The Relative Benefits of Making A Higher Down Payment or Paying Points For A Lower Interest Rate

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An overlooked decision in homebuying is whether making a higher down payment or paying points to lower the mortgage interest rate is better. This paper outlines the relative costs and benefits of each option and then simulates the options for various mortgage interest rates, lengths of stay, and tax brackets. Internal rates of return are derived as the measure of relative benefit. In typical cases, paying more points to lower the mortgage interest rate is superior to making a larger down payment.
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Buying a home has become more complicated during the past two decades. Homebuyers must choose between a fixed and adjustable rate mortgage loan, between 15-year and 30-year terms, and between a variety of other mortgage alternatives, such as biweekly payments, graduated payments, and shared equity and appreciation mortgage loans.

Equally important, however, is the choice between making a higher down payment or paying extra "points" to obtain a lower mortgage interest rate. Consider this situation. Suppose a homebuyer has met the minimum down payment but has an additional $5000 that can be applied to the home purchase or to the financing. Is the homebuyer financially better-off adding the $5000 to the down payment, thereby reducing the amount borrowed, or is it better for the homebuyer to use the $5000 to "buy-down" the mortgage interest rate, thereby financing the loan at a lower mortgage rate? The latter option involves paying "points" to obtain a lower mortgage interest rate.

Although the choice between making a larger down payment and paying points is important to homebuyers, it has been overlooked in both the academic and popular personal finance literature. For example, Garman and Forgue (1991, p. 358, p. 371), Lang (1988, pp. 259-262), and Rosefsky

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(1989, p. 206, p. 320) each discuss the size of the down payment and the payment of points, but they don't compare the relative benefits and costs of the two options. A recent review article on mortgage choice reveals that the tradeoff between a larger down payment and more points for a lower interest rate has also not been addressed by researchers (Follain, 1990). Recent articles on homebuying in *Changing Times* (February, 1987 and July, 1990) and *Money* (May, 1991) also ignore the decision between increasing the down payment and paying points to reduce the interest rate.

This paper examines the relative benefits to the homebuyer of making a greater down payment or paying more points to obtain a lower interest rate on the mortgage loan. Simulation models are developed to examine the two options, and internal rates of return are calculated to measure their relative benefits. In the great majority of comparisons it is found that using funds to pay points and buy-down the interest rate is preferred to increasing the down payment.

The outline of the paper is as follows. The next section presents the general approach and models which are used to analyze the "down payment vs. points" decision. The third section presents the empirical results and a discussion of the results. The paper concludes with a summary and implications.

Approach And Models

The homebuyer facing the aforementioned decision has three options: (1) use a given amount of money to increase the down payment, (2) use the money to pay points and buy-down the mortgage loan interest rate, or (3) use the money for some other purpose, such as investing or paying down on credit card balances.

The most straightforward method for comparing the options is to calculate and compare internal rates of return. The internal rate of return is the interest rate which equates the present value of the stream of benefits of the option to the present value cost of the option. Viewed another way, the internal rate of return is the implicit rate of return, or interest rate, earned by "investing" money in the option. For the investment option, the internal rate of return is simply the after-tax interest rate earned on the investment.

This approach allows rapid identification of the best option: the best option is the one with the highest internal rate of return. The next two subsections specify how to calculate the internal rates of return for a higher down payment and for paying extra points.

Relative Benefits of A Higher Down Payment

There are four benefits of making a larger down payment (Table 1). First, if closing costs are a fraction of the loan amount, then closing costs are less when a higher down payment is made. Second, after-tax monthly mortgage payments are lower when a higher down- payment reduces the loan amount. Third, the homeowner will receive more equity when the house is sold when a higher down payment is made. Fourth, private mortgage insurance costs may be lower or eliminated with a higher down payment.

Table 1
Comparison of Benefits of A Larger Down Payment and of Paying More Points

Larger Down Payment	*Paying More Points*
Lower closing costs	Lower after-tax monthly mortgage payments
Lower after-tax monthly mortgage payments	More equity when house is sold
More equity when house is sold	
Lower private mortgage insurance costs	

In modeling the relative benefits of a higher down payment, closing costs are assumed to be 4% of the loan amount. So the reduction in closing costs from a higher down payment is:

$$(0.04)x[(LoanLowDown)-(LoanHighDown)] \quad (1)$$

LoanLowDown is the loan associated with the lower down payment.

LoanHighDown is the loan associated with the higher down payment.

The savings from lower after-tax mortgage payments that result from a higher down payment are a function of the mortgage interest rate (r), the homeowner's marginal tax rate (t), and the number of months the house is owned (N). The present value of these savings is:

SUM FROM 1 TO N{{PayLowDown - [(t) BOLD{x} (IntLowDown (i))] - [PayHighDown - [(t) BOLD {x} (IntHighDown (i))]} OVER {(1 + IrrDown)^i}}

(2)

PayLowDown is the monthly mortgage payment with a low down payment. IntLowDown(i) is the monthly interest payment in month i with the low down payment. PayHighDown is the monthly mortgage payment with a high down payment. IntHighDown(i) is the monthly interest payment in month i with the high down payment. IrrDown is the internal rate of return.

The present value of additional equity received by the homebuyer when the house is sold is:

UNDERLINE { (SaleValue - BalHighDown - SaleValue - BalLowDown) }
ALIGNC{ (1 + IrrDown) SUP N }

(3)

SaleValue is the house value when the house is sold. BalHighDown is the loan balance with a high down payment when the house is sold. BalLowDown is the loan balance with a low down payment when the house is sold, and N is the number of months from purchase to sale of the house. Equation (3) can be rearranged as:

UNDERLINE { (BalLowDown - BalHighDown) } # (1 + IrrDown) SUP N

(3✞)

Notice that the present value of the additional equity is independent of the ending house value.

The schedule offered by Lang and Gillespie (1981, p. 431) is used to calculate the savings in private mortgage insurance payments resulting from a

higher down payment. The schedule is:

- for a down payment of 5% to less than 10%, annual private mortgage insurance payments are $20 plus 1% of the loan in the first year, and 1/4 of 1% of the loan for each year thereafter until the loan balance to house value ratio becomes less than 80%,
- for a down payment of 10% to 20%, annual private mortgage insurance payments are $20 plus 1/2 of 1% of the loan in the first year, and 1/4 of 1% of the loan for each year thereafter until the loan balance to house value ratio becomes less than 80%.
- for a down payment of more than 20%, there is no private mortgage insurance.

Once private mortgage insurance is taken, it is usually not costless to remove. The model assumes that the homeowner must pay a $150 appraisal fee to remove private mortgage insurance once the loan balance to house value ratio becomes less than 80%. (These results are not sensitive to the appraisal fee assumption.)

This schedule is used to calculate the present value of savings in private mortgage payments using the equation:

SUM FROM N TO 1 {{[PmiLowDown(i) - PmiHighDown(i)]} OVER {(1 + IrrDown) SUP i}}

(4)

PmiLowDown(i) is the private mortgage insurance payment in month i with the low down payment. PmiHighDown(i) is the private mortgage insurance payment in month i with the high down payment. Since the termination of the private mortgage insurance payments depends on the house value, equation (4) varies with the house appreciation rate.

The cost of a higher down payment is the extra money expended for the higher down payment, that is,

HighDown - LowDown

(5)

HighDown is the high down payment. LowDown is the low down payment.

The present value benefit of the higher down payment is (1)+(2)+(3)+(4). The internal rate of return (IrrDown) is the interest rate which equates (5) to

(1)+ (2)+(3☠)+(4).

Relative Benefits of Paying Extra Points

There are two benefits to the homebuyer of paying "points" (1 point equals 1% of the loan) to obtain a lower mortgage interest rate (Table 1). First, after-tax monthly mortgage payments are lower since the loan is financed with a lower interest rate. Second, since the lower interest rate loan is repaid more rapidly, the homebuyer receives more equity when the house is sold.

The calculations of benefits from paying points are similar to the calculations of benefits from making a higher down payment. The present value of savings from lower after-tax monthly mortgage payments is:

SUM FROM N TO 1{{PayLowPts - [(t) x (IntLowPts(i))] - PayHighPts - [(t) x (IntHighPts (i))]} OVER {(1 + IrrPts) SUP i}}

(6)

PayLowPts is the monthly mortgage payment when extra points are not paid and the mortgage interest rate is higher. IntLowPts(i) is the monthly interest payment in month i when extra points are not paid. PayHighPts is the monthly mortgage payment when extra points are paid and the mortgage interest rate is lower. IntHighPts(i) is the monthly interest payment in month i when extra points are paid, t is the homeowner's marginal tax rate, and IrrPts is the internal rate of return.

The present value of additional equity received by the homebuyer when the house is sold at month N is:

{(SaleValue - BalHighPts) - (SaleValue - BalLowPts)} OVER {(1 + IrrPts) SUP i}

(7)

or

{BalLowPts - BalHighPts} OVER {(1 + IrrPts) SUP N}

(7☠)

BalLowPts is the loan balance at month N when extra points are not paid and the mortgage interest rate is higher, BalHighPts is the loan balance at month N when extra points are paid and the mortgage interest rate is lower, and

IrrPts is the internal rate of return.

The cost of buying down the mortgage interest rate by paying extra points is:

$$(1-t) \times (HighPts - LowPts) \times (Loan) \quad (8)$$

HighPts is the higher number of points paid associated with a lower interest rate. LowPts is the lower number of points paid associated with a higher interest rate. Loan is the loan amount, and t is the homebuyer's tax bracket. HighPts and LowPts are measured in proportional terms, for example .03 and .01. Since points are deductible if used to make a home purchase, only (1 - t) part of the points cost represents an out-of-pocket expenditure. So, for example, if a 10% mortgage rate can be obtained by paying 1 point and a 9% mortgage rate can be obtained by paying 5 points, if the loan amount is $100,000, and if the homebuyer's tax bracket is 28%, then the cost of buying down the mortgage interest rate is:

(1-.28) x (.05 - .01) x $100,000, or $2880.

The present value benefit of paying more points to obtain a lower mortgage interest rate is (6)+(7☠). The present value cost is (8). The internal rate of return (IrrPts) is the interest rate which equates (8) to (6)+ (7☠).

Empirical Results

The relative benefits of making a higher down payment are simulated for five mortgage interest rates (7, 9, 11, 13 and 15%) five lengths of stay in the house (2,5,10, 20, and 30 years), and two tax brackets (15 and 28%). A $100,000 house purchase is assumed. Three down payment changes are considered in increments of $5000 (5% to 10%, 10% to 15%, and 15% to 20%). Finally, a 4% annual home appreciation rate is assumed. Simulations were run with other appreciation rates (specifically -3, 0 and 8%), but the results were very similar to those with a 4% appreciation rate.

The relative benefits of paying extra points to obtain a lower mortgage interest rate are simulated for the same interest rates, lengths of stay in the house, tax brackets, and house purchase as in the down payment simulations. For direct comparability to the down payment increments, it is assumed the homebuyer is considering paying 5 points, or $5000. Results are obtained for five alternative reductions in the mortgage interest rate received from this payment of five points: reductions of ½, 1, 2, 3, or 4 percentage points. A typical tradeoff is a reduction of 1 to 2 percentage points for a payment of 5

points, but this tradeoff does vary with mortgage market conditions (Jud and Epley, 1991).

Internal Rates of Return for a Higher Down Payment
The internal rates of return for making a higher down payment (IrrDown) are those which equate equation (5) to the sum of equations (1), (2), (3) and (4). An iterative procedure is used to calculate the rates of return. Once again, the internal rate of return can be thought of as the breakeven after-tax rate of return above which it is better to invest money rather than make the extra down payment.

Table 2 gives internal rates of return for a higher down payment assuming a 15% tax bracket. Two patterns are observed. First, internal rates of return are higher for the 5% to 10% and 15% to 20% down payment changes than for the 10% to 15% down payment change. This follows the "break" points of the private mortgage insurance schedule. The private mortgage insurance rates drop at the 10% and 20% down payment levels, whereas the rates are the same for the 10% and 15% down payments. Thus, it is more advantageous to increase the down payment from 5% to 10% and from 15% to 20%.

The second pattern to observe is the general decline in internal rates of return with longer lengths of stay. This occurs for two reasons. First, the longer the length of stay the less important the reduction in private mortgage insurance costs because the insurance is dropped when the loan to value ratio falls under 80%. Second, the longer the length of stay the relatively less important the initial reduction in closing costs.

Table 3 gives internal rates of return for a higher down payment assuming a 28% tax bracket. The patterns are the same as in Table 2. However, the internal rates of return in Table 3 are lower than in Table 2. This occurs because the larger mortgage interest deductions accompanying smaller down payments are more valuable at higher tax brackets. This reduces the relative benefits of a higher down payment. Compared to their respective mortgage interest rates, the internal rates of return in Tables 2 and 3 are generally within 5 percentage points (plus or minus) of the mortgage interest rate. As already discussed, the internal rates of return are highest for short lengths of stay. The results indicate that internal rates of return for short lengths of stay (5 years and less) are likely higher than could be obtained from a low risk investment. Thus, making a higher down payment in these cases yields a higher internal rate of return than investing the money. However, using funds to pay down credit card balances (and save 18% interest) is competitive to the internal rate of return from making a higher down

payment in all but a few cases.

Internal Rates of Return for Paying Points

The internal rates of return for paying points (IrrPts) are those which equate equation (8) to the sum of equations (6) and (7☠) for various values of the parameters. An iterative procedure is used to calculate the internal rates of return.

Table 2
Internal Rates of Return for A Higher Down Payment, 4% Appreciation Rate, $100,000 House, 15% Tax Bracket

Mortgage Interest Rate	Length Of Stay (Years)	*Down Payment Change* 5% to 10%	10% to 15%	15% to 20%
7%	2	13.52%	9.83%	12.93%
	5	9.83	8.67	9.12
	10	8.29	7.58	7.85
	20	7.62	7.11	7.28
	30	7.51	7.04	7.21
9%	2	15.27	11.38	14.82
	5	11.66	10.45	10.99
	10	10.14	9.41	9.70
	20	9.51	9.00	9.18
	30	9.41	8.96	9.09
11%	2	7.06	12.90	16.72
	5	14.05	11.68	12.84
	10	12.40	10.95	11.56
	20	11.74	10.57	11.06
	30	11.62	10.51	11.00
13%	2	18.80	13.20	19.96
	5	15.95	13.00	15.40
	10	14.29	12.30	13.94
	20	13.66	12.00	13.33
	30	13.53	12.00	13.26
15%	2	20.54	16.17	20.44
	5	17.68	15.23	16.57
	10	16.17	14.56	15.30
	20	15.53	14.20	14.93
	30	15.46	14.12	14.85

Table 3
Internal Rates of Return for a Higher Down Payment, 4% Appreciation Rate, 100,000 House, 28% Tax Bracket

Mortgage Interest Rate	Length Of Stay (Years)	*Down Payment Change* 5% to 10%	10% to 15%	15% to 20%
7%	2	12.55%	8.89%	11.94%
	5	8.85	7.73	8.13
	10	7.32	6.76	7.00
	20	6.69	6.21	6.36
	30	6.56	6.14	6.27
9%	2	14.03	10.20	13.62
	5	10.45	9.27	9.75
	10	9.00	8.31	8.56
	20	8.26	7.78	7.94
	30	8.18	7.67	7.86
11%	2	15.52	11.45	15.29
	5	12.59	10.41	11.33
	10	10.95	9.42	10.15
	20	10.15	9.00	9.56
	30	10.05	8.96	9.46
13%	2	17.02	12.00	18.16
	5	14.15	11.24	13.60
	10	12.55	10.53	12.18
	20	11.82	10.22	11.53
	30	11.70	10.17	11.41
15%	2	18.50	14.70	18.40
	5	15.61	13.43	14.70
	10	14.12	12.46	13.30
	20	13.43	12.09	12.78
	30	13.30	12.03	12.65

The important parameters in this decision are the homeowner's tax bracket, the length of stay in the house, the higher mortgage interest rate, and the reduction in the mortgage interest rate for a given expenditure on points. Table 4 shows the internal rates of return for a 15% tax bracket, lengths of stay varying from 2 to 30 years, mortgage interest rates varying from 7% to

15%, and a reduction in the mortgage interest rate of from ½ percentage point to 4 percentage points for a $5000 payment in points. Alternative reductions in the mortgage interest rate are considered for the payment of 5 points (here $5000) because the rate reduction/points tradeoff varies with market conditions. A 30-year fixed rate mortgage is assumed.

As would be expected, the internal rates of return increase with a greater reduction in the interest rate for a given payment of points. The internal rates of return are very high for a reduction of 2 or more percentage points in the interest rate for a payment of 5 points as long as the length of stay is longer than 2 years.

Table 5 gives internal rates of return for the same situations as Table 4 except that a 28% tax bracket is assumed. Once again the internal rates of return are very high for a 2 or more percentage point reduction in the interest rate and a length of stay of more than 2 years. However, the internal rates of return are lower in Table 5 than in Table 4. This means it is less beneficial for homebuyers with a 28% tax bracket to pay points than it is for homebuyers with a 15% tax bracket. The reason again is that a higher tax bracket increases the value of larger interest payment deductions associated with a higher mortgage interest rate and thereby reduces the cost associated with higher mortgage rates.

Comparisons

A simple comparison of the internal rates of return in Table 2 with those in Table 4, and a comparison of the internal rates of return in Table 3 with those in Table 5 indicate the situations where making an extra down payment or paying points is better. The comparisons are made easier for the reader by the solid "demarcation lines" in Tables 4 and 5. Above the demarcation lines the internal rates of return for making an extra down payment are higher, and below the demarcation lines the internal rates of return for paying points are higher.

Table 4
Internal Rates of Return for Paying Points, $100,000 loan, 15% Tax Rate, 30-Year Fixed Rate Loan, Pay $5000 in points - (5 points)

Higher Mortgage Rate	Length of Stay (Years)	Reduction in interest rate by: ½% Pt.	1% Pt.	2% Pt.	3% Pt.	4% Pt.
7%	2	0.00%	0.00	0.00%	13.59%	36.66%
	5	0.00	0.30	24.24	41.33	55.19
	10	0.16	12.42	29.15	42.79	54.91
	20	6.11	14.87	29.29	42.37	54.64
	30	6.76	14.94	29.15	42.37	54.64
9%	2	0.00	0.00	0.00	14.82	39.79
	5	0.00	0.57	26.17	45.07	61.10
	10	0.45	13.48	31.95	47.37	61.40
	20	6.80	16.21	32.11	47.14	61.40
	30	7.51	16.29	32.11	47.14	61.40
11%	2	0.00	0.00	0.00	15.83	42.50
	5	0.00	0.69	27.82	48.14	65.59
	10	0.60	14.26	33.96	50.86	66.58
	20	7.29	17.23	34.47	50.86	66.58
	30	8.10	17.40	34.47	50.86	66.58
13%	2	0.00	0.00	0.00	16.52	44.78
	5	0.00	0.71	29.02	50.73	69.46
	10	0.64	14.87	35.60	53.59	70.86
	20	7.64	17.98	36.14	53.59	70.86
	30	8.53	18.16	36.14	53.59	70.86
15%	2	0.00	0.00	0.00	16.99	46.30
	5	0.00	0.66	29.85	52.45	72.18
	10	0.61	15.23	36.81	55.69	73.63
	20	7.86	18.50	37.37	55.69	73.63
	30	8.82	18.77	37.37	55.69	73.63

Table 5
Internal Rates of Return for Paying Points, $100,000 loan, 28% Tax Rate,
30-Year Fixed Rate Loan, Pay $5000 in points - (5 points)

Higher Mortgage Rate	Length of Stay (Years)	Reduction in interest rate by: ½% Pt.	1% Pt.	2% Pt.	3% Pt.	4% Pt.
7%	2	0.00%	0.00%	0.00%	12.99%	34.88%
	5	0.00	0.29	23.17	39.12	51.72
	10	0.15	11.88	27.59	39.91	50.70
	20	5.87	14.07	27.45	39.31	50.20
	30	6.49	14.14	27.32	39.31	50.20
9%	2	0.00	0.00	0.00	14.38	38.42
	5	0.00	0.56	25.27	43.31	58.12
	10	0.44	13.02	30.54	45.07	58.12
	20	6.56	15.58	30.70	44.85	57.83
	30	7.26	15.66	30.70	44.85	57.83
11%	2	0.00	0.00	0.00	15.44	41.45
	5	0.00	0.68	27.13	46.96	63.66
	10	0.59	13.91	33.12	49.11	64.30
	20	7.11	16.72	33.29	49.11	64.30
	30	7.86	16.81	33.29	49.11	64.30
13%	2	0.00	0.00	0.00	16.19	43.90
	5	0.00	0.70	28.45	49.73	67.75
	10	0.63	14.58	34.90	52.53	69.12
	20	7.49	17.62	35.43	52.53	69.12
	30	8.32	17.80	35.43	52.53	69.12
15%	2	0.00	0.00	0.00	16.74	45.62
	5	0.00	0.65	29.56	51.67	71.11
	10	0.60	15.08	36.26	54.86	72.54
	20	7.74	18.22	36.81	54.86	72.54
	30	8.64	18.40	36.81	54.86	72.54

The results are straightforward. Making an extra down payment is better when: (1) 5 points buys only a ½ percentage point reduction in the interest rate, (2) 5 points buys only a 1 percentage point reduction in the interest rate *and* the length of stay is 5 years or less, and (3) 5 points buys a 2 percentage point reduction in the interest rate *and* the length of stay is 2 years or less.

In other situations paying points is superior to adding to the down payment.

Since the typical tradeoff is payment of 5 points for a 1 to 2 percentage point reduction in the mortgage interest rate, it appears that paying points is superior to making an extra down payment except where the homeowner expects to stay in the house 5 years or less.

Summary and Implications

This paper has modelled the relative benefits and costs to a homebuyer of making an extra down payment or paying points to reduce the mortgage interest rate. Simulations of the alternatives show that paying points is superior to making an extra down payment except in the situations where there is a very small reduction in the mortgage interest rate for the payment of points or the length of stay by the homebuyer is short (5 years or less). For the typical tradeoff of a 1 to 2 percentage point reduction in the interest rate for the payment of 5 points, paying points is of greater benefit for the homebuyer than making an extra down payment unless the length of stay is 5 years or less.

The results presented in this paper can be used by real estate agents, financial planners, Extension agents, teachers, and lenders in advising homebuyers about the best use of their limited funds. The results are likely contrary to the conventional wisdom held by most homebuyers that making an extra down payment is always better. But the results strongly suggest that in the typical situations, paying points yields a better "return" to the homebuyer than adding to the down payment.

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