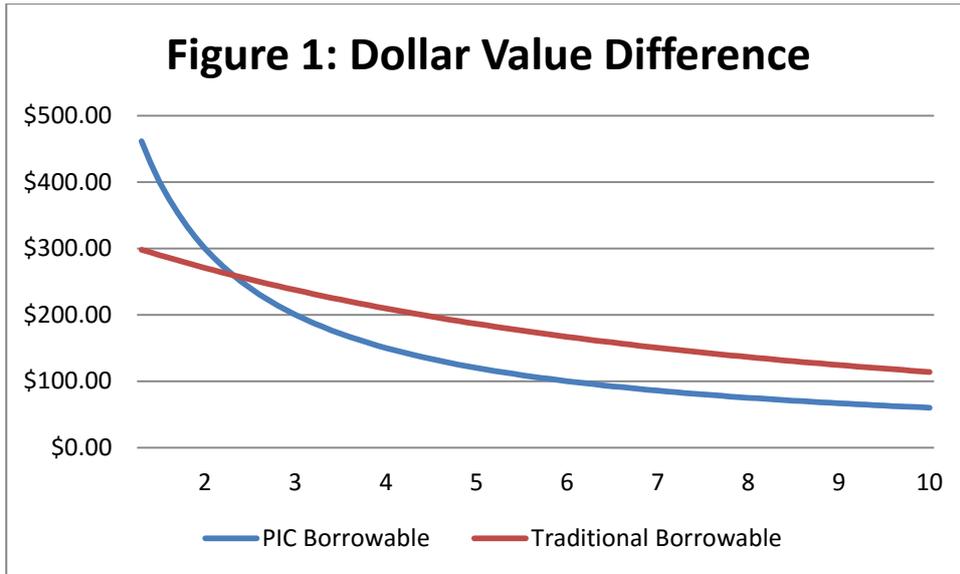
Suppose that instead the PIC were set through a regulation capping the maximum Principal to interest allowed and then allowing the number of payments to be the result of setting a PIC. The PIC could be set at any ratio (20/80; 30/70) but for sake of analysis in this paper a 50/50 ratio will be used. Depending on the interest rate this would alter the dynamics of how much a household could borrow, how long it would take to repay the loan, and alter how much interest was paid during the life of the loan.

Using a fixed payment of \$1 per month the dynamic properties of a 50/50 PIC and a traditional 30 year mortgage become clear. At rates below 2.4% this PIC allows for an increase in the amount that can be borrowed however at rates above 2.4% this PIC lowers the amount that can be borrowed. Figure 1 shows the comparison. Figure 2 shows the percentage differences over interest rates and it shows that as interest rates get higher the percentage decline in the amount that is borrowable under a 50/50 PIC levels off at around 50% less than the amount that can be borrowed under a conventional 30 year mortgage.

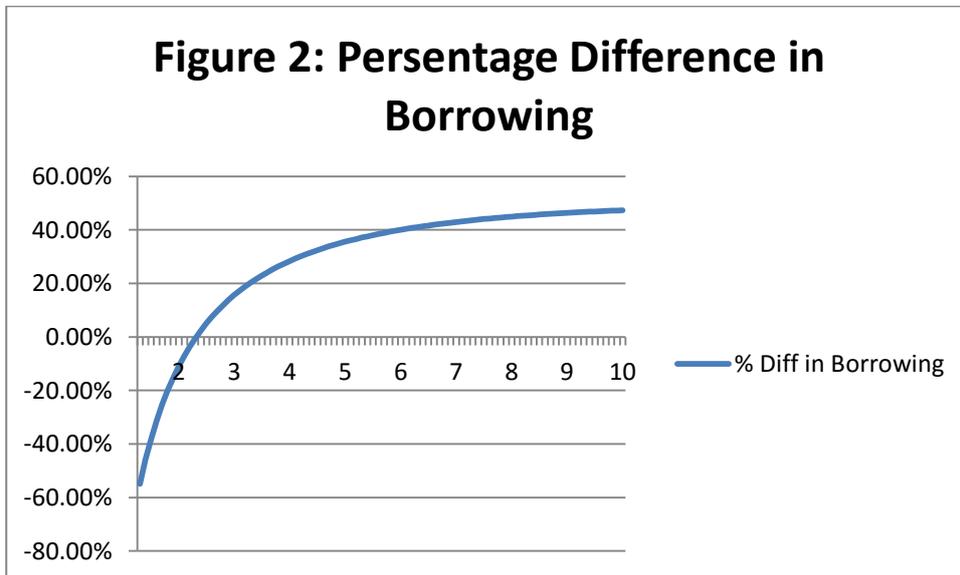
⁵ Or for a more general valuation of a mortgage value you can use the present value equation. $PV = F [1/i] [1 - 1 / (1+i)^n]$ Where PV is the present value (the amount of the mortgage), i is the interest rate, F is the payment each period, and n is the number of periods. Thus a payment of \$1498.88 ($F = 1498.88$) at an annual interest rate of 6% (monthly rate of $i = .06/12$) for 360 months ($n=360$) will get a loan amount of \$250,000.

⁶ More generally the amount paid in Principal on the first payment will be $i * PV$ and the amount paid in Principal will be $F - i * PV$. So with a PV of \$250,000, i of .005 (6% annual over 12 months) interest is 1250 and Principal is 248.88

⁷ The choice to call this a cap instead of a floor is the idea of what is being regulated. It seems that what is being called into question is how much of the payment should go to pay interest? If the payment is going mostly to interest when the ratio is changed from 90% interest to 50% interest you are in essence capping the interest in any given payment. Subsequently you could call it a Principal payment floor but PIC is an easier acronym to use.



Source: Author's calculations



Source: Author's calculations

To make the differences more tangible consider once again the \$250,000 dollar 30 year mortgage at 6% used as an example above. The payment of \$1498.88 under a 50/50 PIC at 6% would only get a borrower \$149,888. In order to be able to borrow \$250,000 under a 50/50 PIC the borrower would have to be willing to make monthly payments of \$2,500.⁸ By setting a more restrictive PIC the amount borrowed would be limited helping alleviate the prisoner's dilemma. The next section will compare the costs and benefits of implementing a PIC regulation to a hypothetical buyer/seller of a house.

⁸ Calculating the payment using a 50/50 PIC starts by calculating the value of the first payment where the interest on the first payment would be the same as the interest paid on the first payment of a traditional mortgage ($PV * i$), in this case $\$250,000 * .005 = \1250 . Since Principal must be equal to interest, F now becomes $\$1250$ interest + $\$1250$ Principal or $\$2500$. Once the first payment is determined the length of the loan can be calculated by rearranging the PV function above. Taking $PV = F [1/i] [1 - 1 / (1+i)^n]$ and solving for n gets $n = \text{LN} \{1/[1-(PV*i/F)]\} * \{1/\text{LN}(1+i)\}$. Thus with a \$250,000 mortgage and a \$2500 monthly payment at a yearly interest rate of 6% the number of payments would be 138.9. Getting the lower loan value associated with the lower payment of 1498.88 would be done in a similar manner. Starting with the first payment of 1498.88, and knowing that half of the payment goes to interest, it becomes possible to calculate the PV of the loan. $PV * i = F/2$; or $PV * .005 = 1498.88 / 2$. Thus $PV = \$149,880$ To be sure that the valuations are the same for this loan as any other present value loan it is possible to take a payment of 1498.88 with in interest rate of 6% and a period of 138.9 and calculate the PV; which works out to \$149,880.

IV. Costs and Benefits of a PIC

In order to compare the costs and benefits of a PIC over current mortgage practices it is best to think about the sale of a house using the same person as both the buyer and the seller. Extending the analysis offered in section 1 consider a person moving from location A to location B wanting to get the same level of housing. Easier mortgage terms result in a higher selling price but also result in an equally higher buying price at location B. The increased housing prices only benefit new home sellers, home sellers not looking for housing services, and mortgage lenders. Easy mortgage terms increase home prices however increased home prices do not translate into captured value to the home user. Instead increased home prices serve to create economic rent opportunities to the financiers of these transactions. Larger mortgages result in higher returns to the banks with few advantages to other players in the market.

In terms of how much extra value is extracted by the mortgage lender by allowing an easier PIC consider the \$250,000 mortgage given above. Under a traditional 30 year mortgage, at 6%, the borrower will pay back \$250,000 in Principal and additional \$289,595 in interest over the life of the loan (this can be seen in Table 1 below for an interest rate of 6%). The financier however is usually more interested in what any given mortgage can be sold for after issuance. This 'market value' of a loan is determined by revaluing the loan using a secondary interest rate representing the next best alternative an investor could get when investing in another instrument. For example if the best alternative is a treasury note then the comparison would be the interest rate on the note to the interest earned on the mortgage. The 'market value' of the mortgage is the present value of the stream of mortgage payments valued using the opportunity cost of the alternative investment as the benchmark. The amount loaned is based upon the interest rate paid by the borrower but the value of the loan is based upon that discounted interest rate. So the present value of 360 monthly payments \$1498.88 at a yearly interest rate of 6% is \$250,000 however the market value when using a lower interest rate of 4% is actually around \$314,000. The difference between the two being the potential gains a mortgage lender could make by selling the loan after origination. The same \$250,000 borrowed under a 50/50 PIC, at 6%, would generate 138.9 payments of \$2500 but the market value using a 4% discount rate would only be worth \$277,711.64. Table 1 shows that using a 2% differential between the borrowing rate and the discount rate a 50/50 PIC is much less profitable to a bank than is a traditional 30 year loan.

Table 1: Comparison of the Market Value of Loans⁹

Interest Rate	Loan Amount	Monthly PIC Payment	Number of PIC Payments	Value to Bank 30 year	Value to Bank PIC
3	\$355,518.42	\$1,777.59	277.605302	\$466,012.38	\$440,385.21
4	\$313,957.26	\$2,093.05	208.290536	\$405,519.76	\$368,079.82
5	\$279,213.79	\$2,326.78	166.701657	\$355,518.42	\$316,883.57
6	\$250,000.61	\$2,500.01	138.975722	\$313,957.26	\$277,711.64
7	\$225,293.01	\$2,628.42	119.171469	\$279,213.79	\$246,489.08
8	\$204,272.60	\$2,723.63	104.318267	\$250,000.61	\$220,970.03
9	\$186,283.60	\$2,794.25	92.7657661	\$225,293.01	\$199,747.39

Source: Author's calculations

More importantly the home buyer is not made better off getting the 30 year mortgage over the PIC. Going back to the prisoner's dilemma the bidders each have the ability to make the same payment, for example \$1498.88, if one of the two bidders chooses the stricter terms of a 50/50 PIC they would only be able to

⁹ This chart shows the total amount a lender could borrow with a \$1498.88 monthly payment with a 30 year mortgage. It then shows how much the borrower would have to pay to get the same amount under a 50/50 PIC rule and the number of payments the borrower would have to make. It then calculates the market value of the 30 year loan to the PIC loan.

borrow \$149,888 but the other bidder, choosing a 30 year mortgage, could borrow up to \$250,000 dollars thus winning the house. Each bidder is forced to go for the easier terms resulting in paying more for the house, paying more interest on the loan and making more payments for the exact same house.

The precise value captured by the banks is the difference between the market value of the two loans the bank would make under the differing policies. A 30 year loan with a payment of \$1498.88 made at 6% interest with a discount of 2% has a market value of \$313,957.26 resulting in a potential profit of \$63,957.27 upon origination. A 50/50 PIC under the same conditions would only originate a loan of \$149,888 with a market value of \$166,502.66 the difference being a bank profit of \$16,614.66. Thus the bank is able to capture an extra \$47,342.61 off the transaction, and the home buyer gets the exact same house either way.

Conclusion

The housing market traditionally has been dominated by home buyers needing a mortgage. Actions of home buyers in the market have an external cost that can be modeled using a simple prisoner's dilemma in which each home bidder chooses to bid up the price of a home until reaching some constraint imposed on their bidding. That constraint is currently being instituted by banks setting the maximum length of a mortgage thereby implicitly setting a Principal to interest cap. The current bank set constraint is very loose so this paper suggested regulating a stricter PIC to limit the costs imposed on home buyers resulting from this prisoner's dilemma. The paper shows how much extra value lenders are able to make off of a 30 year mortgage compared to a 50/50 PIC even though the home bidders wind up getting the same home.

Two considerations of a PIC have not been discussed in this paper due to space constraints. In this paper a 50/50 PIC was explored however there is no reason the ratio needs to be set at that level. Given the current housing market instantaneously instituting a 50/50 PIC might serve as another dangerous shock to home prices. PIC framework regulation could be instituted in a gradual manner starting with a very high interest cap and slowly tightening the cap over time. In fact there are many interesting implications with respect to altering mortgages using a PIC framework as the model, however space constraints don't allow those explorations here. Further any level PIC becomes more restrictive at higher interest rates. This characteristic would seem to be beneficial as both a macroeconomic regulator and to restrain speculative and Ponzi financing during speculative booms. Further explorations of these positive characteristics will have to occur in other papers.

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