An Economic Case for Prepaying your Mortgage

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Households that already contribute sufficiently to tax-deferred retirement accounts often believe that the tax break from interest expense deduction is more beneficial than prepaying a mortgage. This idea stems from a faulty assumption regarding the appropriate opportunity cost of funds. This study covers a 26-year period and shows that prepayment is optimal for this type of household when correctly comparing the after-tax cost of the mortgage and the after-tax return of the risk-appropriate competing investment. The study illustrates that interest expense savings are greater than tax deduction benefits from 1990-2016 when prepaying 15-year and 30-year mortgages.

INTRODUCTION

This study examines the frequently debated question, "Should I pay off my mortgage early?" Often, household consumers are advised to compare their after-tax mortgage cost with the after-tax cost of stock market returns (Brueckner, 1994; Ling & McGill, 1998). This article argues that such a comparison is only relevant when individuals have not contributed the recommended minimum of at least 10 percent of their earnings to their tax-deferred retirement account. This article also assumes that individuals have three to six months of living expenses saved in an emergency fund. Given these assumptions, the proper comparison should include assets of similar risk, such as Treasury securities. Buist and Yang (2000) find that increases in income are related to increased mortgage prepayment which is related to lower default risk. When one pays off their mortgage, both default risk and interest expense are reduced.

There are few prior studies that address how to account for the risky aspect of home ownership (Singh & Spitzer, 2004; Poterba & Sinai, 2011). One alternative suggested by Poterba and Sinai (2011) is a computation of the "weighted average of the mortgage interest rate and a return on an alternative asset, typically a long-term corporate or Treasury bond." More importantly, a significant precedent for using Treasury securities as an asset of similar risk has already been established in the commercial mortgage industry. Banks and insurance companies create "yield maintenance" clauses for mortgage loans that allow prepayment through defeasance (Lefcoe, 1999). Defeasance involves a collateral substitution, typically Treasury securities, "in an amount and of a type that will generate cash flow sufficient to pay all of the remaining principal and interest due on the loan through maturity" (Boyce, 2006). In legal terms, defeasance "involves the pledge of new collateral in favor of the lender in return for a release of the mortgage/deed of trust encumbering the borrower's real property, all while keeping the debt obligation alive" (Boyce, 2006). Further, Section 2(a)(16) of the Investment Company Act of 1940 as amended (15 U.S.C. 80a-1) requires that the substitute collateral consist only of government securities.

According to Poterba and Sinai (2011), greater than 98 percent of homeowners whose income exceeded $125,000 were predicted to itemize tax deductions in 2003. Most homeowners mistakenly believe that, by itemizing their mortgage interest expense, a tax saving occurs that significantly outweighs the interest expense savings of prepaying a mortgage. For example, an individual with an itemized interest expense of $1,000 and a marginal tax rate of 25 percent saves $250 dollars in taxes while losing $750 in the form of interest expense. The math obviously creates a losing argument for tax savings as a motivation to avoid prepaying a mortgage for households that contribute amply to tax-deferred retirement accounts. Opponents to this advice would argue that the extra principal payments could be invested in the stock market to earn a return that is higher than the mortgage interest expense rate. However, stocks are not the appropriate competing investment when household consumers have already contributed sufficiently to tax-deferred retirement accounts. In this case, the competing investment to paying down a mortgage must be free of default risk and offer a fixed rate of return. This is because both prepaying a mortgage and investing in Treasuries are risk-free endeavors. Therefore, Treasury securities with the same maturity as the prepayment period are utilized in this study.

Prior literature does not adequately address the benefits of prepaying a mortgage in the context of the risk-appropriate competing investment. There are limited studies which offer a specific scenario where prepayment is optimal (Smith & Seay, 2016; Deng, Quigley, & Van Order, 2000). The focus of this study is on consumers that contribute sufficiently to tax-deferred retirement accounts and that have the financial ability to make extra principal payments on mortgage debt. This study proposes that it is beneficial for this type of individual to prepay a mortgage.

This research covers the period of 1990-2016 and shows that mortgage prepayment is optimal by correctly comparing the after-tax cost of both 15- and 30-year mortgages to the after-tax rate of return of the risk-appropriate competing investment. Interest expense savings net of lost tax shelters due to the prepayment of 15-year or 30-year mortgages during any given year from 1990-2016 are computed. Further, average required extra monthly payments are calculated. For example, an average extra principal payment of $83 a month can save an average present value of $26,898 when prepaying a 30-year mortgage five years early. The results of the study are of interest to homeowners who have the financial ability to make extra principal payments but fear losing the tax benefit of interest expense deductibility.

LITERATURE REVIEW

Prior literature acknowledges the similarity of the option to prepay a mortgage to the American call option. Therefore, some studies focus on pricing mortgage contracts in the context of the Black-Scholes model (1973). Quigley and Van Order (1990) view the right to prepay a mortgage is a call option and find that many borrows do not exercise their call option as aggressively as they should. They find that it takes a drop of at least 2 percent in current mortgage rates for prepayments to increase for mortgages that are at least 5 years old. The option to prepay the mortgage is considered in the money if the current market value of the home is greater than the par value of the mortgage. This is ultimately reflected by the difference in the mortgage rate and the current market rate. Both the prepayment and the default option are studied in the context of maximizing wealth (Deng, Quigley, & Van Order, 2000). If the market value of a home is less (more) than the loan amount, the default (prepayment) option becomes viable. Using option theory, some of the prior literature has identified optimal situations for mortgage prepayment.

Other prior literature focuses on the choice between increasing payments to a tax-deferred retirement account or increasing mortgage prepayments. This origination of this idea relates to the literature which examines the optimal choice between increasing investments in taxable versus tax-deferred accounts. The purpose of this research stream is to investigate the tax efficiency of different forms of household savings. Theoretically, assets subject to more taxes should be allocated to tax-deferred accounts while assets subject to fewer taxes should be allocated to taxable accounts (Dammon, Spatt, & Zhang, 2004; Shoven & Sialm, 2004; Poterba, Shoven, & Sialm, 2004; Huang, 2008; Garlappi & Huang, 2006).

However, prior literature does not find that consumers make this theorized optimal choice between tax-deferred retirement accounts and mortgage prepayments (Bodie & Crane, 1997; Barber & Odean,

2003; Bergstresser & Poterba, 2004; Amromin, 2004; Amromin, Huang, & Sialm, 2007). For example, Amromin, Huang, and Sialm (2007) extend the traditional definition of household savings to include the choice to increase home equity at the expense of tax-deferred retirement accounts. The purpose of their study is to measure the possible benefit to households who decrease mortgage payments to increase tax-deferred retirement contributions. Their underlying assumption is that these households are not contributing enough to the tax-deferred retirement accounts for retirement purposes. The rationale is that households should take advantage of a tax arbitrage opportunity whereby reducing extra mortgage payments increases the mortgage interest deduction and allows for increased tax-deferred retirement contributions. The extra tax-deferred retirement contributions provide an additional shelter from taxes. According to data provided by the Survey of Consumer Finances, Amromin, Huang, and Sialm (2007) find that 38 percent of households prepay their mortgage instead of contributing more to their tax-deferred retirement accounts. The authors suggest that it is difficult to explain such irrational behavior except for the reason of consumer aversion to debt. Similar to the primary argument of this study, other studies that find that the options to build savings in a tax-deferred retirement account versus in home equity are not considered as substitutes (Hoynes & McFadden, 1997; Poterba, Venti & Wise, 1995).

Smith and Seay (2016) develop a model to analyze the tradeoff between paying off a mortgage early versus contributing to a tax-deferred retirement account. Smith and Seay (2016) use two examples to show two situations where paying off a mortgage is optimal and where contributing to a tax-deferred retirement is optimal. Paying off the mortgage is optimal when the retirement plan offers a lower expected compound return along with a higher tax rate when withdrawals occur. Further, they point out that more should be allocated to tax-deferred retirement accounts when their employer offers a match. They also find that households that contribute more to the stock market versus prepayment of a mortgage are inherently more risk tolerant. This implies that mortgage prepayment and tax-deferred retirement contributions are not perfect substitutes for households that properly compare equally risky investment choices, as this study suggests.

Other studies have examined the elasticity of mortgage borrowing as it relates to changes in mortgage interest rates and changes in tax brackets (Follain & Dunsky, 1997; Ling & McGill, 1998; Dunsky & Follain, 2000). Dunsky and Follain (2000) and Follain and Dunsky (1997) find that the elasticity of demand for mortgage debt with respect to marginal tax rates is rather high within a range of -1 to -1.5. For example, at an elasticity of -1.5, a 3 percent increase in marginal tax rates causes a 4.5 percent decrease in demand for mortgage debt. Poterba and Sinai (2011) study the potential effects of eliminating the mortgage interest expense deduction on loan-to-value ratios, the allocation of income tax expenses, and housing consumption for the tax year 2003. Using data from the 2004 Survey of Consumer Finances, they find that if the mortgage interest expense deduction were eliminated, then less than 30 percent of mortgage debt could be repaid in aggregate. This assumes that all households sold all their financial assets to pay down mortgage debt. This outcome is due to the finding that households with larger mortgages have less financial assets than households with smaller mortgages which have more financial assets.

Smith, Finke, and Huston (2012) take a different approach and examine how the level of financial sophistication affects the level of mortgage debt among older households. The authors determine financial sophistication using factor analysis on four variables by using a technique created by Chatterjee, Finke, and Harness (2011) The four variables are holding greater than 50 percent of revolving credit card balance, ownership of stock, investment risk aversion, and the respondent's understanding of survey questions. They find that higher mortgage debt increases with the proportion of risky investments and financial sophistication. On the contrary, they also find that unsophisticated households which had too much credit card debt and bad credit were also more likely to have higher mortgage debt. In contrast, other studies of older households find evidence of less mortgage debt as defined by lower loan-to-value ratios (Chen & Jensen 1985; LaCour-Little 2007; Li 2005; Nothaft & Chang 2004; Yilmazer & DeVaney 2005). Poterba and Sinai (2011) also point out that older households are actually "less likely to itemize than are their younger, higher-income counterparts."

Prior literature does not approach the prepayment option from the standpoint of using the proper competing investment for households that have contributed sufficiently to retirement accounts and are

financially able to make extra principal payments. As previously discussed, the prior literature examines decisions between mortgage prepayments and retirement contributions as substitutionary investments for household savings. For those households that are not contributing to retirement accounts, the prior literature is correct in advising greater payments to tax-deferred retirement accounts over mortgage prepayment. However, when this goal is met, the comparison of the two endeavors becomes entirely different due to the dissimilarity of the two types of investment risks. The assumptions in this paper are different from that of Amromin, Huang, and Sialm (2007). This goal of this study is to focus on households that are contributing appropriately to their tax-deferred retirement accounts. Therefore, any extra monies available should be directed towards reducing mortgage debt and thus, default risk. Ultimately, higher net worth is related to lower mortgage demand (Follain & Dunsky, 1997).

DATA

Mortgage rates and median sales prices for new houses sold in the U.S. are obtained from the Federal Reserve Bank of St. Louis Economic Research Division. Using weekly data, yearly 15-year and 30-year fixed rate mortgage rates for the years 1990 through 2016 are calculated. Marginal tax rates by filing status are obtained from the IRS Statistics and Income Division to determine the most prevalent rate. The yields for 5-, 7-, 10-, and 20-year Treasuries from 1990 to 2016 are collected from the U.S. Department of the Treasury website. Average yearly data is computed from the monthly data provided by the U.S. Department of the Treasury.

Using monthly data, average yearly median home prices from 1990 to 2016 are calculated. To control for inflation, all dollar values are converted into constant 2016 dollars using the CPI provided by the Bureau of Labor Statistics and the real house price inflation provided by the Federal Housing Agency (FHFA). State-level inflation rates are averaged using the FHFA index to calculate real house price inflation for the study period. Aggregate inflation is also calculated using the Consumer Price Index "All Items Less Shelter" series. Similar to Poterba and Sinai (2011), the combination of these two measures are used to compute an average nominal house price inflation rate for each year of the study.

METHODOLOGY

Following Singh and Spitzer (2004), Equation 1 determines the effective rate of taxes paid on the competing investment (t_I). In Equation 2, t^*_F represents the federal tax rate and t^*_S represents the state tax rate. Equation 2 implies that the after-tax rate of return on the competing investment is $i(1-t_I)$.

$$t_I = t^*_F + t^*_S - t^*_F t^*_S \quad (1)$$

Tax-adjusted Treasury rates will be compared to determine whether the mortgage should be paid off early versus investing any excess money. Equation 2 is used to determine the payoff decision rule. In Equation 2, r is equal to the mortgage rate, t_F is equal to the federal tax rate, i is the rate on the competing investment, and t_I is the effective rate of taxes on the competing investment earnings. If Equation 3 is true, then the mortgage should be paid down early.

$$r(1-t_F) > i(1-t_I) \quad (2)$$

Similar to Campbell and Cocco (2003), this paper does not consider the availability of ARMs, the likelihood of having to move in the future, and the possibility of moving to a larger or smaller house due to changing income. This paper also implicitly assumes that buying is preferred to renting and that the risk associated with labor income remains constant through time. Further, income levels and tax brackets are assumed to remain constant over time. Most importantly, it is assumed that individual taxpayers itemize their interest expense as a tax deduction.

EMPIRICAL RESULTS

Table 1 reports the number of tax returns filed by the marginal tax rate for the tax year of 2014. This is the latest data available from the IRS website which contains individual statistical tables by filing status. A majority (30.9 percent) of taxpayers fall within the 15 percent marginal tax bracket. However, the purpose of this study is to examine the potential benefits for households that can afford to make extra principal payments. Therefore, the study will use 25 percent to represent t*F, the federal tax rate. In the tax year 2014, the 25 percent marginal tax bracket represented single filers who made between $36,901 to $89,350 and married joint filers who made $73,801 to $148,850.

TABLE 1
ALL RETURNS: TAX CLASSIFIED BY THE MARGINAL TAX RATE, TAX YEAR 2014
(FILING YEAR 2015)

Marginal Tax Rate	Number of Returns	%
0.0%	35,964,899	25.9%
10.0%	27,338,132	19.7%
15.0%	42,955,747	30.9%
25.0%	24,662,921	17.8%
28.0%	4,885,202	3.5%
33.0%	1,912,142	1.4%
35.0%	189,947	0.1%
39.6%	978,900	0.7%
Total	**138,887,890**	**100%**

Table 2 reports the number of filers classified by filing status and the percentage of filing status by the marginal tax rate for the tax year 2014. Although single persons account for the majority (47.4 percent) of tax filers in aggregate, married persons filing jointly account for 47.8 percent of filers in the 25 percent marginal tax bracket. Therefore, the study will focus on married persons filing jointly in the 25 percent marginal tax bracket.

State income tax brackets for married persons filing jointly will be used to represent the average state income tax rate in the study. Forty-three states impose individual income taxes. Eight states have flat-rate tax structures while thirty-three states have progressive-rate income tax brackets. Some states have up to ten different tax brackets. Using data from the Tax Foundation's Fiscal Fact No. 544 (Scarboro, 2017), the average state income tax is 5.26 percent based on the income of an average tax bracket of greater than $45,504 up to a maximum tax bracket of greater than $139,400 for both single filers or married persons filing jointly. This rate best captures the state income tax level for individuals with marginal tax rates of 25 percent using the tax year of 2014 as a reference point.

Table 3 provides descriptive statistics for both mortgage and treasury rates representing the period 1990 to 2017. This study focuses on 15- and 30-year mortgages. Early payoff benefits are found by comparing reported yearly historical mortgage interest rates to yearly historical Treasury security rates represented below. Historical data for Treasuries are available in 5-, 7-, 10-, and 20-year increments. Thus, these time increments are used as example timeframes for early payoff comparisons.

Table 3 reveals that the average 15-year and 30-year rates are 5.61 percent and 6.31 percent, respectively. The highest 15-year mortgage rate was 8.41 percent in 1991 while the lowest rate was 2.93 percent in 2012. Thirty-year mortgages hit a high of 10.13 percent in 1990 and a low of 3.65 percent in 2016. Average Treasury yields range from 4.08 percent to 4.82 percent for 5- to 20-year instruments. For comparison, the geometric mean and the standard deviation of the S&P 500 were 7.43 percent and 17.41

percent, respectively, from 1990 to 2016. And, the average return on 30-year treasuries was 5.35 percent with a standard deviation of 1.74 percent. Long-term treasuries provided an average return of about 2 percent less than the S&P 500. However, the risk level of long-term Treasuries was significantly lower by 15.67 percent.

TABLE 2
ALL RETURNS: NUMBER OF FILERS CLASSIFIED BY FILING STATUS, TAX YEAR 2014 (FILING YEAR 2015)

Filing Status	Total Number of Filers	Total Percentage	Percentage of Filing Status by Marginal Tax Rate						
			0.0%	10.0%	15.0%	25.0%	28.0%	33.0%	39.6%
Returns of married persons filing jointly and returns of surviving spouses	48,342,184	34.9%	22.6 %	26.4%	37.5%	47.8%	58.0%	76.7%	82.6%
Returns of married persons filing separately	2,837,986	2.0%	1.2%	1.3%	2.7%	2.7%	3.1%	3.0%	3.5%
Returns of heads of households	21,757,958	15.7%	23.2 %	21.3%	13.5%	6.5%	2.5%	2.8%	2.5%
Returns of single persons	65,759,815	47.4%	53.0 %	51.0%	46.4%	43.0%	36.4%	17.5%	11.3%
TOTAL	138,697,943	100%	100%	100%	100%	100%	100%	100%	100%

TABLE 3
DESCRIPTIVE STATISTICS FOR MORTGAGE RATES, TREASURY RATES, AND INFLATION-ADJUSTED MEDIAN HOUSE PRICES FOR THE PERIOD 1990 TO 2017

Type of Instrument	Mean	25th Quartile	Median	75th Quartile	Standard Deviation	N
15 Year Mortgage	5.61%	3.89%	5.98%	7.10%	1.75%	27
30 Year Mortgage	6.31%	4.63%	6.38%	7.65%	1.77%	28
5 Year Treasury	4.08%	1.93%	4.24%	6.16%	2.13%	28
7 Year Treasury	4.40%	2.52%	4.41%	6.23%	2.01%	28
10 Year Treasury	4.66%	3.11%	4.62%	6.11%	1.87%	28
20 Year Treasury	4.82%	3.62%	4.96%	6.20%	1.51%	25
30 Year Treasury	5.25%	3.18%	4.08%	4.88%	1.91%	25

The results in Table 4 illustrate the results of Equation 3, written in the following form:

$$r(1-t_F) - i(1-t_I) \quad (3)$$

Therefore, positive differences illustrate a net cost to the individual when comparing the after-tax cost of a mortgage with the after-tax rate of return earned on Treasury securities. In other words, positive differences imply that early payoff of the mortgage is desirable because one cannot earn more on the appropriate competing investment.

TABLE 4
DESCRIPTIVE STATISTICS FOR THE 30-YEAR AND 15-YEAR AFTER-TAX MORTGAGE COST MINUS THE AFTER-TAX TREASURY RETURN FOR THE PERIOD 1990 TO 2017

A: Years remaining for 30-year mortgage payoff	Mean	25th Quartile	Median	75th Quartile	Standard Deviation	N
5 years	1.67%	1.36%	1.67%	2.05%	0.37%	28
7 years	1.43%	1.24%	1.41%	1.59%	0.26%	28
10 years	1.24%	1.10%	1.24%	1.35%	0.18%	28
20 years	0.86%	0.68%	0.83%	1.00%	0.21%	25
B: Years remaining for 15-year mortgage payoff						
5 years	1.27%	1.05%	1.20%	1.54%	0.34%	27
7 years	1.02%	0.88%	0.98%	1.14%	0.25%	27
10 years	0.82%	0.67%	0.72%	0.99%	0.23%	27

Table 4 provides descriptive statistics of the net cost for various early payoff scenarios for 30-year and 15-year mortgages. For example, when choosing between the alternative of investing in a 5-year Treasury versus paying down a 30-year mortgage five years early, the average excess interest rate paid is 1.67 percent. In other words, the opportunity cost of choosing not to pay off a 30-year mortgage five years early is 1.67 percent. Likewise, the opportunity cost of choosing not to pay off a 15-year mortgage five years early by choosing to invest in a 5-year Treasury is 1.27 percent. The key point of the paper is that Treasury securities are the proper competing investment alternative to a mortgage payoff due to the similar low-risk characteristics of both endeavors.

Another helpful way to look at the benefit of early mortgage payoff is to examine the present value of interest savings net of the tax shelter lost with prepayment. Tables 5 and 6 provide descriptive statistics for net interest savings using median house prices provided by the St. Louis Federal Reserve for 30-year and 15-year mortgages, respectively. House prices are stated in constant 2016 dollars using the combination of CPI and average state-level inflation rates. Table 5 reveals that the average reported median house price from 1990 to 2016 is $237,008.

Total interest saved is calculated using a loan amortization schedule each year from 1990 to 2016 using the inflation-adjusted median house price and the current mortgage rate for either a 30-year (Table 5) or 15-year (Table 6) mortgage. Another key assumption is that homeowners put 20 percent equity into the home. This is a conservative approach and it should be noted that the results in Tables 5 and 6 could be understated as a result of a lower or zero downpayment percentage. The early payoff is assumed to occur by making constant extra monthly principal payments. A 5-year early payoff occurs at year twenty-five for a 30-year mortgage. The foregone tax shelter is calculated as total interest saved multiplied by 25 percent as the representative marginal tax bracket for married persons filing jointly.

In Table 5, each 30-year loan early payoff scenario provides a positive net interest savings benefit, providing more detailed support for the prepayment argument. The net benefit (net interest savings) is equal to the total interest expense saved minus the foregone tax shelter. Total interest expense saved is equal to the present value of the original interest expense minus the present value of the new interest expense under early paydown assumptions. Interest expenses are discounted at the opportunity cost of investing in one-month Treasury securities corresponding to a starting mortgage date of January 1, 1990. This discount method allows for a realistic range of treasury bill rates throughout time.

TABLE 5
30-YEAR LOAN EARLY PAYOFFS 1990-2016: PRESENT VALUE OF MORTGAGE INTEREST EXPENSE SAVINGS AND REQUIRED EXTRA PRINCIPAL PAYMENTS (CONSTANT 2016 DOLLARS).

A: Total net benefit on a 30-year mortgage	Mean	25th Quartile	Median	75th Quartile	Standard Deviation	N
5-year early payoff	$26,898	$20,656	$28,542	$30,665	$6,033	27
7-year early payoff	$37,046	$28,458	$39,293	$42,218	$8,304	27
10-year early payoff	$50,678	$39,030	$53,761	$57,708	$11,277	27
20-year early payoff	$89,704	$69,990	$95,387	$101,589	$19,186	27
B: Required monthly extra principal payment for a 30-year mortgage						
5-year early payoff	$83	$63	$87	$97	$23	27
7-year early payoff	$129	$98	$134	$150	$35	27
10-year early payoff	$218	$168	$226	$251	$56	27
20-year early payoff	$960	$776	$981	$1,088	$203	27
C: Inflation adjusted median house prices	$237,008	$200,165	$238,887	$266,717	$39,691	27

In Panel A, the average present value of net interest savings on a 30-year mortgage that is paid off five years early is $26,898. This answer is achieved by assuming an average extra principal payment of $83 per month as seen in Panel B. In comparison, one could pay off a 30-year loan ten years early by paying an extra principal payment of $218 per month and achieve a net interest savings of $50,678. The table also contains data for 7-year and 20-year early payoffs.

TABLE 6
15-YEAR LOAN EARLY PAYOFFS 1990-2016: PRESENT VALUE OF MORTGAGE INTEREST EXPENSE SAVINGS AND REQUIRED EXTRA PRINCIPAL PAYMENTS (CONSTANT 2016 DOLLARS)

A: Total net benefit on a 15-year mortgage	Mean	25th Quartile	Median	75th Quartile	Standard Deviation	N
5-year early payoff	$16,826	$12,822	$18,349	$19,478	$4,038	26
7-year early payoff	$23,518	$17,991	$25,660	$27,131	$5,579	26
10-year early payoff	$34,087	$26,234	$37,221	$39,108	$7,937	26
B: Required monthly extra principal payment for a 15-year mortgage						
5-year early payoff	$511	$430	$520	$572	$94	26
7-year early payoff	$902	$762	$916	$1,010	$161	26
10-year early payoff	$2,087	$1,773	$2,112	$2,334	$361	26
C: Inflation adjusted median house prices	$237,008	$200,165	$238,887	$266,717	$39,691	27

Table 6 provides descriptive statistics for net interest savings using median house prices provided by the St. Louis Federal Reserve for 15-year mortgages. As in Table 5, house prices are stated in constant 2016 dollars using the combination of CPI and average state-level inflation rates. As a point of reference, statistics regarding median house prices from 1990 to 2016 are repeated in Panel C of Table 6.

Similar to the results in Table 5, each 15-year loan early payoff scenario provides a positive net interest savings benefit. Note that a 15-year mortgage already provides significant interest savings relative to a 30-year mortgage. The additional interest expense savings of a 15-year mortgage over a 30-year mortgage are unreported. The results reported in Table 6 are only relevant to those households with the financial capability of considering 15-year mortgages.

The net benefit (net interest savings) is equal to the present value of total interest expense saved minus the foregone tax shelter. In Table 6 Panel A, the average net interest savings on a 15-year mortgage that is paid off 5 years early is $16,826. This answer is achieved by assuming an average extra principal payment of $511 per month as seen in Table 6 Panel B. After the prepayment, individuals can use the extra money that would have gone to a house payment to invest in a portfolio that matches their risk preference. The table also contains data for 7-year and 10-year early payoffs, although these scenarios may be harder to achieve.

CONCLUSION

This study proposes a proper competing investment that better accounts for the risky aspect of home ownership which is rarely addressed in the prior literature. Relying on the precedent established in the commercial mortgage industry related to mortgage prepayment through defeasance, Treasury securities are recommended as the proper competing investment. This case should be compelling given the fact that Section 2(a)(16) of the Investment Company Act of 1940 as amended (15 U.S.C. 80a-1) requires that the substitute collateral in defeasance consist only of government securities. For example, this study shows that the opportunity cost of not paying off a 30-year mortgage five years early is 1.67 percent. This represents the excess mortgage interest rate paid over the interest that could be earned by investing in a five-year Treasury security.

A key assumption in this study that makes the Treasury security a valid competing investment is that particular households have already contributed the recommended minimum of at least ten percent of their earnings to their tax-deferred retirement account. It is important to note that the study advocates contributing sufficiently to a tax-deferred retirement account before considering an early mortgage paydown. Another important assumption is that households have already established their emergency fund by saving three to six months of living expenses for liquidity needs. Both foreclosure risk and interest expense are reduced when mortgage prepayment occurs for households projected to have sufficient retirement income and emergency fund savings.

This study computes the required average monthly extra principal payment and average total interest expense savings net of lost tax shelters for the early retirement of 30- or 15-year mortgage debt for various scenarios from 1990 to 2016. For example, it would only take an average extra principal payment of $83 a month to prepay a 30-year mortgage five years early and save an average $26,898 based on the historical mortgage rates for the last twenty-seven years. Similarly, by making an extra principal payment of approximately $218 households can prepay a 30-year mortgage ten years early and can save an average of $50,678. The estimates reported in this study are very conservative because they target married persons filing jointly in the 25 percent marginal tax bracket and the study assumes a 20 percent down payment. The results of the study are of interest to homeowners who have the financial ability to make extra principal payments but fear losing the tax benefit of interest expense deductibility.

The prior literature revealed that, in general, most households could not liquidate all of their financial assets to pay down their mortgages (Poterba & Sinai, 2011). Further research should determine the characteristics of households that overextend themselves with respect to their mortgage debt. These results could be used for targeted education about how much house to buy. Further, the priority of investing in retirement assets and having an appropriate emergency fund should also be included in this

education. Once households are equipped with and utilize this knowledge, then mortgage prepayment can become optimal for most households. This result would warrant a study of the effects of such a widespread change in the mortgage market on aggregate household saving and the consumption of non-housing goods.

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