

CHAPTER 4 MINI-CASE: SALLY AND DAVE'S CONDO—FINANCING WITH A MORTGAGE*

This version: April 2011

Overview

This mini-case takes us back to b-school grads Sally and Dave. You'll perhaps recall from PFE Chapter 4 that they're thinking of buying a condo which will cost \$100,000. In Chapter 4, Sally and Dave were planning to finance the condo purchase without borrowing. In this case we consider the case where they take out a mortgage to finance the investment.

The point of this case is to get you to think about the effect of financing on returns. It should also lead to a discussion of the relation between financing and risk.

Case facts

Here are the facts:

- Sally and Dave intend to take a 10-year mortgage for \$50,000. The mortgage has interest rate of 8%, compounded annually. Repayment of the mortgage is in *equal annual payments* of interest and principal.
- Sally and Dave can rent out the condo for \$2,000 per month. They'll have to pay property taxes of \$1,500 annually and they're figuring on additional miscellaneous expenses of \$1,000 per year.
- All the income from the condo has to be reported on their annual tax return. Currently Sally & Dave have a tax rate of 30%, and they think this rate will continue for the foreseeable future.
- The full cost of the condo can be depreciated over 25 years on a straight-line basis.
- To calculate the return from owning the condo, Sally and Dave assume that they will sell the condo at the end of 10 years for \$100,000. Any gain over book value on the sale is, of course, taxable.

Assignment

1. Use the template for this case to calculate Sally and Dave's IRR on their equity investment. (Terminology: Since the cost of the condo is \$100,000 and since they're borrowing \$50,000, the *equity investment* is \$50,000.) Remember that for income tax purposes depreciation and interest on the mortgage are expenses, but that repayment of mortgage principal is not an expense. Use Excel's **IPMT** and **PPMT** functions (see explanation below).

2. Show (in a data table) the effect on the equity IRR when the mortgage goes from \$0, \$10,000, \$20,000, ... , \$90,000 . Explain your results.

* This is a case to accompany Chapter 4 of *Principles of Finance with Excel, 2nd Edition* by Simon Benninga (Oxford University Press, 2011). All rights are reserved, and you may not use this case without permission from the author simon@simonbenninga.com .

3. Show (in a data table) the effect on the equity IRR when the tax rate varies from 0% to 40% (in steps of 5%).
4. Suppose that Sally and Dave take a \$50,000 mortgage with a 25-year term. They still plan to sell the apartment at the end of year 10. At this date they will repay the remaining mortgage principal with a 2% penalty for early repayment. Calculate the equity IRR.

Excel note

A mortgage is a loan which usually involves flat annual repayments of principal and interest.¹ We discussed such loans in Chapter 2, where we showed how to build a *loan table* which describes the annual breakdown of the payment into interest and principal.

Excel has two functions, **IPMT** and **PPMT**, which do this breakdown without the necessity of a loan table. You will find these functions handy in this case. Because interest is deductible for tax purposes and repayment of loan principal is not, this case requires you to distinguish between the two. That's where , **IPMT** and **PPMT** come in.

Here's an example: Suppose you borrow \$10,000 for 5 years at 12%. The flat annual payment of principal + interest on this loan is \$2,774.10 (see cell B6 below). The loan table shows how this payment is split each year between interest and repayment of principal.

	A	B	C	D	E	F
1	THE EXCEL FUNCTIONS IPMT AND PPMT					
2						
3	Loan principal	10,000				
4	Interest rate	12%				
5	Loan term (years)	5				
6	Annual payment	\$2,774.10	<-- =PMT(B4,B5,-B3)			
7						
8						
9	Loan table		Payment split:			
10	Year	Principal at beginning of year	Payment at end of year	Interest	Repayment of principal	
11	1	10,000.00	2,774.10	1,200.00	1,574.10	<-- =C11-D11
12	2	8,425.90	2,774.10	1,011.11	1,762.99	<-- =C12-D12
13	3	6,662.91	2,774.10	799.55	1,974.55	
14	4	4,688.37	2,774.10	562.60	2,211.49	
15	5	2,476.87	2,774.10	297.22	2,476.87	
16						
17						
18	Using the IPMT and PPMT functions			Payment split:		
19	Year			Interest	Repayment of principal	
20	1	=IPMT(\$B\$4,A20,\$B\$5,-\$B\$3)		1,200.00	1,574.10	<-- =PPMT(\$B\$4,A20,\$B\$5,-\$B\$3)
21	2			1,011.11	1,762.99	<-- =PPMT(\$B\$4,A21,\$B\$5,-\$B\$3)
22	3			799.55	1,974.55	<-- =PPMT(\$B\$4,A22,\$B\$5,-\$B\$3)
23	4			562.60	2,211.49	
24	5			297.22	2,476.87	

By using the Excel function **=IPMT(interest rate, year, loan term, loan principal)** we can calculate the interest component of each year's payment directly. Similarly, we can use **PPMT** to calculate the principal component of each year's payment. This is illustrated in rows 20-24 above.

¹ Loans having this property are often called *term loans*. Term loans are common not only among mortgages, but also among many kinds of commercial loans.

	A	B	C	D	E	F	G	H	I	J
1	SALLY & DAVE'S CONDO--Template									
2	Condo purchase price	100,000.00								
3	Annual rent	24,000.00								
4	Property tax, annual	2,000.00								
5	Other expenses, annual	1,000.00								
6	Depreciation	4,000.00	<-- =B2/25							
7	Tax rate	30%								
8										
9	Mortgage									
10	Principal	50,000.00								
11	Interest	8%								
12	Term	10								
13	Annual payment	\$7,451.47	<-- =PMT(B11,B12,-B10)							
14										
15										
16	Calculation of income for tax purposes									
17	Year	0	1	2	3	4	5	6	7	8
18	Rent									
19	Miscellaneous expenses									
20	Property taxes									
21	Other expenses									
22	Depreciation									
23	Mortgage interest									
24	Reportable income									
25	Taxes									
26	Net income									
27										
28	Cash flow to Sally & Dave									
29	Net income									
30	Add back depreciation									
31	Take out mortgage principal repayment									
32	Equity cash flow									
33	Terminal value									
34	Total equity cash flow									
35										
36	IRR--compound return to equity									
37										
38										
39	Terminal value									
40	Estimated resale value, year 10									
41	Book value									
42	Taxable gain									
43	Taxes									
44	Net after tax									