

Effect on Net Worth of 15- and 30-Year Mortgage Term

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The choice between a 15-year and 30-year fixed-rate mortgage term is evaluated considering the borrower's income tax rate, ability to itemize deductions, access to tax-deferred savings, and risk aversion. The difference between payments on the two options is assumed to be regularly deposited in an investment account. Results indicate the best choice for the mortgage term depends on the borrower's eligibility to invest in a tax-deferred account, return on the investment account, tax rate, risk aversion, interest rate on the mortgage, and spread between the two mortgage rates, but not on the amount of the mortgage loan if the borrower is able to itemize deductions.

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Introduction

Owing a home is a goal of most Americans. The Fannie Mae National Housing Survey (2002), showed that a majority of Americans rated owing a home as a safe way to invest, and a quarter indicated they planned to purchase a home over the next three years. The survey found that "Thirteen percent of Americans say they have started saving money for the down payment and are thinking about where they want to live, 6 percent say they have saved most of the money they need and have a good idea where they want to live, and 4 percent say they have the money they need for the down payment and are actively looking or have made an offer on a home."

Once the decision is made to purchase a residence, the buyer usually must decide on a type of financing for their purchase. Lenders and financial institutions often advocate 15-year fixed-rate mortgages over 30-year fixed-rate mortgages, and/or recommend paying down the mortgage debt early. The benefits of the 15-year mortgage are lower interest payments; the interest expense of the 15-year mortgage is less than half the interest expense of the 30-year mortgage. Also, the borrower is free of mortgage payment and out of debt in 15 years.

An adequate evaluation of the 15-year and 30-year mortgage must also recognize the borrower's income tax rate, ability to itemize deductions, access to tax-deferred savings, and risk aversion. This analysis of the two mortgage arrangements assumes that the borrower wants to maximize their net worth, intends to invest the difference in payments between the two mortgage arrangements in an investment account, and is disciplined enough to follow the investment plan.

To accurately evaluate the impact on net worth of 15-year versus 30-year mortgage terms, this analysis considers the:

- after-tax cash flow difference between the two mortgage arrangements
- expected rate of return of the investment account given the degree of risk associated with the different potential investments.
- borrower's eligibility for tax-deferred investment accounts
- spread between the two mortgage options

Literature Review

Marshall (1989) and McCartney (1989) concluded that a 15-year mortgage is less costly than a 30-year mortgage, but they supported the use of a 30-year mortgage based on factors such as the flexibility allowed with the lower payments. Dhillon, Shilling, and Sirroans (1990) evaluated data compiled by the Home Financing Transaction Panel Survey conducted by the National Association of Realtors from 1985 and 1986 and concluded wealthy borrowers are more likely to take a 15-year mortgage over a 30-year mortgage, especially in areas where real house prices are higher relative to real incomes. Their results suggested a natural incentive exists to select shorter term loans, typically by wealthier households in high tax brackets. However, they stated greater tax advantages exist for longer term mortgages, thus partially contradicting their findings because the higher income individuals or households get the greatest tax break for mortgage interest.

Vruwink and Fisher (1995) found that the 30-year mortgage is beneficial to a homebuyer based on their hypothetical analysis of different variable inputs, and the existence of a tax-deferred investment vehicle makes the 30-year mortgage even more attractive.

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They conducted their analysis by creating hypothetical mortgage rates with a 0.5 percent spread between the two fixed-rate mortgage options (15-year and 30-year). Their analysis created a hypothetical return on an investment account where the difference between the mortgage payments was invested based on an 8.5 percent 15-year or 9 percent 30-year \$100,000 mortgage with a marginal tax rate of 31 percent. They did not directly state their analysis utilized tax-deferred investments for the investment account, but upon duplicating their results, it appears they only assessed the value of the investment account on a tax-deferred basis.

Goff and Cox (1998) compared the use of a 15-year versus a 30-year fixed-rate mortgage by creating hypothetical loan input variables and investing the difference in the payments between the 15-year and 30-year mortgage options in an investment account in equity securities. However, they assumed the investment of the difference in the payments was placed in a tax-deferred account, and failed to address the issue of maximum contributions to a tax-deferred account. They concluded, "The advantage of the tax-deferred investment plan will make a 30-year mortgage more attractive than a 15-year mortgage for many homeowners." Goff and Cox also stated that the benefits of using a 30-year mortgage versus a 15-year mortgage are greater for a homeowner in a higher tax bracket and with a larger mortgage. However, they did not consider investing in taxable investment accounts, and they did not support their calculations with empirical data, but only assessed hypothetical loan amounts. They did recognize that the risk of investing in equities is higher than the risk of a mortgage, however, they did not conduct any analyses or evaluate any other investment alternatives, nor did they take into account non tax-deferred investment accounts.

Tomlinson (2002) assessed mortgage debt reduction versus an investment decision by evaluating a hypothetical situation of receiving an inheritance of \$100,000 and deciding whether to pay down a mortgage or invest in an equity investment account. He conducted the analysis using a direct statistical approach and compared returns and probability of a positive equity stock portfolio return over a 10-year period. He concluded risks exist with the equity investments and the individual borrower has to determine their risk aversion level to find which option would be best for them. However, he assumed the equity investment was in a tax-deferred or tax-efficient account (i.e. the investor did not have to pay taxes on

the account when interest, dividends or capital gains are taken). A major problem with his analysis is no account is currently available where one can invest a lump sum of \$100,000 that is completely tax-efficient. Even an index mutual fund has distributions from dividends and capital gains forced by redemptions by other investors, or rebalancing. He showed lower stock returns caused a lower probability of the investment portfolio being the best option.

Storms (2000 and 2001) evaluated the use of mortgages and debt management of financial planners during a borrower's retirement years. He gives hypothetical examples and situations of a debt management structure allowing a borrower to achieve their goal with the use of a mortgage. He also presents evaluations of mortgage choices, but his studies are on the retirement phase of a borrower's financial plan, therefore he mainly focuses on monthly payments and liquidity issues.

Past studies have used hypothetical mortgages and rates to show the tradeoff between the 15-year and 30-year mortgage options, but these can bias the outcome of an analysis by changing the spread between the rates, if the spread is even considered. Studies have also used a growth rate in an investment account equal to the average past stock market return for their investment accounts. This is misleading because an equity investment, even in an index, is not on the same risk level as a fixed-rate mortgage. A significant amount of uncertainty exist in stock market returns and the value of a portfolio in the future, but a fixed-rate mortgage has set payments and a present value of the mortgage is known throughout the life of the loan. Although a fixed-rate mortgage has a risk of mortgage default, an assessment of a mortgage should utilize different risk classes of investments, which can yield further insight into the best mortgage option given the different risk aversions of borrowers. The investment accounts utilized in the analyses of past studies did not assess non tax-deferred accounts only tax-deferred accounts. If a borrower is already utilizing their tax-deferred accounts, past analysis and their conclusions become useless. Former researchers did not assess the different risk classes of the financial instruments used in the comparative investment account, they only assessed equity investments. Various advisors have suggested that the best approach in determining which mortgage term is better is to compare the after-tax mortgage rate to the rate of return on invested funds, an approach evaluated in this analysis.

Methodology

This study compares a 15-year and a 30-year fixed-rate mortgage assuming that the

- decision has been made to purchase the home using a fixed-rate mortgage
- after-tax difference in payments between the two mortgage arrangements is regularly deposited in an investment account
- borrower is not going to change their mortgage arrangement or withdraw funds from the investment account

Factors that influence the choice of between a 15-year or a 30-year mortgage are:

- level of acceptable payment,
- risk aversion towards an investment,
- spread between the two mortgage options,
- tax rate of the borrower,
- tax-deferred account utilization,
- borrower discipline towards money management / investing.

The steps in determining which mortgage option is most beneficial for the borrower are.

1. Calculate the monthly payment of both the 15- and 30- year mortgage.
2. Determine the difference between the two monthly payments of the mortgage choices.
3. Calculate the monthly amortization tables for the two mortgage options.
4. Determine the interest portion paid each year for the two mortgage options.
5. Determine the tax rate of the borrower.
6. Determine the tax savings from the interest paid on the mortgage.
7. Determine the amount to be deposited in the investment account each year.
 - a. For the 30-year mortgage, the amount is the difference between the two mortgage payments plus the difference between the tax savings on the interest paid.
 - b. For the 15-year mortgage, the amount is the mortgage payment that is deposited at the end of year 16 and each year thereafter through year 30.
8. Determine the medium for the investment account.
9. For the non tax-deferred analysis, determine the interest earned and/or distributions distributed. Reinvest the after-tax earnings into the account assuming the same rate of return.
10. Determine the value of both the 15-year and 30-year investment accounts at the end of the year 30.
11. Compare the difference between the accounts to determine which gives the greatest net worth.

Tax-Deferred Accounts

Both a tax-deferred account and a non tax-deferred account are included in the analysis. Past studies assumed everyone had the ability to invest in a tax-

deferred accounts so did not limit the contributions to the account or consider the effect of taxes on investment accounts. In this study, the borrower's ordinary income tax rate is used to calculate taxes on interest earned in the investment account. The taxes that are generated in the non tax-deferred account are paid out of the account to determine the value of the account over time.

If a borrower invests in riskier equity assets, they have greater potential for larger gains. In addition, the borrower would have lower taxes on the dividends received as a result of the new law taxing dividends at 15 percent and would be able to manage their capital gains assuming they are not invested in a mutual fund. In fact, as the risk increases, the expected return should increase making the effects of the analyses more pronounced.

Risk Aversion and Choice of Investment Media

If a borrower chooses to invest the difference between the mortgage arrangements in an investment account bearing risk, they have to understand the different risk and returns associated with various investment choices; therefore, the borrower's risk aversion plays a role in the selection of a 15-year or a 30-year mortgage. The analysis assumes the borrower invests the after-tax mortgage payment difference in an investment account matching their risk aversion. The investment choices evaluated are the historical average rates of return for the 3-month Treasury Bill, the 1-year Treasury Bill, the 5-year Treasury Note, the 10-year Treasury Note, the 20-year Treasury Bond, the Moody's AAA rated bonds, and the S&P 500 index investments. The 3-month Treasury Bill is used as a risk-free investment, the other investments are listed in order of increasing total risk measured by their historical standard deviation over 72 years.

Calculating the Value of Investment Account

The analysis determines the amount of after-tax cash flow available to be deposited in the investment account each year for the two mortgage arrangements, recognizing the benefits of the compounding of the investments over the 30-year period. Even though a 30-year mortgage arrangement allows smaller investments for each of the 30 years, the investments that are made in the first 15 years will take advantage of compounding during those early years. With the 15-year mortgage option, the investment account does not begin until year 16 when the amount that had been paid on the mortgage is now free to be deposited in the investment account; therefore, the compounding benefit is realized only over the last 15 years. The comparison is concluded after 30 years when both mortgages are paid off leaving the residence free of mortgage debt as well as having a substantial investment account.

Data

The analyses of the two mortgage options use historical data for monthly mortgage rates for 15-year and 30-year mortgages from September 1991 to September 2002; the data is limited to that period because recording of 15-year mortgage rates began in September 1991 (St. Louis Federal Reserve, 2004).

Table 1.
Fixed-rate Mortgage Rates

	15-year	30-year	Spread
Average	0.0731	0.0775	0.0044
Median	0.0714	0.0765	0.0046
Maximum	0.0880	0.0964	0.0059
Minimum	0.0551	0.0609	0.0027

The average interest rate is 7.21 percent for a 15-year loan and 7.75 percent for 30-year loan. The average spread between the 15-year and 30-year rates is 0.4428 percent. The spread moved between a high of 0.59 percent in August 2002 and a low of 0.27 percent in August 2000.

Table 2.
Percentage Rates of Return for Investment Options

1991 to 2002	3 Month Treasury Bill	1-Year Treasury Bill	5 Year Treasury Note	10 Year Treasury Note	20 Year Treasury Bond	Moody's AAA	S&P 500
Average	4.41	4.76	5.71	6.06	6.47	7.44	10.57
Median	4.88	5.22	5.79	6.01	6.42	7.39	9.37
Minimum	1.57	1.53	2.63	3.63	4.74	6.10	-24.29
Maximum	6.42	7.32	7.90	8.05	8.30	9.08	35.20

To encompass the risk aversions of different borrowers, the following investment alternatives are evaluated: 3-month Treasury Bill, 1-year Treasury Bill, 5-year Treasury Note, 10-year Treasury Note, 20-year Treasury Bond, Moody's AAA rated bonds, S&P 500 index investments. The rates of return for these investments for the time period September 1991 to September 2002 are shown in Table 2. (St. Louis Federal Reserve, 2004, and Yahoo, 2004)

Calculating the Comparison

To analyze the difference between the 15- and 30-year mortgage, a \$200,000 mortgage loan is assumed using the average rate shown in Table 1. Table 3 shows the monthly payments are \$1,433.48 for the 30-year mortgage using the average rate over the data sample period of 7.7548 percent. Using the average spread of 0.4428 percent, the 15-year mortgage rate would be 7.3119 percent, which requires payments of \$1,832.72

Choice of Investment Account

It can be argued the risk of making payments on a fixed-rate mortgage is zero because the payment and remaining balance is known unless the borrower chooses to refinance. To make an accurate comparison between paying off a mortgage and depositing funds to an investment account, the investment should be in a similar risk class, such as risk-free Treasury securities. Although such comparisons are often made using a diversified portfolio of stocks, one could argue that a portfolio of futures or options would result in higher returns. Because these assets incur greater risk, they are not appropriately compared to funds used to reduced a mortgage. The percentage of assets that households maintain in risk-free Treasury Bills is admittedly a small portion of the average household's total assets. Therefore, it is prudent to consider other investment options with varying levels of risk which align with the borrower's risk aversion. Even though interest rates fluctuate over time and the price of fixed-income assets changes accordingly, if such investments are held to maturity and do not default, the yield to maturity is earned.^a

for the 15-year mortgage. The difference between the two payment options is \$399.24. Over the life of the mortgage, a borrower would pay \$186,163.81 less interest with the 15-year term.

Table 3
Payments for the \$200,000 Mortgage

	15-Year Mortgage	30-Year Mortgage
Number of Periods	180	360
Interest Rate	0.0731 per year 0.0061 per month	0.0775 per year 0.0065 per month
Payment Monthly	\$1,832.72	\$1,433.48
	Difference in payments \$399.24	
	15-Year Mortgage	30-Year Mortgage
Payments Total	\$329,889.45	\$516,053.26
Interest Total	\$129,889.45	\$316,053.26
	Difference in interest paid \$186,163.81	

Mortgage Interest as an Itemized Deduction

The interest on the mortgage loan offers potential for a federal income tax benefit if the borrower itemizes deductions. To calculate the potential benefit relative to the standard deduction, taxpayer income was assumed to be at the national average of \$47,700 in 1995, thus falling into the 25 percent tax bracket for 2003. The rate used for property tax and state income tax was obtained by averaging over all states with such taxes of 2.8 percent and 2.8 percent, respectively (Ettliger et al., 1996) were used.

The initial mortgage principal of \$200,000, the taxpayer's income, the standard deduction, and the federal tax brackets are adjusted for inflation using a 2.90 percent inflation rate adjustment ascertained from the consumer price index over the period of analysis.^b Tax rates are assumed to be constant, however the tax brackets and average income are indexed for inflation.

Results show that it is advantageous for the borrower to itemize deductions to generate a lower tax liability unless they are married and filing jointly in the last year of a 15-year mortgage and in the last two years of a 30-year mortgage. Detailed results are available from the author upon request.

Ability to Use the Tax-Deferred Accounts

Comparisons of 15- and 30-year mortgages that use a tax-deferred account generally do not consider the limit in amount that can be invested in such accounts and do not consider the possibility of investing in both a tax-deferred and taxable accounts. Under 2003 regulations, an investor can put only \$12,000 in a 401(k) and \$3,000 in a non-deductible IRA, thus making the maximum contribution to tax-deferred accounts \$15,000 in one year, (see United States Master Tax Guide, 2002). Furthermore, the IRA must be a non-deductible IRA account if the borrower has an employer sponsored program available. In the example for this analysis, if an investor chooses the 15-year mortgage option, the assumption is the annual mortgage payment of \$21,922.63 will be invested in tax-deferred accounts in years 16 through 30 when the loan has been paid in full. The annual payments exceed the annual tax-deferred account maximum, but the 401(k) and the IRA contributions are indexed for inflation. Evaluating the example, an annual investment amount of \$21,922.63 could be reached if contribution limits increase by an average of 2.42 percent annually. Since the inflation adjustment is unknown, it cannot be assumed that a borrower will be able to investment the required sum in tax-deferred accounts in 16 years. However, we can estimate the investment in tax-deferred accounts by making

projections for inflation adjustments in the permitted maximum. Over the period of this analysis, the average rate of increase in the consumer price index (CPI) is 2.90 percent (St. Louis Federal Reserve, 2004). Thus, under these assumptions it appears the borrower could place the entire \$21,922.63 in a tax-deferred account in 16 years.

A misconception in past literature exists contending that tax-deferred accounts are not fully utilized by mortgage investors.^c If the argument is incorrect and the borrower is already maximizing their tax-deferred accounts, then the mortgage investment account will be in a taxable account, and one must consider the tax implications. If the borrower is not fully utilizing their tax deferred accounts, then the borrower should use their available investment in a tax-deferred account.

After the difference between the mortgage payments of the 15- and 30-year options and the tax savings through itemizing deductions have been established, the accumulated funds in the investment account holding the deposits of the after-tax dollar difference between the premiums will be determined. The analyses are conducted using tax rates for 2003. Any taxable interest in the non tax-deferred investment account is calculated at the current tax rate of the borrower and consequently deducted from the investment account.

If the borrower chooses the 15-year mortgage, they will begin investing the mortgage payments in the 16th year. This is compared to choosing a 30-year mortgage and taking the after-tax difference between the two mortgage options and placing the difference in an investment account each year over the 30-year period. The results presented in Table 6 show the value of the investment account for the 30-year mortgage option minus the value of the investment account for the 15-year mortgage option at the end of the 30-year period. Investment values of similar and greater risk than the mortgage are presented to show the effects of different risk choices of the borrower. The comparison between the investment accounts shows the difference in increase of net worth after 30 years for both options. An amount in parentheses indicates the 15-year mortgage option is beneficial by the amount shown; when the amount appears without parentheses, the 30-year mortgage option is beneficial by the amount shown. The dollar amounts reported in Table 6 are the differences between the 15-year investment account and the 30-year investment account, not the values of the investment accounts themselves at the end of the 30-year time period. The analyses are conducted using a non tax-deferred account (Table 6-A) and a tax-deferred account (Table 6-B).

Table 6-A

Non Tax-Deferred Account -- Investment Account Accumulations for a 30-Year Mortgage minus Accumulation for a 15-Year Mortgage

	Type of Investment Account and Rate of Return						
	3-Month T-Bill	1-Year T-Bill	5-Year T-Note	10-Year T-Note	20-Year T-Bond	Moody's AAA	S&P 500
Borrower tax rate	4.4108%	4.7644%	5.7138%	6.0622%	6.4655%	7.4435%	10.5699%
10%	(139,586)	(133,827)	(114,425)	(105,677)	(94,305)	(60,435)	114,013
15%	(127,339)	(121,613)	(102,677)	(94,266)	(83,416)	(51,522)	151,556
25%	(104,776)	(99,276)	(81,664)	(74,046)	(64,359)	(36,565)	226,641
28%	(98,483)	(93,088)	(75,959)	(68,605)	(59,290)	(32,747)	249,167
33%	(88,454)	(83,268)	(67,021)	(60,127)	(51,450)	(26,999)	286,709
35%	(84,599)	(79,507)	(63,637)	(56,933)	(48,516)	(24,901)	301,726

Table 6-B.

Tax-Deferred Account -- Investment Account Accumulations for a 30-Year Mortgage minus Accumulation for a 15-Year Mortgage

	Type of Investment Account and Rate of Return						
	3-Month T-Bill	1-Year T-Bill	5-Year T-Note	10-Year T-Note	20-Year T-Bond	Moody's AAA	S&P 500
Borrower tax rate	4.4108%	4.7644%	5.7138%	6.0622%	6.4655%	7.4435%	10.5699%
10%	(131,434)	(123,939)	(98,529)	(86,999)	(71,950)	(26,787)	236,589
15%	(114,070)	(105,647)	(77,459)	(64,796)	(48,350)	614	281,347
25%	(79,342)	(69,062)	(35,319)	(20,391)	(1,152)	55,416	370,863
28%	(68,923)	(58,086)	(22,677)	(7,069)	13,007	71,857	397,718
33%	(51,559)	(39,793)	(1,608)	15,134	36,606	99,258	442,476
35%	(44,613)	(32,476)	6,820	24,015	46,046	110,218	460,379

The results shown in Table 6 A-B indicate that a borrower who is unwilling to take an investment risk greater than that associated with the 1-year Treasury Bill will be better off utilizing a 15-year mortgage regardless of the tax bracket or tax status of the investment account. If a borrower has a high risk aversion or wishes to match the risk of the fixed-rate mortgage to their investment account, the 15-year mortgage is appropriate providing the borrower can afford the higher payments. On the opposite side of the risk spectrum, an investor willing to take an investment risk comparable to that of the S&P 500, or greater, they will be better off utilizing a 30-year mortgage regardless of their tax bracket or investment account tax status.^d

As shown in Table 6, the difference between the two options depends on the borrower's current tax rate, ability to use a tax-deferred account, and choice of investment for the investment account. If a borrower is already fully utilizing their tax-deferred accounts and must use a taxable account, the 15-year mortgage option is better for all tax brackets when the borrower's risk aversion cannot tolerate the S&P 500. However, if the borrower accepts the risk of investing in the S&P 500 and earns an average return over the 30 years of 10.57 percent or greater, the 30-year mortgage option will create a higher net worth (Table 6-A).

For a borrower who is not fully utilizing tax-deferred accounts and has the ability to invest \$5,206.24--the

average annual difference between the two mortgages--in tax-deferred accounts, then the 30-year loan is more appealing than the 15-year arrangement if the borrower is in the 35 percent tax bracket and willing to take the risk of a 5-year Treasury Note, or greater, in the investment account (Table 6-B). If the borrower is already currently maximizing their investment potential in a tax-deferred account, they would be better off with the 15-year mortgage option when investing in 5-year Treasury Notes (Table 6-A). If a borrower is not fully utilizing their tax-deferred accounts and accepts the risk associated with 10-year Treasury Notes and is in the 33 percent tax bracket, or higher, the 30-year mortgage option is beneficial, but if the borrower is in the 28 percent tax bracket, or lower, the 15-year mortgage is more attractive (Table 6-B). If the borrower accepts the risk of a 20-year Treasury Bond and is not fully utilizing their tax-deferred account and is in the 28 percent tax bracket or higher, the 30-year mortgage would be preferred, but if the borrower is in the 25 percent or less tax bracket the 15-year mortgage is better (Table 6-B). If a borrower is willing to assume more risk by investing in Moody's AAA rated bonds and is not utilizing their tax-deferred account, the 30-year mortgage option will be advantageous when a borrower is in the 15 percent tax bracket or higher (Table 6-B). However, if the borrower is already utilizing their tax-deferred accounts and planning to invest in Moody's AAA rated bonds, they would generate a greater net worth by utilizing the 15-year mortgage option (Table 6-A).

Conclusions and Recommendations

Table 7 summarizes the results of the analyses indicating which mortgage option yields the greatest net worth for the borrower. The factors that should be considered when the borrower has the option of using either a 15-year or 30-year mortgage are their ability to use a tax-deferred account, risk aversion, and income tax rate. If the borrower is already utilizing their tax-deferred accounts, the 15-year mortgage option is preferred for all tax brackets and all investment choices, except for the S&P 500. However, if the borrower is not currently utilizing their tax-deferred accounts, the decision depends on the borrower's tax bracket and risk aversion.

Stability of Results

Evaluation of the effect on the comparison of 15-year and 30-year mortgage terms of various spreads between the rates indicate that when a larger spread exists, the benefit from using a 30-year mortgage is diminished. The analyses shows that if the interest rate rises, while the average spread remains constant, the 15-year mortgage option becomes relatively more attractive and *vice versa*. In fact, if the 30-year rate goes to 15.5 percent, the 15-year mortgage is beneficial in all the investment options at all the tax rates. Evaluation of mortgages of different size indicates that the results presented above are stable, although there are limits on mortgage interest deductions that one can take in certain situations.

Comparison with Alternative Approach

It is often suggested that the choice between a 15-year and 30-year mortgage need consider only the after-tax mortgage rate compared to rate of return on invested funds. If the after-tax borrowing rate is lower than the investment rate, then the borrower is better off with the longer term loan because they are borrowing at a lower rate than their rate of return they can earn on funds in the investment account. However, if the after-tax rate is higher, the borrower is advised to pay off the loan as quickly as possible.

If this approach is applied under the assumptions of the analysis presented here (Table 1, 2 and 6), the shortcomings are apparent. Using a 28 percent tax rate, the before-tax rate of 7.75% for a 30-year mortgage becomes 5.58% after taxes. One might conclude that a borrower would be better off with the 30-year mortgage if they invest in the 5-year Treasury Note, the 10-year Treasury Note, the 20-year Treasury Bond, the Moody's AAA bonds, and the S&P 500 investments, all of which have returns higher than the after-tax rate of 5.58%. However, as shown in Table 6-A, if a borrower is investing in a non tax-deferred account, the S&P 500 investment account is the only one that supports the choice of a 30-year mortgage.

Considering Contingencies

In choosing the best mortgage terms, it is prudent to consider the possibility that the borrower may encounter some financial hardship before the mortgage loan is paid. Advantages of a 15-year mortgage in such circumstances include less remaining debt on the mortgage and therefore better refinancing options. If a borrower loses their source of income after five years, the remaining total mortgage loan principal would be less with the 15-year mortgage allowing the owner to receive a smaller second mortgage and payment or a larger home equity line of credit. The option to refinance to a 30-year mortgage resulting in a lower payment is possible, assuming that the loan rates have not changed. The disadvantages include the lack of an accumulated investment portfolio until the 15-year mortgage is completed and the costs associated with securing refinancing, a second mortgage, or line of credit options.

Advantages of the 30-year mortgage include lower monthly payments and accumulated wealth in an investment account available to help alleviate hardships. Withdrawals from the investment account would be free of penalties for the non tax-deferred accounts, and free of penalties for the tax-deferred

Table 7
Preferred Mortgage Term

	Investment Account and Rate of Return						
	3-Month T-Bill	1-Year T-Bill	5-Year T-Note	10-Year T-Note	20-Year T-Bond	Moody's AAA	S&P 500
Non tax-deferred	4.4108%	4.7644%	5.7138%	6.0622%	6.4655%	7.4435%	10.5699%
For all tax rates	15-Year	15-Year	15-Year	15-Year	15-Year	15-Year	30-Year
Tax-deferred							
Tax rate--10%	15-Year	15-Year	15-Year	15-Year	15-Year	15-Year	30-Year
15%	15-Year	15-Year	15-Year	15-Year	15-Year	30-Year	30-Year
25%	15-Year	15-Year	15-Year	15-Year	15-Year	30-Year	30-Year
28%	15-Year	15-Year	15-Year	15-Year	30-Year	30-Year	30-Year
33%	15-Year	15-Year	15-Year	30-Year	30-Year	30-Year	30-Year
35%	15-Year	15-Year	30-Year	30-Year	30-Year	30-Year	30-Year

accounts if funds are used for a qualifying expense. If it is not a qualified expense and the borrower takes the funds out of tax-deferred accounts, they would be subject to taxes and penalties. The 30-year mortgage allows a borrower to pay down the mortgage early by paying more than the minimum payment when it is convenient. Thus, if a borrower falls on hard times they can reduce their mortgage payment without any penalty or costs of refinancing. In addition, if the borrower chooses a 30-year mortgage and pays more than the monthly payment, the borrower would pay more in interest even if they paid off the mortgage in 15 years because the interest rate on the 30-year mortgage option is always higher than on the 15-year loan. The investment account will accumulate throughout the life of a 30-year mortgage and will provide an emergency cash reserve for the borrower. As with a 15-year mortgage, borrowers could also use a second mortgage or a line of credit to get needed cash. The downside to the 30-year mortgage is that less home equity has been accumulated when obtaining a line of credit or second mortgage when compared to a 15-year mortgage.

Summary

Once the decision has been made to purchase a residence and to utilize either a 15-year or 30-year fixed-rate mortgage, it should be determined which mortgage term will result in the greatest gain in the borrower's net worth. This study examines the advantages and disadvantages of using a 15-year fixed-rate mortgage versus a 30-year fixed-rate mortgage option when purchasing a residence and is based on the assumption that a borrower can afford either the 15-year or 30-year mortgage and has discipline with their investments. The mortgage options are compared by evaluating various scenarios and investment strategies. The investment portfolio for the 30-year mortgage option is accumulated by investing the difference between the 15-year and 30-year payment for the life of the 30-year mortgage, while the investment account for the 15-year mortgage option begins by investing the mortgage payment in the 16th year and continuing through the 30th year. The portfolios are assessed for both a tax-deferred account and a non tax-deferred account, and by evaluating different investments options with different risk levels.

The results of the analyses indicate that the best mortgage option depends on the borrower's ability to invest in a tax-deferred account versus a non tax-deferred account, tax rate, acceptance of investment risk, the interest rate on the mortgage, and the spread between the two mortgage interest rates, but not on the amount of the mortgage loan assuming the borrower is itemizing their deductions. The data showed that a borrower without the ability to contribute to tax-

deferred accounts with a risk level below that of the S&P 500 would benefit from using a 15-year mortgage. However, if they are willing to invest with a risk level associated with the S&P 500 they would benefit from a 30-year mortgage. If the borrower can utilize tax-deferred accounts, the decision of using a 15-year or 30-year mortgage has a "stair-step" effect based on the choice of an investment account and the borrower's tax bracket.

Endnotes

^a There are adjustments to determine the real rate of return on an investment, such as the compounding effect of the timing of the payments, the compounding on the interest earned and the formula used in the evaluation, the reinvestment risk of the interest payments received, and if there is a deferred payment, etc. However, a good estimate of what a borrower will earn on a fixed-income investment is the yield to maturity rate, given some assumptions, see Bodie, Kane, and Marcus (2002) for more discussion on these assumptions and fixed-income investments.

^b See IRS (2003a) Publication 26 CFR 601. 602. Tax Forms and Instruction for statements indicating inflation adjustments to the tax brackets. See IRS (2003b) Publication 501 Exemptions, Standard Deduction, and Filing Information for statements indicating inflation adjustments to the standard deduction. Refer to St. Louis Federal Reserve (2004) for consumer price index data.

^c This is indirectly shown in the publications, (Investment Company Institute, 2003), which shows that 41.4 percent of all U.S. households have some type of IRA investment, based on U.S. Census Bureau's most recent estimate of 109.3 million total U.S. households (U.S. Bureau of the Census, 2002). This report, however, does not take into account other employee sponsored programs that might be available.

^d In Table 6 A-B, the S&P 500 is used as a proxy for the stock market; the actual data is from the SPY (spiders) with a management fee of 0.12 percent per year and tax-efficient features. The exchange traded funds unique tax-efficiency stems from their ability to rarely distribute dividends and capital gains to the borrower. However, taxes will be assessed when the borrower sells the shares if there is a capital gain.

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