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Mortgage refinancing: the interaction of break even period, taxes, NPV, and IRR

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Abstract

This paper develops a refinance model that provides pertinent information for investors about refinancing their mortgage. We discuss the input variables and how to compute the breakeven number of months when deciding to refinance a mortgage. We incorporate the interest rate tax effects that are normally ignored by investors when making their refinancing decision. We also compute the net present value and internal rate of return to allow one to analyze refinancing as an investment decision. Additionally we have developed an Excel model, complete with automated macros, to perform this analysis. © 2007 Academy of Financial Services. All rights reserved.

JEL classifications: G21; M5

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1. Introduction

In this paper, we examine home mortgage refinancing from a financial analysis framework. In particular, we examine the after-tax savings resulting from refinancing while taking into consideration the lost tax savings from the higher interest rate on the old mortgage. We discuss the input variables required and how to compute the net present value (NPV), internal rate of return (IRR), and breakeven period for the mortgage refinancing decision. We incorporate the interest rate tax effects that are normally ignored and we develop an Excel

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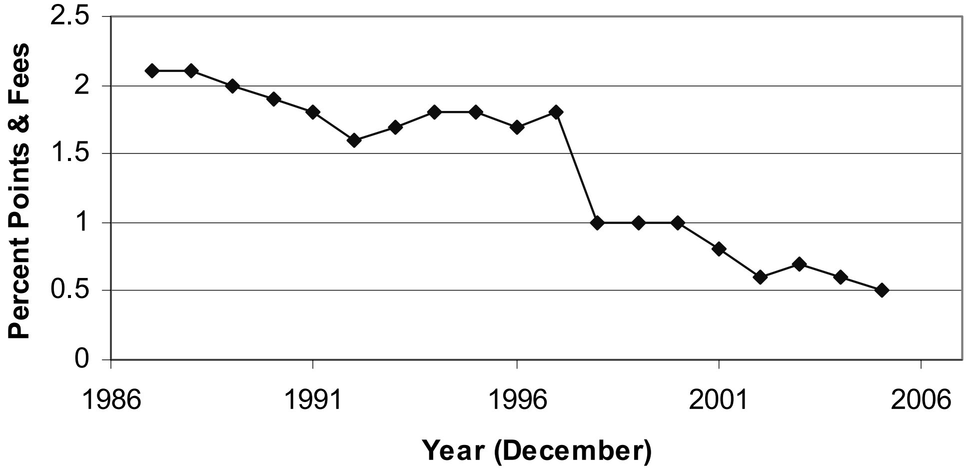

Fig. 1: Points and Fees as Percent of Home Loan

model to perform this analysis and utilize Goal Seek to optimize the solution. We find that breakeven is about 35% to 40% longer when considering the effect of the lost interest tax shield. The model we develop allows the user to compute the NPV and IRR based on their specific investment horizon for the mortgage.

During the past 10 years, the cost of obtaining a mortgage has declined significantly. Figure 1 shows average points and fees associated with a 30-year fixed-rate conforming mortgage as a percentage of the loan amount over the 10-year period 1986 through 2006 (source: Primary Mortgage Market Survey, FHLMC, 2006). Points and fees have declined from 1.8% in 1995 to 0.6% in 2005. The declining cost of obtaining a mortgage encourages homeowners to refinance by decreasing the cost of refinancing.

Mortgage interest rates have also decreased. Figure 2 shows that current mortgage rates are near recent historical lows. When current mortgage rates are lower than the rate on an outstanding mortgage, the benefits of refinancing are enhanced (e.g., monthly payment savings, faster payoff of the loan, etc.).

As the cost of a new mortgage declines relative to outstanding mortgage rates, the percentage of new loans associated with refinancing should increase. Figure 3 illustrates the recent percentage of home loans that are created through refinancing. The refinancing percentage is highly negatively correlated with the current mortgage rate and the points and fees associated with a new loan. In other words, as the benefits increase and the costs decrease, refinancing increases.

As a homeowner evaluates her decision to refinance it is important to perform the analysis correctly. Some financial advisors recommend an easy approach, the payback or break-even period method, which divides the cost of refinancing by the monthly payment savings. The homeowner compares this break-even period with the expected time that she will live in the house. This method is easy to understand for the average homeowner who may not be familiar with more sophisticated methods of financial analysis.

The problems with this approach are that it ignores the time value of money, the potential loss of some or all of the value of the mortgage interest tax deduction, and the differences in the loan balances of the old and new loans. Our paper takes all of these factors into

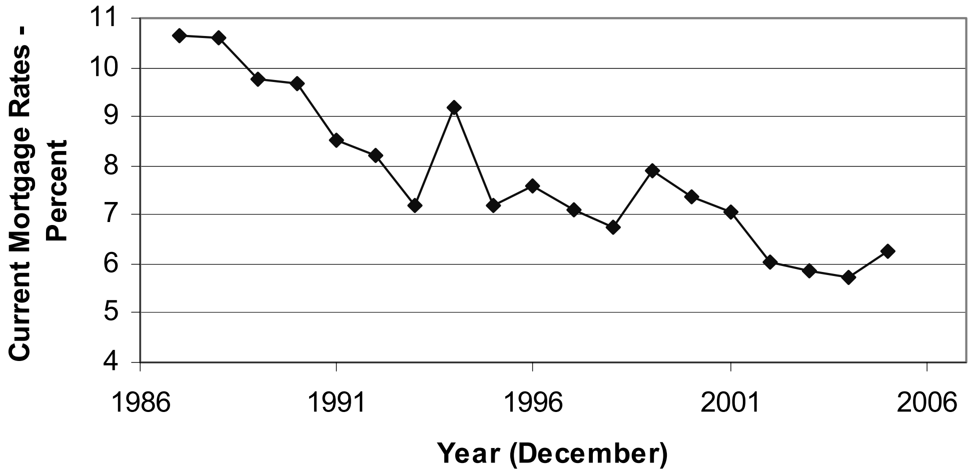

Fig. 2: Conventional Conforming 30-year Fixed-Rate Mortgage

account. In addition, we provide an Excel model for the financial advisor or the homeowner to use, which provides the IRR and the NPV as a function of the length of ownership.

2. Relevant literature

With the home as one of the largest investments by many investors, the home buying decision and the mortgage financing as part of personal financial planning have received

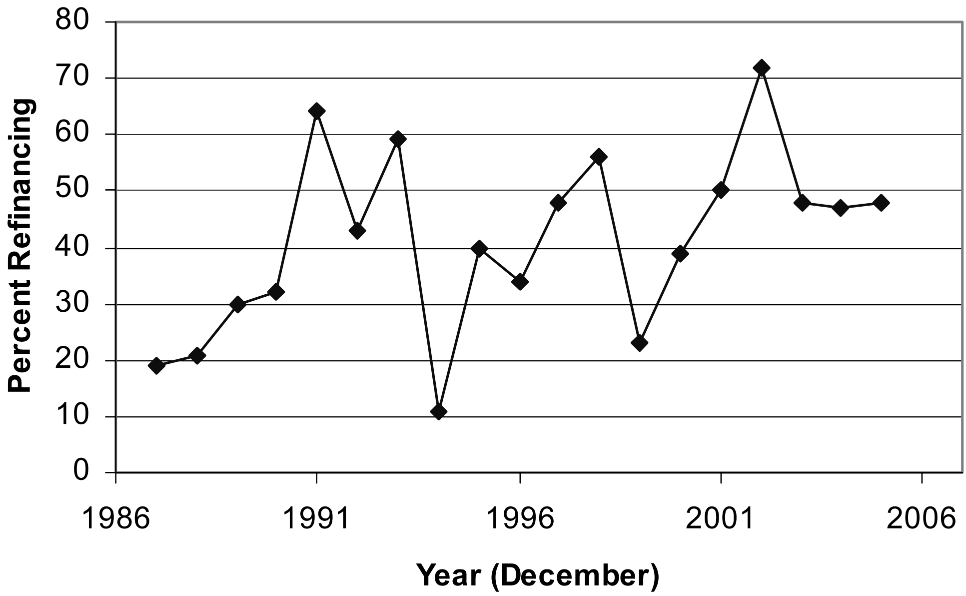

Fig. 3: Refinancing Percentage of Home Loans

attention in this journal. Templeton, Main, and Orris (1996, 2002) provide a simulation approach to choosing between fixed and adjustable rate mortgages and investigate adjustable-rate mortgage pricing features, respectively. Zivney and Luft (1999) investigate the feasibility of an individual hedging the interest rate risk involved in planning to take out a mortgage at a future point in time. Lee and Hogarth (2000) investigate how consumers search for information on a home mortgage loan. Waggle and Johnson (2003) examine the impact of a single-family home on a family's optimal asset allocation. Larsen (2004) examines the impact of loan rates on direct real estate investment holding period returns. Only one paper by Hoover (2003) in this journal has dealt with mortgage refinancing. Before we look at the Hoover article, we will review other articles related to mortgage refinancing.

The literature on mortgage refinancing from the borrower's viewpoint includes several interesting articles. Auster (1998) explains that homeowners must consider taxes, points and closing costs, and use equal amortization schedules to find the true cost savings of refinancing. He maintains that when discounting the cash flows, the appropriate discount rate is the mortgage rate on the new loan. G-Yohannes (1988) illustrates that the decision to refinance should include a number of important factors, including: closing costs, interest rate on the existing loan, interest rate on the new loan, holding period, opportunity discount rate, income taxes, remaining balance, and the term of the new loan. Valachi (1982) uses the internal rate of return to evaluate mortgage refinancing. Followill and Johnson (1989) show that because of the tax deductibility of the mortgage interest payment, the refinancing decision must be made from an after-tax perspective. They utilize a net present value model to analyze the benefits of refinancing.

Bennett, Keane, and Mosser (1999) explain that the high number of loans that have been refinanced is not because of just being cost effective, but is also because of favorable economic conditions. They observe that homeowners typically refinance if the borrower's current rate exceeds the refinance rate by 50 to 200 basis points. They also find that the mortgage interest rate spread explains about 72% of the refinancing activity in the 1990 through 1998 period. Bennett, Peach, and Peristiani (2000) present a prepayment model that incorporates the borrower's creditworthiness, loan-to-value ratio, and market conditions. Using a loan level dataset they develop a model that allows them to compute the minimum interest-rate differential needed to justify refinancing. Wetmore and Ndu (2006) use a Garch model to explain changes in mortgage refinancing over 1990 through 2001. They find that refinancing activity is negatively related to the 30-year mortgage rate, that mortgage refinancing is a substitute for other investments, and that investors respond more quickly to changes in interest rates than in the past.

Chen and Ling (1989) present a model of mortgage refinancing in which the borrower is viewed as the seller of a callable mortgage bond to the lender. They find that it is advantageous to "refinance a fixed-rate mortgage when the present value of interest savings exceeds the refinancing costs." They also show that this minimum differential increases with transaction costs, interest rate volatility, and expected holding period. Johnson and Randle (2003) present a model for analyzing the feasibility of mortgage refinancing. Their model finds the breakeven number of months between the sum of the present value of the P&I payment and unpaid balance for the old and new loans. As with previous authors, they find that it is mathematically the same to include the closing costs in the new loan balance as opposed to being "paid out of pocket." Their model does not include the value of the lost interest tax shield. Fortin and Michelson (2005) provide an Excel model to determine the break-even period with and without these tax benefits.

Our paper is an extension to the elegant closed-form equation model developed by Hoover (2003) that computes the breakeven and NPV of mortgage refinancing. The Hoover model extends earlier work by Chen (1997), Rose (1992), and Johnson and Randle (1996, 2003) by recognizing the importance of after-tax analysis and properly defining the proper discount rate. Our approach extends the Hoover model by relaxing the assumption made in the Hoover paper that all loans are interest-only. Rather than a closed-form equation solution, our model is iterative (made necessary by the changing proportion of principal and interest in most mortgage payments each month) and has been programmed into Excel, which is much easier to use than the algebraic closed-form approach. Because principal reduction loans are most common, this is a significant advancement. The iterative approach also results in an accurate calculation rather than an approximation resulting from the closed-form model.

This paper incorporates the previously discussed factors. In addition, we provide an Excel model for the finance professional or the homeowner to use that provides the IRR and the NPV as a function of the length of ownership, as well as an after-tax breakeven period.

3. Data and methodology

Our primary objective is to examine the mortgage refinancing decision, while considering the lost tax shield from the interest payments on a higher interest rate mortgage. Rules of thumb for refinancing are not very accurate and the breakeven interest differential is higher than one might think. Our analysis utilizes simulated data, over a representative sample of differential mortgage rates over various refinancing periods and using middle-income federal tax rates. We also provide an Excel model that can be used by the reader to analyze mortgage refinancing for personal and professional use. The model allows the investor to modify the mortgage balance, the term, the tax rate, the old mortgage interest rate, and the new mortgage interest rate. A copy of the working model can be downloaded at www.drsm.org/model1.html.

We first discuss the basic inputs to the model, followed by a presentation of the Excel model, and then provide a discussion of the results of the analysis of typical mortgage data. The important input variables to the model are: mortgage balances, interest rates on the old and new loans, number of remaining payments on the old loan, term of the new loan, closing costs, and investor tax rate.

Using this data, we calculate the remaining balance on the old loan and use this amount for the starting balance of the new loan, but also add the closing costs to the new balance. Additionally, we calculate the monthly payment on each of the loans and then iteratively perform a breakeven analysis. For each loan (old and new) we calculate the present value of the future mortgage payments up to the breakeven month and the present value of the unpaid balance. Following Auster (1998) and Johnson and Randall (2003), we assume that the interest rate on the new mortgage is the opportunity cost of debt for this investor and the relevant interest rate for computing present values is the interest rate on the new mortgage.

We take the sum of both of the PVs for each loan and then find the breakeven number of months for the two sums to be equal for the old loan and the new loan. We use Goal Seek in Excel to perform this optimization.

The previous calculation does not consider the lost interest tax deduction. To find the breakeven while incorporating taxes, we perform a similar analysis as described above, but also include the present value of the lost interest tax deduction. To do so, we calculate the difference in the interest payment each month for the old and the new loans and then multiply this value (each month) times the investor's marginal tax rate. This incorporates the value of the lost tax deduction because of lower interest payments on the new loan. We then find the present value of these monthly "tax deductions" over the breakeven period number of months and use this value to penalize the new loan for the lost tax deduction, thus creating a longer breakeven period.

As with previous authors, we find that the results are mathematically identical when including the closing costs in the new loan balance in contrast to being considered separately during closing. We incorporate the closing costs in the new loan balance and, thus, compute the breakeven between the old mortgage's lower balance and the new mortgage's higher balance. The higher remaining balance on the new loan is offset by the lower P&I payments and the higher payments towards the principal balance, due to the lower interest rate obtained by refinancing.

For NPV, one first selects the year at which to compute the NPV. At that year, we find the present value of the difference in principal and interest payments, the present value of the difference in remaining balances, and the present value of the lost interest deduction. One would normally select the year based on how long the homeowner anticipates holding the mortgage and the result would be a positive or negative NPV decision. For IRR, the computation is similar to NPV, except we now solve for the rate of return.

Algebraically, our calculations are accomplished as follows:
To find the present value of the principal and interest payments at the breakeven year (m), compute the following for the old loan and the new loan, where *loan* indicates the payment is for either the old loan or the new loan.

$$PV_{P\&I} = \sum_{n=1}^{n=m} \frac{PMT_{loan}}{(1 + i_{new}/12)^n} \tag{1}$$

To find the present value of the remaining balance at the breakeven year (m) for the old loan and the new loan, where loan indicates the payment is for either the old loan or the new loan.

$$PV_{Remaining\ Balance} = \sum_{n=m+1}^{n=360\ or\ (180)} \frac{PMT_{loan}}{(1+i_{loan}/12)^n} \tag{2}$$

Then find the sum of both present values for the P&I and the Remaining Balance for both the old loan and the new loan. Excel's Goal Seek will be used to find the breakeven number of years in which these two sums are equal. Alternatively, algebraically, find m (breakeven month), such that:

$$PV_{\text{P\&I (old loan)}} + PV_{\text{Remaining Balance (old loan)}} = PV_{\text{P\&I(new loan)}} + PV_{\text{Remaining Balance (new loan)}} \quad (3)$$

This equation is used to find the breakeven month (m), not incorporating the value of the interest deduction.

To incorporate the value of the lost interest deduction:

$$PV_{\text{lost deduction}} = \sum_{n=1}^{n=m} \frac{\left[\sum_{n=1}^{n=m} \text{Interest payment}_{\text{n, old loan}} - \sum_{n=1}^{n=m} \text{Interest Payment}_{\text{n, new loan}}\right] \times \text{Tax Rate}}{(1 + i_{\text{new loan}}/12)^n} \quad (4)$$

Then adjust the sum of the present values (above) used to find the breakeven, by including the lost interest deduction:

$$PV_{\text{P\&I(old loan)}} + PV_{\text{Remaining Balance(old loan)}} = PV_{\text{P\&I(new loan)}} + PV_{\text{Remaining Balance(new loan)}} + PV_{\text{lost deduction}} \quad (5)$$

This equation is used to find the breakeven month (m), including the value of the interest deduction.

4. The Excel model

Table 1 presents the Excel model developed to perform the breakeven analysis and Table 2 provides examples of the results. Table 3 shows the formulas used to build the model. The inputs are in the shaded cells (original loan amount, loan term, interest rates, remaining number of payments, tax rate, and closing costs). The monthly payments are calculated using the PMT function. The model calculates the remaining balance of the old loan using a lookup (VLOOKUP function) that references the amortization table. The present value of the P&I payments is calculated using the PV function to discount the mortgage payments using the new loan interest rate as the discount rate. The present value of the unpaid balance is computed using the PV function to discount the P&I payments from the end of the loan up to the breakeven month. These two values are summed (PV of P&I and PV of Remaining Balance) separately for the old and the new loan. We then use the Goal Seek Analysis Tool to find the breakeven period number of months to cause these two sums to be equal, using the difference cell, D23.

As indicated in Column G of Table 1, Goal Seek can be used to find the breakeven number of months. Goal Seek is the simplest form of a linear program, in that there is only one constraint. To use Goal Seek, go to Tools, Goal Seek, and then fill in the three blanks in the dialogue box. For Set Cell, specify cell D23 and for Value, specify 0. For Changing Cell,

Table 1.

	A	B	C	D	E	F	G	H	I	J
1		**Exhibit 1**								
2		**Fixed Rate Level Payment Home Loan Loan Amortization Model**								
3		**Breakeven Months For New Loan With and Without Taxes**								
4										
5										
6			**Old Loan**	**New Loan**						
7		**Input Values:**					**Input Values**			
8		**Initial Loan Amount, Old Loan**	$100,000	NA			**Goal Seek Cells**			
9		**Original Loan Term**	360	240	**After-Tax Rate**					
10		**Annual Interest Rate**	7.00%	6.00%	4.32%					
11		**Remaining Number of Payments**	240	240			**Goal Seek:**			
12		**Remaining Loan Balance**	$85,812				**Set cell: D23 or D31**			
13		**New Loan Amount**		$86,812			**Set to value: 0**			
14		**Monthly P&I Payment**	$665	$622			**Changing cell: C19 or C26**			
15		**Closing Costs, New Loan**	NA	$1,000						
16		**Tax Rate**	28%	28%			**Macros:**			
17							**Ctrl T - first breakeven**			
18		**Calculations without any tax effect:**					**Ctrl G - Tax breakeven**			
19		**Breakeven Number of Months (m)**	**14.74**	14.74						
20		**PV of P&I Payments at (m)**	$9,429	$8,815						
21		**PV of Remaining Balance at (m)**	$77,383	$77,997						
22		**PV of All Cash Flows at (m)**	$86,812	$86,812			**NPV at**	**36**	**Months**	
23			Difference	$0			**$674.61**			
24										
25		**Calculations with Tax Effect:**					**IRR at**	**36**	**Months**	
26		**Breakeven Number of Months (n)**	**20.42**	20.42			**49.83%**	annualized		
27		**PV of P&I Payments at (n)**	$13,077	$12,225						
28		**PV of Remaining Balance at (n)**	$76,430	$76,925						
29		**PV of All Cash Flows at (n)**	$89,508	$89,150						
30		**PV of Interest Deduction Difference at (n)**	$357							
31		**Difference with Interest Tax Deduction**		$0						

Table 2.

Exhibit 2
Months to Breakeven, NPV, and IRR when Refinancing

Old mortgage amount	$100,000	$100,000	$100,000	$100,000
Old mortgage remaining balance	$85,812	$85,812	$85,812	$85,812
New mortgage amount (unpaid balance plus closing costs)	$86,812	$86,812	$86,812	$86,812
Old mortgage term (months)	360	360	360	360
Months left on old mortgage	240	240	240	240
New mortgage term (month)	240	240	240	240
Interest rate old mortgage	7.00%	7.00%	7.00%	7.00%
Interest rate new mortgage	6.00%	6.50%	5.50%	5.00%
Closing costs on new mortgage	$1,000	$1,000	$1,000	$1,000
Investor tax rate	28%	28%	28%	28%
Old mortgage P&I monthly payment	$665	$665	$665	$665
New mortgage P&I monthly payment	$622	$647	$597	$573
Months breakeven w/o taxes	**14.74**	**31.44**	**9.63**	**7.15**
Months breakeven w taxes	**20.42**	**44.23**	**13.30**	**9.69**
NPV	**$0**	**$0**	**$0**	**$0**
IRR	**4.32%**	**4.68%**	**3.96%**	**3.60%**

Table 3.

	A	B	C	D	E	F	G	H	I
1		**Exhibit 3**							
2		**Fixed Rate Level Payment Home Loan Loan Amortization Model**							
3		**Breakeven Months For New Loan With and Without Taxes**							
4									
5									
6			**Old Loan**	**New Loan**					
7		**Input Values:**					**Input Values**		
8		**Initial Loan Amount, Old Loan**	$100,000	NA			**Goal Seek Cells**		
9		**Original Loan Term**	360	240	**After-Tax Rate**				
10		**Annual Interest Rate**	7.00%	6.00%	=D10*(1-D16)				
11		**Remaining Number of Payments**	240	240			**Goal Seek:**		
12		**Remaining Loan Balance**	=VLOOKUP($C$9-$C$11,A35:E395,5)				**Set cell: D23 or D31**		
13		**New Loan Amount**		=C12+D15			**Set to value: 0**		
14		**Monthly P&I Payment**	=PMT(C10/12,C9,-C8)	=PMT(D10/12,D11,-D13)			**Changing cell: C19 or C26**		
15		**Closing Costs, New Loan**	NA	$1,000					
16		**Tax Rate**	28%	28%			**Macros:**		
17							**Ctrl T - first breakeven**		
18		**Calculations without any tax effect:**					**Ctrl G - Tax breakeven**		
19		**Breakeven Number of Months (m)**	**15**	=C19					
20		**PV of P&I Payments at (m)**	=PV($D$10/12,C19,-$C$14)	=PV($D$10/12,D19,-$D$14)					
21		**PV of Remaining Balance at (m)**	=PV($C$10/12,$C$11-C19,-$C$14)*(1/(1+D10/12))^C19	=PV($D$10/12,$D$11-D19,-$D$14)*(1/(1+D10/12))^C19					
22		**PV of All Cash Flows at (m)**	=SUM(C20:C21)	=SUM(D20:D21)			**NPV at**	**240**	**Months**
23			Difference	=C22-D22			**=VLOOKUP(H22,K35:W395,11)**		
24									
25		**Calculations with Tax Effect:**					**IRR at**	**240**	**Months**
26		**Breakeven Number of Months (n)**	**20**	=C26			**=VLOOKUP(H25,K36:W398,13)**	annualized	
27		**PV of P&I Payments at (n)**	=PV($E$10/12,C26,-$C$14)	=PV($E$10/12,D26,-$D$14)					
28		**PV of Remaining Balance at (n)**	=MAX(PV($C$10/12,$C$11-C26,-$C$14),0)/((1+E10/12)^C26)	=MAX(PV($D$10/12,$D$11-D26,-$D$14),0)/((1+E10/12)^D26)					
29		**PV of All Cash Flows at (n)**	=SUM(C27:C28)	=SUM(D27:D28)					
30		**PV of Interest Deduction Difference at (n)**	=VLOOKUP(C26,K35:P395,6)						
31		**Difference with Interest Tax Deduction**		=C29-D29-C30					

specify C19. These values specify that you require Goal Seek to optimize such that C22 and D22 (the PV of All Cash Flows, old loan and new loan) are equal, by varying the values in C19 (the Breakeven Number of Months). Notice that the breakeven number of months is the time-period used in computing the present values of P&I payments and remaining balance.

When computing breakeven while considering the tax effect of the lower interest deduction, the logic is similar to the previous breakeven calculation. The primary difference is that cell C30 also incorporates the PV of the lost interest deduction, penalizing the new loan for the difference. To use Goal Seek for the breakeven computation that incorporates the interest tax deduction, the procedure is similar to the non-tax case, just change the cell references. The Set Cell is D31, Value is zero, and Changing Cell is C26. We have also developed macros to allow automatic operation of Goal Seek. Simply depress Control-T to compute the first breakeven value and depress Control-G to compute the tax adjusted breakeven value. We have also provided macro buttons in rows 2–4 (not shown on the exhibit) that can also be used to run the two macros.

To compute NPV and IRR, input the number of months one expects to hold the mortgage in Cells H22 and H25. The resulting NPV and IRR will appear in Cells G23 and G26 that are generated by referencing a lookup (VLOOKUP) from the amortization table, where the NPV and IRR are computed for every month in the mortgage. The values for NPV and IRR are exact for each whole month, but not continuous, so NPV will not be exactly zero when 20.42 is entered in cell H22. The program enters the value of 20.42 as 20 and the corresponding NPV is −26.67. If you enter 21 in cell H22 the NPV is +19.14. You can see that an NPV of zero would fall between the two values. A similar situation exists for IRR when entering values for months in cell H25. At 20 months the IRR is −1.55% and at 21 months the IRR is 4.59%. The after-tax discount rate of 4.32% in cell E10 falls between those two values.

Figure 4 presents a graph showing how NPV increases as the mortgage term increases. One can see graphically how the breakeven number of years is equal to the point at which

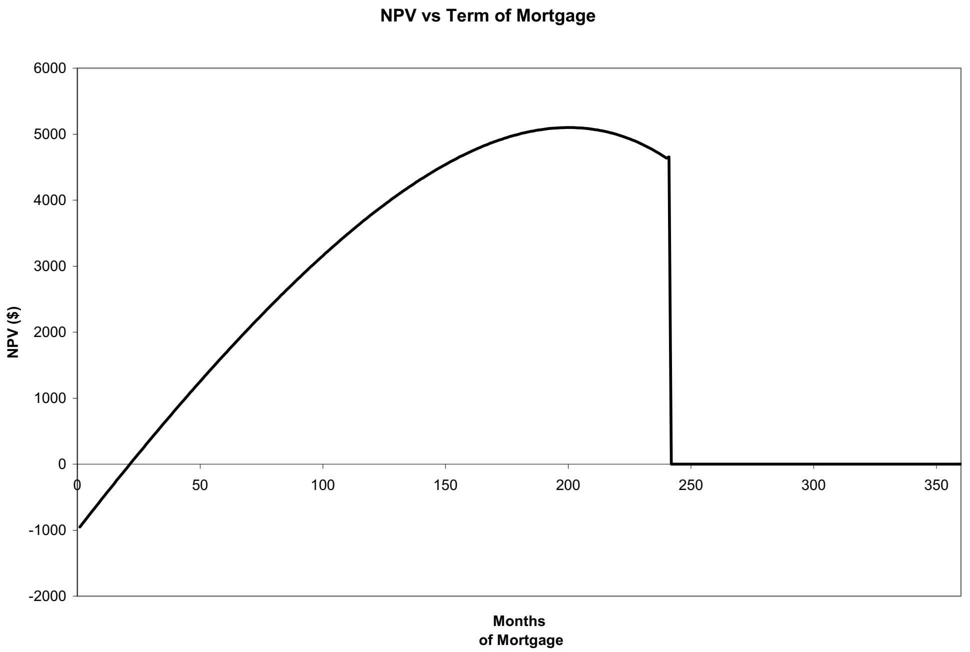

Fig. 4: NPV vs Term of Mortgage

NPV is zero and the point where the IRR is equal to the discount rate (after-tax interest rate on the new loan). The graph updates as one changes the input variables.

5. Results and discussion

Table 2 presents example results of the model shown in Table 1. We have varied the mortgage amount, term, and interest rate to provide a sample of scenarios for discussion. The table presents the results for a $100,000 original mortgage, $85,812 remaining balance, and $86,812 new mortgage including closing costs of $1000. The remaining balance is computed based on the number of months remaining in the mortgage. The new loan amount is the remaining balance of the old loan, plus closing costs. The mortgage principal and interest payments are computed based on the term, mortgage amount, and interest rate. Note that the number of months remaining on the old mortgage and the term on the new mortgage are the same. This is not a requirement of the model; we simply utilize the same number of months to allow the reader to more easily compare the old and new loan. In general, the variables that create a longer breakeven include: longer term mortgage, lower initial interest rate, smaller difference in old and new interest rates, and lower principal balance on the mortgage.

On a $100,000 mortgage, a one percentage decrease in interest rates requires about one year to breakeven (15 months), when not considering taxes and about two years when the lost tax deduction is included (21 months). When reviewing a one-half percentage difference in mortgage rates, the break-even is much longer. The breakeven is three years (32 months) without the lost interest tax deduction. However, when also considering taxes, the breakeven is about four years (45 months), about 40% longer. A larger decrease in interest rates provides much faster breakevens. A one and one-half percentage difference provides a 14-month breakeven (incorporating taxes) and a two percentage difference provides a 10 month breakeven. Even though both breakevens are fairly rapid, they are still about 40% slower than the equivalent breakeven not incorporating the tax effect.

In this model, the NPV and IRR are calculated for each year of the mortgage. Therefore, an investor can use the model to determine how long they will need to hold the mortgage to have a positive NPV or high enough IRR, based on their horizon. For example, if an investor is planning on retaining this mortgage for 36 months using the 6% new mortgage rate, the resulting NPV is $674.61 and the IRR is 49.83%. This confirms that over a 36-month horizon, refinancing would be a good investment decision. When we review the NPV and IRR at the breakeven point, the result is known beforehand. At the breakeven, the NPV should be zero and the IRR will be the after-tax rate of return. Table 2 confirms that this is true. Therefore, under all of our scenarios, the NPV is zero and the IRR decreases as the new mortgage interest rate decreases. Note that in this model, we present the breakeven as a whole number (we do not present fractional months), so there is some round off when comparing breakeven, NPV, and IRR.

The data illustrate that at least a one-percent interest rate differential is necessary to achieve a reasonable breakeven. Longer-term mortgages also tend have a faster breakeven because more interest is saved by refinancing. Similar results are found when including the effect of the lost interest deduction, although the breakeven periods are about 40% longer. Because the average mortgage holder tends to move or refinance every three to five years, one must evaluate their specific breakeven very carefully. All of the scenarios presented break even in less than five years. If an investor is considering moving or refinancing after only three years, he or she would need a one percentage or larger interest rate decrease to breakeven.

6. Conclusion

This paper provides homeowners with relevant information about what is likely the largest single asset in their overall financial portfolio. We discuss the input variables required and how to compute the NPV, IRR, and breakeven period for the mortgage refinancing decision. We incorporate the interest rate tax effects that are normally ignored and we developed an Excel model to perform this analysis and utilize Goal Seek to optimize the solution. We find that breakeven is about 35% to 40% longer when considering the effect of the lost interest tax shield. The model we develop allows the user to compute the NPV and IRR based on their specific investment horizon for the mortgage. A free copy of this Excel model is available at: www.drsm.org/model1.html.

A financial planning website (CCH 2007) states "A rule of thumb is that your new loan should have an interest rate that is at least 1% less than your present mortgage before you consider refinancing. Also, you must plan on owning your home for a long enough period–generally five years is required–to at least breakeven when it comes to the costs and fees incurred in obtaining a lower interest rate." This is fairly typical advice that a client receives from a financial planner. The model that we develop in this paper allows a financial planner to easily apply the information when advising their clients. The financial planner can compute an accurate breakeven period, NPV, and IRR of refinancing. The lost tax benefit of refinancing at a lower interest rate is also incorporated in the model. The Excel spreadsheet allows the financial planner to customize the variables (including mortgage interest rate, tax rate, mortgage term, and closing costs) for their client's specific situation. If the financial planner wishes to quote rules of thumb, he or she can indicate that a one-percentage decrease in mortgage rates will result in a one to two year break-even. The reason for considering the lost interest deduction is that breakevens are about 35% to 40% longer when these deductions are incorporated. In addition, longer term mortgages break even much faster when considering the lost interest deduction because the interest savings is greater. In conclusion, financial planners need to stop using rules of thumb and take the time to compute the actual benefits to their client. Our model easily allows this to be accomplished.

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CCH, Financial Planning Toolkit, http://www.finance.cch.com/text/c20s15d660.asp, Copyright 2002–2007, CCH Incorporated.

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