CHAPTER 11

MORTGAGE ANALYSIS IN REAL ESTATE PRACTICE

Learning Objectives

After studying this chapter, a student should be able to:

- ☑ Calculate the market value (or cash-equivalent price) of a purchase offer that involves financing at a non-market rate of interest; specifically, the market value of a fully or partially amortized vendor take-back mortgage or a loan assumption
- ☑ Discuss the impact of financing on real estate market transactions
- ☑ Calculate the yield (return) on a fully or partially amortized bonused and discounted mortgage
- ☑ Explain the impact of brokerage fees for both borrowers and lenders
- ☑ Discuss the disclosure requirements of the *Business Practices and Consumer Protection Act* (BPCPA) and calculate the Annual Percentage Rate (APR)

INTRODUCTION

In previous chapters, you were introduced to several mortgage finance calculations:

- conversion of an interest rate to an equivalent rate with a different compounding frequency;
- solving for constant payments, given amortization period, loan amount, and interest rate; and
- calculating outstanding balances and principal/interest amounts.

While you have accomplished a lot in learning these calculations, they represent only a starting point for mortgage finance analysis. If you think of it like carpentry, you have now learned how to use the basic tools – a tape measure, level, saw, and hammer – and with those basic tools, you have the capabilities to build things. In mortgage finance terms, these basic tools are calculating interest rates, payments, outstanding balances, and principal/interest amounts. With these basic tools mastered, you now have the foundation in place to carry out more advanced financial analyses. It is with more advanced analyses where you see practical and realistic market

applications – how real estate professionals can use finance to better represent their clients' interests and to solve problems creatively towards successful sales transactions.

Mortgage loans can be used to make real estate sales more attractive, for example, by providing purchasers with an attractive low-interest rate loan or providing vendors a potential financial benefit that adds to the return on their investment. A potential purchaser could propose such alternative financing arrangements as a *vendor take-back mortgage (vendor financing)*, or the assumption of an existing mortgage *(assumable mortgage)* registered against the property. When these types of financing are not at the current rate of interest being charged by financial institutions, "value" may be created for the vendor, the purchaser, or both. It is essential that real estate professionals advising the public in real estate transactions have a thorough understanding of these financial arrangements so that they may adequately protect their clients' interests.

vendor take-back mortgage
a mortgage taken back by the vendor from the purchaser to facilitate a sale, whereby the vendor becomes the lender and the purchaser becomes the borrower

assumable mortgage
a mortgage that allows a purchaser to assume or take over the responsibilities and liabilities under the mortgage from the vendor

On a related note, the increasing presence of mortgage brokers in loan transactions is changing the landscape of real estate finance. Mortgage brokers can help facilitate loan transactions, aiding both lenders and borrowers. However, this assistance comes at a cost of fees payable by the lender, the borrower, or both. The impact of these fees is seen in either raising the cost of borrowing for the borrower or lowering the yield or return earned by the lender.

This chapter explores each of these scenarios, where an offer to purchase involves beneficial financing and where the services of a mortgage broker impact the real rate of borrowing or lending.

IMPACT OF FINANCING ON REAL ESTATE TRANSACTIONS

Most real estate purchases involve some form of financing, usually secured by a mortgage charge on title. A typical transaction has purchasers arranging their own financing separate from any involvement of the vendor, with a lender of their own choosing. In this transaction, the financing likely has little or any impact on the value of the real property in the transaction, given the purchaser effectively provides the vendor with an "all cash" payment as part of the conveyancing, through a combination of the cash down payment or equity, plus the mortgage funds provided directly from the lender. Alternatively, there are situations where the purchaser only provides partial cash up front, with the remainder being provided either by assuming the vendor's existing mortgage loan or by the vendor providing partial financing.

Assumed mortgages are generally attractive to purchasers if the interest rate on the assumable mortgage is lower than the prevailing market rate or if purchasers cannot qualify for financing on their own (or perhaps at a prohibitively high interest rate). Similarly, vendor financing can also be an attractive option for purchasers if they can receive a below-market interest rate.

Where the financing is beneficial to the purchaser, this can create additional value that adds to the package of what the vendor is selling. In other words, rather than selling a parcel of land with a house on it, the vendor is also including beneficial financing. Put another way, the vendor is selling the borrower an opportunity to save on future interest payments. Where a purchaser is receiving a benefit, the purchaser should expect to pay for it – and it is this potential added value that is at the heart of mortgage analysis.

Cash-Equivalent Price or Market Value of an Offer

With assumable or vendor-supplied mortgage loans, the benefits accruing to the vendor or purchaser can create value above and beyond the real estate. In

representing a client's interests, whether a vendor or purchaser, this financial relationship must be explained. The benefits to the parties may include a higher purchase price when financial benefits are considered or facilitating a purchase that might otherwise not happen if relying only on conventional financing. The difficult task faced by the real estate professional is explaining to their client what value is created and what potential courses of action may result.

Cash-equivalent price is a mathematical tool that can be used to partially explain these potential benefits. Where the current or market rate of interest is greater than the contract rate in an assumed or vendor-supplied mortgage, then the offer will be worth an amount less than the stated offer price. In other words, the offer is *discounted* to account for the financial benefit the purchaser is receiving – as the purchaser is not just receiving some real estate for their purchase price but also receiving a beneficial financing package on top of this. The benefit of this financing is subtracted from the apparent purchase price, to isolate what price the real estate alone is being sold for.

cash equivalent price
the amount of cash that could reasonably be accepted in lieu of the beneficial financing offer

discount
where an offer to purchase is sold for less than the face value of the loan

Alternatively, where the current or market rate of interest is lower than the contract rate in the assumed or vendor mortgage, then the offer will be worth an amount more than the stated offer price. In other words, the offer is *bonused* to account for the financial benefit the vendor is receiving – as the vendor is being paid not just for the sale of the real estate but also for the additional benefit of above-market interest payments (for vendor financing) or for getting rid of a high-interest loan (for an assumed mortgage).

bonus
where an offer to purchase is sold for more than the face value of the loan; the portion of the face value of a mortgage loan that exceeds the funds actually received by the borrower and is intended as additional compensation for the lender

Before accepting any offer requiring the provision of financing at a rate of interest other than the market rate, the vendor should be aware of the cash-equivalent price of that offer. The cash-equivalent price means the amount of

cash that could reasonably be accepted in lieu of the beneficial financing offer. Figure 11.1 illustrates the relationship of financing and *market value of the offer*.

market value (of an offer)
the cash down payment plus the present value of the mortgage loan discounted at the market rate, i.e., the market value of the mortgage

The method used to calculate the cash-equivalent price of an offer is to add the amount of the down payment to the market value of the mortgage:

	Cash Down Payment
+	Market Value of Mortgage
	Market Value of the Offer (Cash-Equivalent Price of the Offer)

The *market value of a mortgage* is the present value of the future mortgage payments calculated at the market rate of interest. The difference between the market value of the mortgage and its face value can be thought of as the present value of the financial benefits accruing to either the vendor or the purchaser.

market value (of a mortgage)
the present value of future mortgage payments (and outstanding balance, if applicable) calculated at the market rate of interest

Mathematically, the value of an assumed or vendor-supplied mortgage is calculated by determining what amount of money an investor would pay today to purchase the mortgage contract from the vendor and thereby own the right to receive the future mortgage payments under the loan. The cash the vendor would receive from selling the mortgage contract to such an outside investor is the cash-equivalent, or the market value, of the mortgage. In most cases, the interest rate on the loan is below the prevailing market rate, so the investor must be enticed to purchase the loan by receiving a discount from its face value. As a result, this process is referred to in financial language as *discounting* the stream of payments at the market rate of interest.

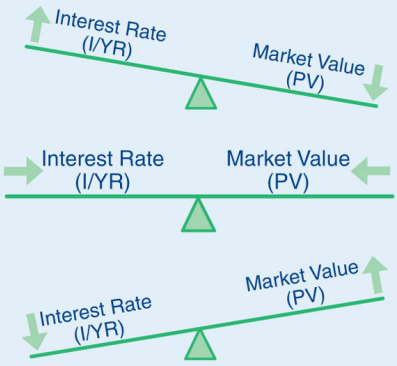
discounting
the process of expressing expected future income in terms of a present value

FIGURE 11.1: Financing and the Market Value of the Offer

Offer Involving Below-Market Rate Financing
If the market interest rate is higher than the contract rate on the mortgage, then the market value of the offer will be less than the stated offer price.

Offer Involving Market Rate Financing
If the market interest rate is the same as the contract rate on the mortgage, then the market value of the offer will be the same as the stated offer price.

Offer Involving Above-Market Rate Financing
If the market interest rate is lower than the contract rate on the mortgage, then the market value of the offer will be greater than the stated offer price.



Summary of the Relationship of Interest Rates and Market Value
Interest rates and market value (present value) are inversely related; when one goes up, the other goes down, and vice versa.

The calculations shown in the next two sections of this chapter will outline how to account for financing benefits in cash-equivalent terms or in terms of market value. However, keep in mind that the advantages to the parties may involve more than just differing interest rates, such as a sale incentive where typical buyers cannot qualify for conventional financing, a non-price marketing promotion (e.g., no interest for six months), or to help avoid prohibitive prepayment penalties for an existing loan. These non-interest rate benefits may offset the pure financial calculations – the bottom line being the advantage to either vendors or purchasers is purely a matter of negotiation. However, the financial calculations give a solid starting point for analyzing these potential benefits.

Vendor-Supplied (Take-Back) Mortgage

Vendor financing is often used as a non-price sale incentive. For example, consider a developer who needs to promote the slow sales of building lots. Rather than lowering the price, the developer might instead offer a no-interest or low-interest loan to spur demand. This type of loan would typically be for a short term and would often be re-sold upon origination to a mortgage investor at a discount, to account for its low rate of interest relative to other market-based loans.

Vendor financing could also be used to facilitate sales in situations where purchasers cannot obtain conventional financing. Consider a vendor attempting to sell a residential property in a depressed market, with high

unemployment. Purchasers may not be able to qualify for conventional loans, so to sell a property, the vendor may need to consider accepting some cash up front and then have the remainder paid back over time. With some funds being paid in the future, this vendor is effectively being asked to act as a lender. The loan would usually be secured by a mortgage charge on title (or alternatively, structured as an agreement for sale). In this scenario, the vendor may consider this a higher-risk loan relative to typical loans and demand a higher-than-market interest rate.

Where an offer to purchase involves financing below the current or market rate of interest, the offer will be worth an amount less than the stated offer price (discount). Where financing is above the market rate, the offer will be worth an amount more than the stated offer price (bonus). In determining what this discount or bonus might be, the first task is to calculate the cash-equivalent price or market value of that offer.

When a vendor accepts an offer to purchase that contains a vendor-supplied mortgage, the borrower (purchaser) agrees to make a series of mortgage payments. The amount of these payments will be governed by the contract signed between the two parties and will be calculated at the rate of interest stated in the contract (the contract rate).

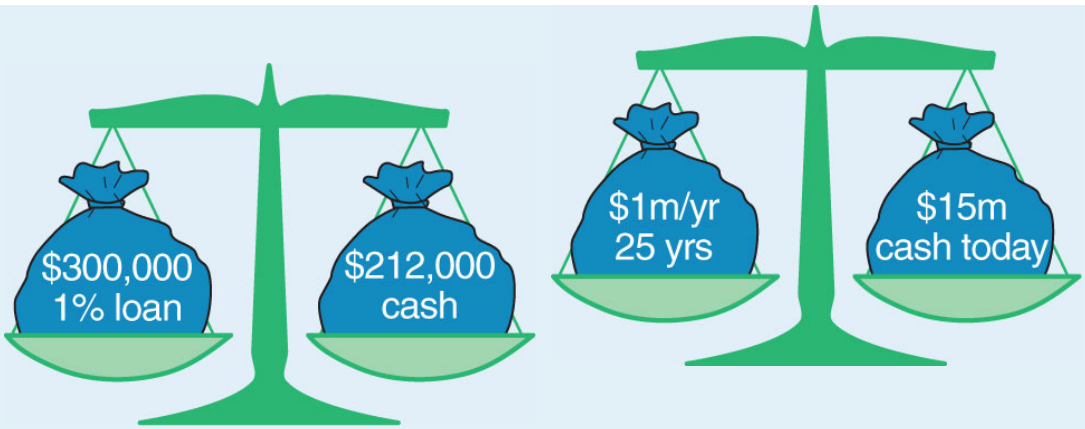
However, assume the vendor could instead choose to invest their money in an investment that earns the market rate of interest. Assuming the contract interest rate is less than the market interest rate, how much better off would the vendor be with a loan at the market rate? Alternatively, how much is the vendor losing by accepting the lower contract rate of interest instead? At what point would the vendor be just as happy to accept this offer with vendor financing or to accept a lower "all cash" offer? That point is the cash-equivalent price or market value of the offer.

Lottery Winnings

The "Set for Life" lottery highlights what a cash-equivalent price means. If you win the $25 million prize, you quickly discover that the winnings are paid as $1 million per year, not $25 million upfront. However, if you want the money upfront, you can choose $15 million instead. Which do you choose?

Most people would say $15 million now, as that is still more money than you can ever probably use. So, let's lower it to $10 million, now which do you choose? Perhaps you still choose the $10 million. Well then, what about at $8 million? Or $6 million? Or $5 million? The point where you stop, think about it, and say "I don't know, I am indifferent either way" ... that is the cash-equivalent price!

Real Estate



You are selling your house. Someone offers $300,000, consisting of $50,000 cash plus a $250,000 mortgage, with monthly payments based on 1% per year for 25 years. The market rate for similar mortgages is 5%. This buyer is saving roughly $500 per month compared to what they would pay with a market mortgage – over the course of 25 years, this saves the purchaser $88,000 in present value terms. Or, put another way, the vendor is being asked to accept a loan where they are losing $500 per month compared to what they could obtain if the vendor went into the market and invested on their own; this costs them $88,000 in lost interest!

If the vendor received another offer of $212,000, all-cash, the vendor would presumably be indifferent between accepting this amount or receiving the $300,000 offer with the substantially below-market interest rate. In this example, $212,000 is the cash-equivalent price.

Illustration 11.1(a)

Similar to the real estate example in the previous text box, Stephanie has her house listed for $400,000 but is having trouble selling her property. She decides to offer advantageous financing to motivate buyers. For a $300,000 mortgage, the market rate of $j_{12} = 6.5\%$ leads to payments of $2,025.62 per month, over a 25-year amortization period. However, Stephanie offers payments of $1,500 per month instead. How much of a financial benefit does this amount to in cash-equivalent present value terms?

Analysis of Market Value of Offer to Purchase (Fully Amortized Loan)

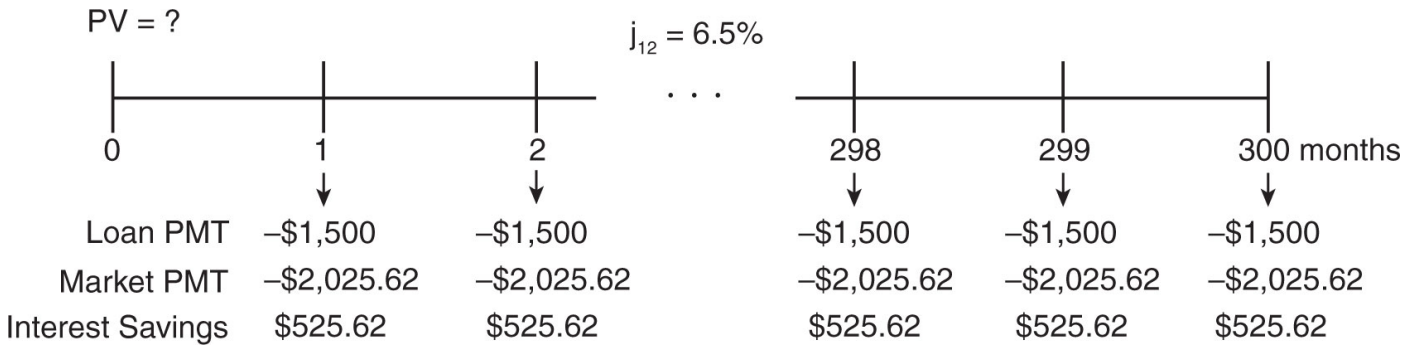
Proposed Offer Price

	Amount Offered	$400,000
–	Cash Down Payment	– 100,000
	Vendor Mortgage	$300,000

Terms of Proposed Vendor Mortgage

Face Value:	$300,000
Loan Payments:	$1,500
Market Payments:	$2,025.62
Amortization:	25 years
Contractual Term:	25 years
Payments:	Monthly

Solution:



Calculation

Press	Display	Comments
6.5 I/YR	6.5	Enter market rate
12 ■ P/YR	12	Monthly compounding frequency
25 × 12 = N	300	Enter amortization period in months
0 FV	0	Payments fully amortize loan over 300 months
525.62 +/– PMT	–525.62	Monthly interest savings
PV	77,845.738329	Present value of payment stream

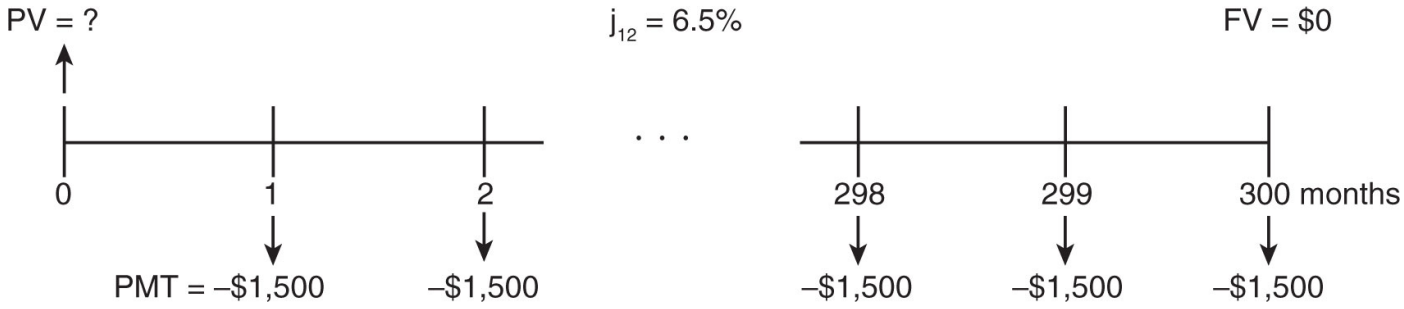
This calculation shows that a $525.62 interest savings for 300 months will provide the purchaser with a $77,845.74 benefit in present value terms. Alternatively, by giving this purchaser $525.62 per month in interest savings for 300 months, Stephanie is losing $77,845.74 today in comparison to what she could instead have received by investing at the market interest rate.

In cash-equivalent terms, the loan will be worth $77,845.74 less than the $300,000 face value. The market value of the mortgage is $222,154.26. If this

loan was immediately sold to a third-party mortgage investor, the investor would only pay $222,154.26 for the right to receive these 300 payments – with the $77,845.74 representing a discount to compensate the investor for the $525.62 monthly interest loss compared to market alternatives.

Alternative Analysis for Illustration 11.1(a)

This problem could also be stated as follows: "if the borrower was willing to pay $1,500 per month for 25 years at the j_{12} = 6.5% market rate, how much could they borrow?"



Calculation

Press	Display	Comments
6.5 I/YR	6.5	Enter market rate
12 ■ P/YR	12	Monthly compounding frequency
25 × 12 = N	300	Enter amortization period in months
0 FV	0	Payments fully amortize loan over 300 months
1500 +/– PMT	–1,500	Monthly payment
PV	222,154.04188	Present value of payment stream
+/– + 300000 =	77,845.95812	Mortgage discount

At a payment of $1,500, the borrower could only qualify for a loan of $222,154.04.[1] The difference, $77,845.96, represents how much of a financial benefit Stephanie is providing this borrower by reducing the payments below the $2,025.62 that would have been required at the market interest rate. This payment amount implies an interest rate just under 3.5%,[2] nearly half of the 6.5% market interest rate – quite an interest savings for the purchaser!

Illustration 11.1(b)

Continuing Illustration 11.1(a), Kit offers to buy Stephanie's property for $100,000 cash in addition to this fully amortized mortgage. How much is Kit paying for the real estate once this financing benefit is accounted for? If you are representing Stephanie, would you advise her to accept the offer, refuse the offer, or make a counter-offer?

Solution:

The market value of this offer (or cash-equivalent price) is:

	Cash Down Payment	$100,000.00
+	Market Value of Mortgage	+ 222,154.26
	Market Value of Offer	$322,154.26

As discussed in Illustration 11.1(a), Kit is receiving approximately $78,000 in beneficial financing through being given nearly $526 each month in interest savings, compared to the loan terms he could get elsewhere. From Stephanie's perspective, you might consider explaining to her that she is selling more than a plot of land and a house; she is also selling a mortgage. This mortgage adds value to the transaction, and if this is something that a purchaser would consider valuable, then she may want to consider this when agreeing to the price. In other words, the bundle of real property for sale here is greater than just the real estate alone – this is analogous to her including her car or expensive furniture to sweeten the deal. This is a benefit to purchasers that can be sold.

Whether or not Stephanie should accept this offer is unclear because we are missing a key piece of information – what is the underlying market value of the property, ignoring this financial benefit? If the property's market value is only $320,000, then this might represent an excellent offer. However, Stephanie must be made aware of the possible risks involved in this scenario as well. She will become a mortgage lender, tying her to this property and to Kit for 25 years. While her capital may be protected by the mortgage charge on title, this is clearly a lot more effort and risk than she would undertake by accepting an all-cash offer.

Alternatively, consider if this property's market value is somewhere around $400,000. In this case, Stephanie might be underselling the real estate by

accepting this offer. Perhaps she might want to ask for a larger down payment or more advantageous terms, such as a shorter term.

Illustration 11.1(c)

What happens if Stephanie makes a counter offer with the same loan but restricted to a one-year term. Based on a one-year term, calculate the market value of the mortgage and the market value of the offer.

Solution:

The outstanding balance at the end of the 12th month, after making 12 monthly payments, is calculated as $292,343.46 (based on the implied interest rate of 3.488369% if the monthly payment is $1,500). With a one-year term, Kit will make 12 payments of $1,500 and repay the outstanding balance as a lump sum at the end of the one-year term. We will continue with the "alternative" calculation from Illustration 11.1(a), as that is simpler to illustrate:

Calculation

Press	Display	Comments
6.5 I/YR	6.5	Enter market rate
12 ■ P/YR	12	Monthly compounding frequency
12 N	12	Enter 12-month term; no payments made beyond 1 year
1500 +/– PMT	–1,500	Monthly payment
292343.46 +/– FV	–292,343.46	Enter OSB_{12} as future value owing at end of year
PV	291,375.551042	Present value of payment stream
+100000 =	391,375.551042	Market value of the offer

The market value of the mortgage is $291,375.55. The market value of this offer (or cash-equivalent price) is:

	Cash Down Payment	$100,000.00
+	Market Value of Mortgage	+ 291,375.55
	Market Value of Offer	$391,375.55

Reducing the loan term increases the market value of the offer to $391,375.55, approximately $70,000 more than the fully amortized loan. This is because the interest savings to Kit, or the interest loss suffered by Stephanie, is now only for

12 months rather than 300 months. After 12 months, Kit will have to refinance this loan at the market interest rate.

Illustration 11.1(d)

Continuing this example, Stephanie realizes that Kit is interested in vendor financing because he has a poor employment history and cannot qualify for conventional financing. Stephanie figures Kit is a high-risk borrower and she is not too keen on loaning to him. However, she considers a counter-offer with a higher-than-market interest rate, to compensate her for this risk. She asks for payments of $2,400 per month over a 25-year amortization period. How much extra is Kit paying in this scenario? How does this impact the overall purchase price in cash-equivalent terms?

Solution:

By paying $374.38 extra each month above the market terms, Kit is effectively paying an additional $55,446.69 to Stephanie for this financial benefit, above the real estate value alone. Adding the $300,000 mortgage face value, the mortgage's market value is $355,446.69. Adding the cash down payment, the market value of the offer is $455,446.69. In other words, Stephanie is being paid $400,000 for the real estate and $55,446.69 for the financing benefit she is offering Kit and the financial risk she is undertaking in providing this.

Calculation

Press	Display	Comments
6.5 I/YR	6.5	Enter market rate
12 ■ P/YR	12	Monthly compounding frequency
25 × 12 = N	300	Enter amortization period in months
0 FV	0	Fully amortized
2400 – 2025.62 =	374.38	Extra payment per month, above-market rate
+/– PMT	–374.38	Monthly payment
PV	55,446.6868	Present value of extra payment amount*

* Alternative calculation: if payment is entered as –2,400, then the PV = $355,446.47. Ignoring minor rounding errors, this is the same financial benefit as calculated previously.

In this example, we have simplified the analysis by using j_{12} interest rates and by doing the payment and outstanding balance calculations for you. In the following illustrations, we will add in these additional complicating factors.

Practical Perspective – Vendor Financing and Mortgage Brokers

Vendor financing is about facilitating a sale, whether a purchaser is taking advantage of a below-market interest rate or a vendor is providing a loan where a purchaser cannot obtain conventional financing. The interest rate may be below-market or above-market, depending on how the deal is structured, which may result in the market value being less than or more than the face value. Either party may gain. When one party gains, the other party gives something up. As a mortgage professional, your task is to explain the implications of financing to whichever party you are working with. You must understand the relationship of interest rates and present value and be able to explain its impact on the deal you are working on.

The examples in this section are based on real estate trading services representatives (licensees) helping to establish and negotiate sales using vendor financing as an incentive. Keep in mind the analysis is the same for mortgage brokers as well, should you get involved in a vendor financing situation.

Illustration 11.2(a)

Assume that a prospective vendor listed his property for sale at $245,000 and indicated he might provide financing to a "qualified purchaser".

Several days later, his real estate licensee received a telephone call from a prospective purchaser who wished to view the property immediately. A viewing was arranged; the result was a "full price" offer to purchase the property for $245,000, subject to the vendor taking back a first mortgage for $165,000 at 7% per annum, compounded semi-annually, fully amortized with monthly payments over 25 years. The licensee contacted her principal and presented the offer. However, the licensee suggested that the offer not be accepted and that it be countered with a similar proposal, except that the mortgage is partially amortized with a 3-year term and a 25-year amortization period.

Upon hearing the details of the offer and the licensee's advice to counter-offer rather than accept, the vendor was confused. The offer was for the full price, there was a large down payment of $80,000, and the prospective purchaser's income and credit rating were also acceptable. Therefore, the vendor asked the licensee to explain her reasons for suggesting the counter-offer rather than accepting the purchaser's offer. Calculate the market value of the mortgage and the market value of the original offer if the loan is fully amortized.

Solution:

The licensee responded with the following detailed analysis:

Analysis of Market Value of Offer to Purchase (Fully Amortized Loan)

Proposed Offer Price

	Amount Offered	$245,000
–	Cash Down Payment	– 80,000
	Vendor Mortgage	$165,000

Terms of Proposed Vendor Mortgage

Face Value:	$165,000
Interest Rate:	$j_2 = 7\%$
Amortization:	25 years
Contractual Term:	25 years
Payments:	Monthly

HELPFUL HINT/CHECKLIST!

The following steps could be followed when calculating the market value of an offer including a vendor take-back (VTB) mortgage loan:

1. Calculate/verify the loan information based on the "contract rate" and enter into the calculator:
   - ☐ Perform an interest rate conversion, if necessary
   - ☐ Calculate the required payment and enter the rounded payment as a negative number
   - ☐ If partially amortized, calculate the OSB at the end of the term and enter the rounded OSB into FV as a negative number
2. Calculate the market value of the mortgage with the "market rate":
   - ☐ Perform an interest rate conversion, if necessary
   - ☐ If partially amortized, enter number of payments into N
   - ☐ Compute the market value of the mortgage (press PV)
3. Calculate the market value of the offer:
   - ☐ Add the cash down payment to the market value of the mortgage to calculate the market value of the offer

1. Calculate/Verify the Loan Information Based on the Contract Rate

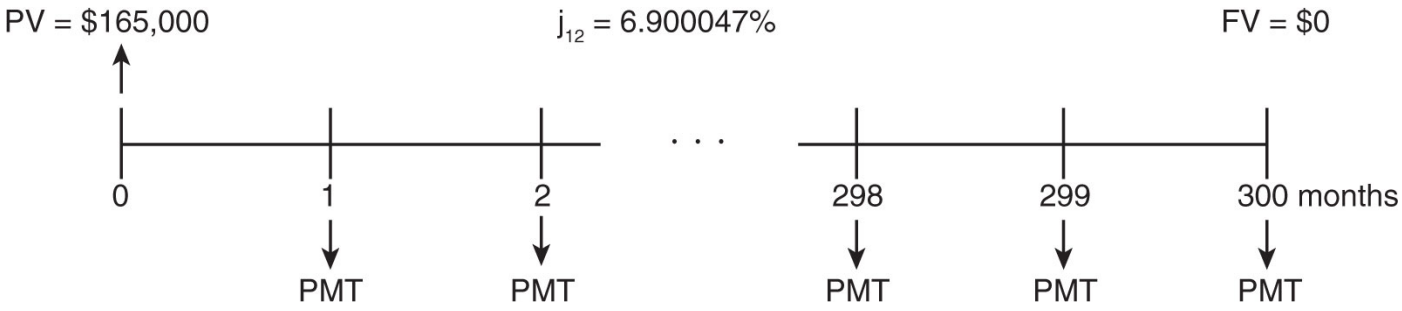
a. Calculate the Equivalent Nominal Rate with Monthly Compounding

Calculation

Press	Display	Comments
7 ■ NOM%	7	Enter stated nominal rate
2 ■ P/YR	2	Enter stated compounding frequency
■ EFF%	7.1225	Compute equivalent effective annual rate
12 ■ P/YR	12	Enter desired compounding frequency
■ NOM%	6.900047	Compute nominal rate with monthly compounding

b. Calculate the Monthly Payment

j_{12} = 6.900047%; PV = $165,000; N = 300; PMT = ?



Calculation (continued)

Press	Display	Comments
	6.900047	j_{12} already stored
165000 PV	165,000	Actual loan amount
25 × 12 = N	300	Enter amortization period in months
0 FV	0	Payments fully amortize loan over 300 months
PMT	−1,155.685994	Compute monthly payment
1155.69 +/− PMT	−1,155.69	Enter rounded payment

The monthly mortgage payments are $1,155.69.

2. Calculate the Market Value of Proposed Vendor Mortgage with the Market Rate

In a survey of local lenders, the licensee finds that mortgages are available to qualified borrowers at interest rates of 15.5% to 16% per annum, compounded semi-annually. As the prospective borrower desires a fully amortized loan, a rate of j_2 = 16% is used to determine the market value of the vendor mortgage.[3]

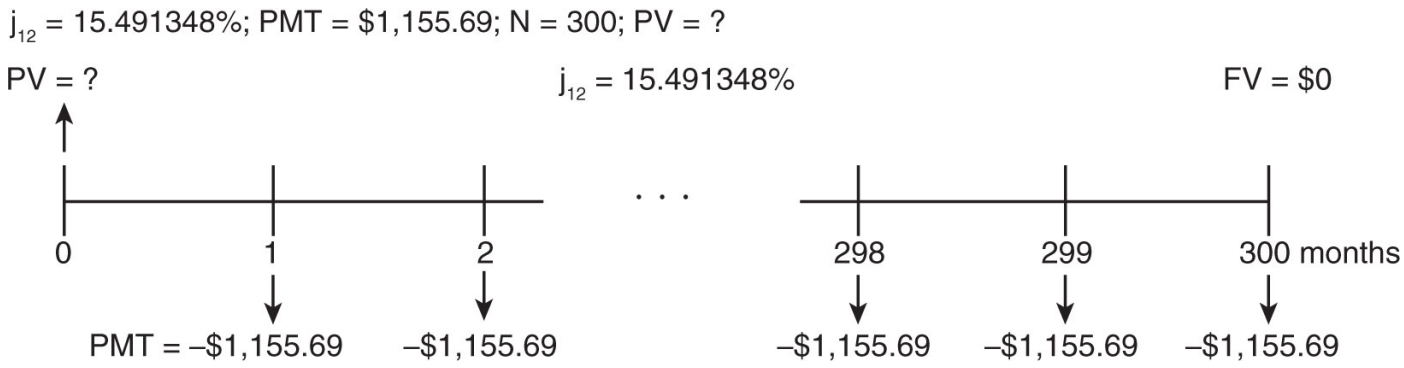
a. Calculate the Equivalent Nominal Rate with Monthly Compounding

Calculation

Press	Display	Comments
16 ■ NOM%	16	Enter stated nominal rate
2 ■ P/YR	2	Enter stated compounding frequency
■ EFF%	16.64	Compute equivalent effective annual rate
12 ■ P/YR	12	Enter desired compounding frequency
■ NOM%	15.491348	Compute nominal rate with monthly compounding

For the same loan amount and loan terms, this market interest rate would require monthly payments of $2,176.47. This means the purchaser is underpaying in market terms by $1,020.78 per month. Or, put another way, if the purchaser attempted to secure their own loan at a 16% interest rate but only paid $1,155.69 per month, the lender would advance substantially less than $165,000. What we need to calculate is how much less the purchaser could borrow with these payments.

b. Calculate the Market Value of the Mortgage (Present Value of Payments at Market Interest Rate)



Calculation (continued)

Press	Display	Comments
	15.491348	j_{12} already stored from previous calculation
PV	87,614.008286	Present value of payment stream

Note that because all the other loan information was already entered in the financial keys, once the new interest rate is calculated, the present value can be calculated without re-entering any other information.

With payments of $1,155.69 over 25 years at an interest rate of 16%, a lender would loan only $87,614.01. This is substantially less than $165,000, as

suspected, because the payments of $1,155.69 are not sufficient to pay the market interest rate. In terms of cash-equivalent prices, the vendor should be indifferent between a $165,000 mortgage with payments of $1,155.69 per month and a mortgage of $87,614.01 at the 16% market rate. This cash-equivalent price is the market value of the vendor mortgage as proposed.

3. Calculate the Market Value of the Offer

If the vendor had accepted the initial offer, he would have received proceeds with a market value (or cash-equivalent price) of $167,614.01 rather than the $245,000 indicated by the stated offer price:

	Cash Down Payment	$80,000.00
+	Market Value of Mortgage	+ 87,614.01
	Market Value of Offer	$167,614.01

If you refer to Figure 11.1, you will see that this example illustrates the first relationship. In this example, the mortgage contract rate (j_2 = 7%) was less than the market rate (j_2 = 16%), which meant the market value of the offer ($167,614.01) was less than the stated offer price ($245,000).[4] In other words, the purchaser has made an offer where the purchaser received a substantial financial advantage. The $245,000 offer includes receiving both the underlying real estate and the financing benefit. If the financing benefit is calculated to be worth $77,385.99 ($245,000 face value of the offer less the $167,614.01 market value of the offer), then this implies that the purchaser is only offering $167,614.01 for the real estate alone.

Alternative Analysis for Illustration 11.2(a)

The solution for Illustration 11.2(a) presents a scenario that looks at a hypothetical mortgage investor, i.e., given the payments in the proposed contract, how much would a mortgage investor pay for the right to receive these funds, versus another investment at market interest rates? In financial terms, the discount is the difference between what the investor would pay and the face value of the loan.

An alternative way to approach this problem is to instead focus on interest savings. This finds the same result but may be easier to understand for some students. At j_2 = 7%, the monthly payments are $1,155.69. At j_2 = 16%, the

required payments are $2,176.47. This effectively means the purchaser would be saving $1,020.78 per month in comparison to a loan at market terms. Monthly interest savings of $1,020.78 over 25 years results in a present value of $77,386.35 – the same answer as the method shown for Illustration 11.1(a) (with the minor difference due to rounding).

Calculation (continued)

Press	Display	Comments
RCL I/YR	15.491348	j_{12} already stored from previous calculation
300 N	300	Enter amortization period in months
0 FV	0	Payments fully amortize loan over 300 months
1020.78 +/– PMT	–1,020.78	Enter monthly interest savings
PV	77,386.347012	Present value of interest savings

Illustration 11.2(b)

The licensee in Illustration 11.2(a) suggested that the vendor counter the offer with a similar arrangement, except that the mortgage contains a three-year term. The market value of the proposed counter-offer is determined in a similar manner to the previous example; however, there is also the outstanding balance to consider at the end of the loan term.

Calculate the market value of the mortgage and the market value of the offer if the loan is partially amortized, i.e., the counter-offer.

Solution:

Analysis of Market Value of Proposed Counter-Offer (Partially Amortized Loan)

Proposed Counter-Offer

Amount Offered	$245,000
– Cash Down Payment	– 80,000
Vendor Mortgage	$165,000

Terms of Proposed Vendor Mortgage

Face Value:	$165,000
Interest Rate:	7% per annum, compounded semi-annually
Amortization Period:	25 years
Contractual Term:	3 years
Payments:	Monthly

1. Calculate/Verify the Loan Information based on the Contract Rate

a. Calculate the Equivalent Nominal Contract Rate with Monthly Compounding

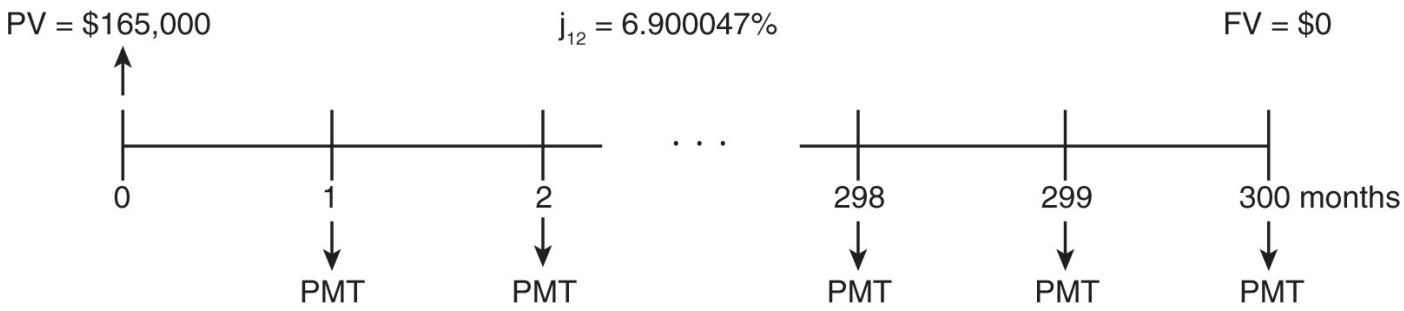
Calculation

Press	Display	Comments
7 ■ NOM%	7	Enter stated nominal rate
2 ■ P/YR	2	Enter stated compounding frequency
■ EFF%	7.1225	Compute equivalent effective annual rate
12 ■ P/YR	12	Enter desired compounding frequency
■ NOM%	6.900047	Compute nominal rate with monthly compounding

The equivalent nominal contract rate with monthly compounding is j_{12} = 6.900047%.

b. Calculate the Monthly Payment and the Outstanding Balance Due at the End of the Term

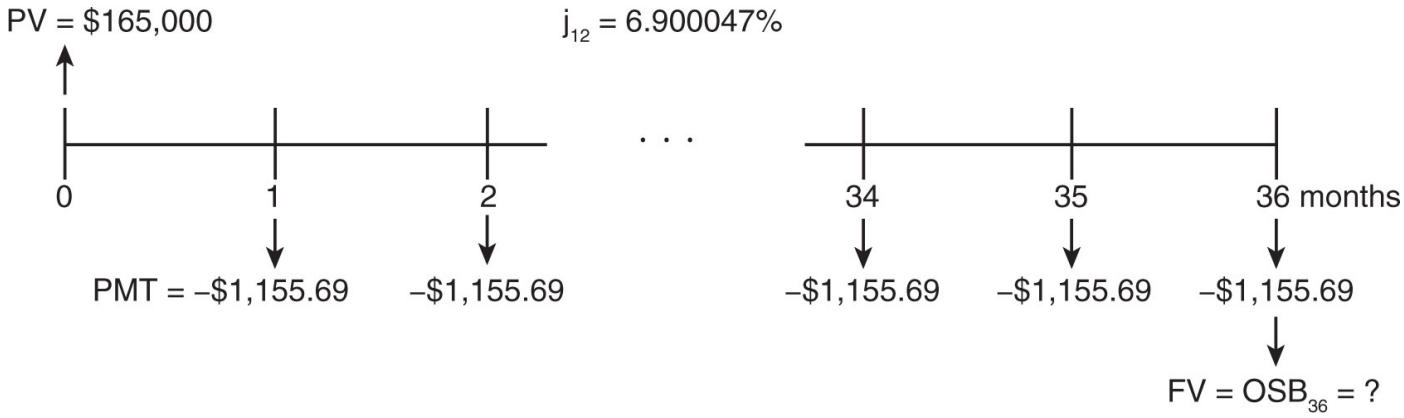
i. Payment:



Calculation (continued)

Press	Display	Comments
	6.900047	j_{12} already stored
165000 PV	165,000	Actual loan amount
300 N	300	Enter amortization period in months
0 FV	0	Payments fully amortize loan over 300 months
PMT	–1,155.685994	Calculated payments
1155.69 +/– PMT	–1,155.69	Enter rounded payment

ii. Outstanding Balance:



Calculation (continued)

Press	Display	Comments
36 INPUT ■ AMORT	PER 36-36	
= = =	156,749.516995	Outstanding balance after 36th payment
156749.52 +/– FV	–156,749.52	Enter rounded OSB_{36}

2. Calculate the Market Value of Proposed Vendor Mortgage with the Market Rate

Under the terms of the proposed vendor mortgage, the vendor would have the contractual right to receive 36 monthly payments of $1,155.69 as well as the outstanding balance payment of $156,749.52 at the end of the loan term. In valuing this mortgage proposal, the licensee used an interest rate of j_2 = 15.5% because it is the market rate for 3-year term mortgages.

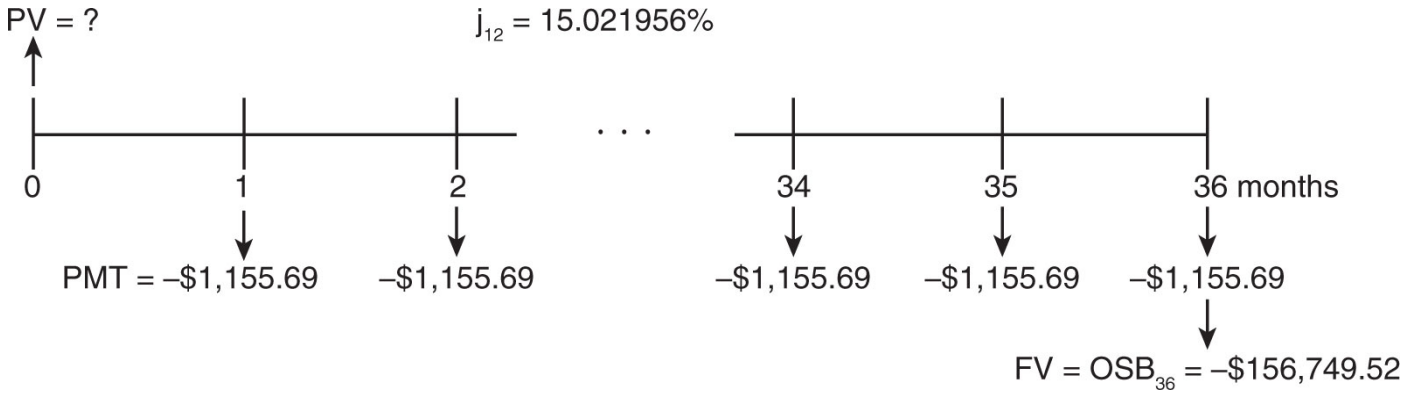
a. Calculate the Equivalent Nominal Market Rate with Monthly Compounding

Calculation

Press	Display	Comments
15.5 ■ NOM%	15.5	Enter stated nominal rate
2 ■ P/YR	2	Enter stated compounding frequency
■ EFF%	16.100625	Compute equivalent effective annual rate
12 ■ P/YR	12	Enter desired compounding frequency
■ NOM%	15.021956	Compute nominal rate with monthly compounding

b. Calculate the Market Value of the Mortgage (Present Value of Payments and Outstanding Balance at Market Interest Rate)

N = 36; j_{12} = 15.021956%; PMT = $1,155.69; FV = $156,749.52; PV = ?



Calculation (continued)

Press	Display	Comments
	15.021956	j_{12} already stored from previous calculation
36 N	36	36 regular payments to be received
PV	133,490.058616	Present value of payment stream over the loan term

The market value of the vendor mortgage as proposed in the counter-offer is $133,490.06. Note that because all other loan information was already entered in the financial keys, once the new interest rate is calculated and the number of payments to be received is entered, the present value can be calculated without re-entering any other information.

3. Calculate the Market Value of the Counter-Offer

The counter-offer has a market value to the vendor that is much higher than the purchaser's original offer:

	Cash Down Payment	$80,000.00
+	Market Value of Vendor Mortgage	+ 133,490.06
	Market Value of Offer	$213,490.06

The counter-offer increases the cash value of the transaction from $167,614.01 to $213,490.06, which may better represent the property's true market value and certainly provides more benefit to the vendor, in limiting the length of time the interest advantage is offered to the purchaser. In this way, the licensee has both protected their client's interests and found a method of providing low-rate financing to the purchaser.

Example 11.1

Assume that fully amortized mortgages are currently available at 6% per annum, compounded semi-annually, and that 5-year term first mortgages are offered at 5% per annum, compounded semi-annually. Consider the case of a property listed for sale at $75,000. A potential purchaser makes an offer of a $23,000 cash down payment, subject to the vendor taking back a $50,000 mortgage at 3% per annum, compounded semi-annually, amortized with monthly payments over 25 years. Calculate the market value of the offer assuming:

(a) the loan is to be fully amortized

(b) the loan is partially amortized over a five-year term

Abbreviated Solution:

(a) Calculate the Market Value of the Offer, Subject to a Fully Amortized Mortgage

1. **Calculate/Verify the Loan Information based on the Contract Rate**

Calculation

Press	Display
3 ■ NOM%	3
2 ■ P/YR	2
■ EFF%	3.0225
12 ■ P/YR	12
■ NOM%	2.98142
50000 PV	50,000
300 N	300
0 FV	0
PMT	–236.622749
236.62 +/– PMT	–236.62

2. Calculate the Market Value of Mortgage with the Market Rate

Calculation (continued)

Press	Display
6 ■ NOM%	6
2 ■ P/YR	2
■ EFF%	6.09
12 ■ P/YR	12
■ NOM%	5.926346
PV	36,983.049447

The market value of the mortgage is $36,983.05.

3. Calculate the Market Value of Offer

	Market Value of Mortgage	$36,983.05
+	Cash Down Payment	+ 23,000.00
	Market Value of Offer	$59,983.05

(b) Calculate the Market Value of the Offer, Subject to a Partially Amortized Mortgage

1. Calculate/Verify the Loan Information based on the Contract Rate

Calculation

Press	Display
3 ■ NOM%	3
2 ■ P/YR	2
■ EFF%	3.0225
12 ■ P/YR	12
■ NOM%	2.98142
50000 PV	50,000
300 N	300
0 FV	0
PMT	–236.622749
236.62 +/– PMT	–236.62
60 INPUT ■ AMORT	PER 60-60
= = =	42,737.480252
42737.48 +/– FV	–42,737.48

2. Calculate the Market Value of Mortgage with the Market Rate

Calculation (continued)

Press	Display
5 ■ NOM%	5
2 ■ P/YR	2
■ EFF%	5.0625
12 ■ P/YR	12
■ NOM%	4.948699
60 N	60
PV	45,940.741918

The market value of the mortgage is $45,940.74.

3. Calculate the Market Value of Offer

	Market Value of Mortgage	$45,940.74
+	Cash Down Payment	+ 23,000.00
	Market Value of Offer	$68,940.74

If the offer is accepted, subject to a fully amortized mortgage, the vendor receives $23,000 cash plus a contract with a face value of $50,000 but with a market value of only $36,983.05. Thus, the offer to the vendor has a cash value of $59,983.05, rather than the stated $73,000. If the vendor accepts the offer subject to the partially amortized loan, the market value of the mortgage would increase to $45,940.74 and the cash value of the offer would increase to $68,940.74, which is still lower than the $73,000 indicated offer price.

By accepting a mortgage at a rate less than the prevailing market rate, the vendor is, in effect, accepting less for the property than the stated value of the offer. This may still be a good quality offer, depending on the market value of the real estate and other market issues. The real estate professional's task is to advise their party in the transaction, such that the client can make an informed decision.

In summary, a mortgage with a contract interest rate less than the prevailing market rate will have a market value lower than the face value of the loan. Mortgage investors will only buy the mortgage for the amount that the required payments will repay at the current market rate; the contract rate is only of use in determining the payments required under the mortgage.

Example 11.2

The mill has permanently shut down in Port Marilu and Ruby needs to sell her house to get a job in the city. However, she has had her house on the market for six months now, and while there has been some interest, the deals always fall through due to loan qualification. With half of the town now unemployed, it is difficult for many buyers to qualify for conventional financing. Ruby has had requests to offer vendor financing, but she turned them down because she considers them too risky. She is now reconsidering but wants to ensure she gets an interest rate that will adequately compensate her for the risk she will be undertaking.

She has an offer to purchase for a $10,000 cash down payment plus vendor financing for $120,000. The loan will have an interest rate of j_{12} = 5% (the market rate) over a 5-year term, with monthly payments based on a 30-year amortization. Ruby is considering a counter-offer with all the same terms, except increasing the interest rate to j_{12} = 12%. What is the market value of this counter-offer?

Abbreviated Solution:

Calculate the Market Value of the Offer, Subject to a Partially Amortized Mortgage

1. **Calculate/Verify the Loan Information based on the Contract Rate**

Calculation

Press	Display
12 I/YR	12
12 ■ P/YR	12
120000 PV	120,000
360 N	360
0 FV	0
PMT	–1,234.335116
1234.34 +/– PMT	–1,234.34
60 INPUT ■ AMORT	PER 60–60
= = =	117,195.463536
117195.46 +/– FV	–117,195.46

2. **Calculate the Market Value of Mortgage with the Market Rate**

Calculation (continued)

Press	Display
5 I/YR	5
60 N	60
PV	156,727.882597

The market value of the mortgage is $156,727.88.

3. **Calculate the Market Value of Offer**

	Market Value of Mortgage	$156,727.88
+	Down Payment	+ 10,000.00
	Market Value of Offer	$166,727.88

The face value of the offer is $130,000 but with the advantage to the vendor from the above-market interest rate considered, the market value of the offer is $166,727.88. In other words, Ruby is selling her house and land for $130,000, but she is also selling a financing package with a cash value of $36,727.88.

In advising Ruby, you will have to consider all the factors comprehensively:

- the value of the property in a market value sense;
- her alternative options for selling her property in this down market;
- whether this present value calculation represents an appropriate “risk premium” to compensate her for the management time and potential losses involved in this type of financing arrangement (acting as a lender); and
- other options, such as structuring the offer as an agreement for sale (analogous to a “rent-to-own” scenario).

Ultimately, it is Ruby’s decision whether to accept this offer or counter-offer with variations like those above. Your task is limited to advising her of the ramifications of the various alternatives, such that Ruby is in a better position to make an informed decision.

Above-Market Interest Rate

This is the first example where the market interest rate is lower than the rate on the vendor mortgage. Returning to the see-saw in Figure 11.1, when the interest rate drops, the present value increases. Rather than a discount from face value as in the prior examples, this is a premium or bonus above face value – the vendor is receiving extra above what they would obtain in the market. This might be seen as a reward to compensate for the risk of being a mortgage lender. Alternatively, this may be seen as the purchaser having to pay extra to entice the vendor to offer this financing.

Exercise 11.1

In each of the following situations, a vendor has agreed to take-back a mortgage to facilitate a sale. For each example, calculate the market value of the mortgage, rounded to the nearest dollar.

	Loan Amount	Contract Rate	Market Rate	Amortization	Term	Payment
a.	$193,500	$j_2 = 7\%$	$j_2 = 9\%$	20 years	3 years	Monthly, round to next higher $100
b.	$250,000	$i_{mo} = 0.85\%$	$i_{mo} = 1.15\%$	25 years	5 years	Monthly, round to next higher $1
c.	$400,000	$j_{12} = 8\%$	$j_{12} = 4\%$	20 years	20 years	Monthly, round to nearest cent
d.	$320,000	$j_2 = 6\%$	$j_2 = 4.5\%$	20 years	1 year	Monthly, round to next higher $1

Abbreviated Solution:

a. PMT = $1,500
   OSB_{36} = $178,055.58
   Market value of mortgage = $184,012
b. PMT = $2,308
   OSB_{60} = $235,753.86
   Market value of mortgage = $218,349
c. PMT = $3,345.76

Market value of mortgage = $552,124

d. PMT = $2,280

OSB_{12} = $311,372.47

Market value of mortgage = $324,530

Mortgage Assumption

A vendor may receive an offer to purchase that specifies that the purchaser will assume an existing mortgage loan. Mortgage assumption means taking over the payment of monies owing.

The primary benefit of assuming a mortgage loan is to take advantage of interest rate savings on an established loan that has a contract rate of interest below prevailing market rates. If a vendor allows a prospective buyer to assume a mortgage when the rate is lower than current market rates, the marketability of the property being sold may increase. As a result, assumed mortgages are more common in times of rising interest rates because the established low rates are attractive.

There are other potential advantages to mortgage loan assumption:

- The vendor may avoid prohibitive prepayment penalties if the alternative is to pay off the loan prior to maturity.
- It may facilitate a sale to a purchaser who cannot obtain conventional financing (although this entails higher risk to the vendor, as will be discussed).
- It may help avoid fees, such as legal, appraisal, or insurance, that would be required in originating a new loan.

Assumed mortgages are less attractive in times of low interest rates. Also, the increased portability of mortgages or the ability to transfer an existing loan to a new property reduces the likelihood of a vendor offering an assumed mortgage.

From a legal standpoint, mortgage loans vary in their “assumability”, as specified in the loan contract. In principle, any loan may be assumed, if it is simply the purchaser taking over payments with the original borrower remaining on title. However, this is risky in the case of default, especially if title to the property has already transferred. In most contemporary mortgages, if the new borrower can qualify with the new lender, then the new borrower may

assume the mortgage and have their name replace the original borrower's name on title.

The calculations required to analyze assumed mortgages are similar to those for vendor take-back loans. Mathematically, the market value or cash-equivalent price of the offer is calculated based on the difference between the contract interest rate and the market interest rate, based on the contracted cash flows under the existing loan. The two main differences between vendor financing calculations and assumed mortgage calculations are:

1. Time has elapsed since the loan's origination, so N will change in the calculation; and
2. The payments and outstanding balance are established by contract and known at the time of offer, so these generally do not need to be calculated.

HELPFUL HINT/CHECKLIST!

The following steps could be followed when calculating the market value of the offer with an assumed loan:

1. Calculate/verify the loan information based on the "contract rate" and enter into the calculator (in some cases, the payment and OSB information is already known, so calculations may not be necessary):
   - ☐ Perform an interest rate conversion, if necessary
   - ☐ Calculate the required payment (if necessary) and enter the rounded payment as a negative number
   - ☐ If partially amortized, calculate the OSB at the end of the term (if necessary) and enter the rounded OSB into FV as a negative number
2. Calculate the market value of the assumed mortgage with the "market rate":
   - ☐ Perform an interest rate conversion, if necessary
   - ☐ Enter the number of payments remaining (the assumed payments) into N
   - ☐ Compute the market value of the assumed mortgage (press PV)
3. Calculate the market value of the offer:
   - ☐ Add the cash down payment to the market value of the mortgage to calculate the market value of the offer

The practical considerations for the real estate professional, in dealing with assumed mortgages, are similar to those for vendor financing. Mathematically-

speaking, we will illustrate how to quantify the benefits of this financial arrangement. However, in actual applications these seemingly precise calculations only give a basic sense of the magnitude of the potential financial benefit involved. The real benefit to either party will be the subject of negotiation between the parties – did the parties understand the benefit they were providing or receiving? How much did this influence the price they were willing to pay or accept?

Just as with vendor financing, the real estate professional's goal will be to ensure the client is well-informed about the pros and cons of assumable financing. Ultimately, this means that a real estate professional needs to understand the underlying mathematical relationships, so they can help the client make an informed decision. If the client does not understand the relationship of interest rates and present value, then they cannot make an informed decision; if the real estate professional does not understand this relationship, then they cannot explain its impact and will be in breach of their professional responsibilities!

It may be helpful to think of an assumed mortgage as another separate asset that is being included to sweeten a deal. Consider the following illustration.

Illustration 11.3

Steven is considering making an offer to purchase a property, including potentially assuming the existing loan, and has asked for your advice. This loan has 26 months remaining in its term and is 3% below the current market rates, which you estimate will save approximately $500 per month in payments. The current loan balance is $279,000. You feel the property's market value, without considering financing possibilities, is $399,000.

Should Steven offer $120,000 plus assumption of the existing financing?

Solution:

You may think of this conceptually as Steven being offered a separate asset on top of the real estate alone. Steven is considering buying (1) the real estate, a combination of land and building; and (2) a financial asset that represents the right to save $500 interest per month for 26 months. The question is how much

Steven is willing to pay for this benefit and how much the vendor will need to be paid to be willing to provide this benefit.

You have calculated the present value of the payment savings over 26 payments is roughly $16,000.[5] This is what Steven will save by assuming this mortgage's payments rather than paying 3% more per month in a new loan. So how should this influence the offer?

You may think of this as analogous to a vendor throwing in another asset or personal property to sweeten the deal. For example, what would happen if the vendor had offered to include a used BMW car, worth $30,000 on the open market? If the real estate was worth $400,000, then you might be willing to pay $430,000 if the car is included, perhaps somewhere between $400,000 and $430,000 if you are not that excited about the car, or maybe no more than $400,000 if you are indifferent about it.

The same argument can be made for the potential financing benefit related to assumed mortgages. You may assume Steven is willing to pay $16,000, perhaps something less, or perhaps something more, depending on how badly he wants this benefit and the negotiating strength of the vendor. For example, if the vendor has numerous offers to choose from, the vendor might demand to be paid $16,000 extra to consider this – or an offer of $136,000 cash plus assumption of the mortgage. On the other hand, if the vendor is having some difficulty selling the property, perhaps they would be willing to split the difference. Or perhaps the vendor is motivated to avoid prohibitive prepayment penalties, in which case the vendor may already be receiving a benefit and charge nothing extra to the purchaser. Or perhaps the vendor knows the purchaser will be avoiding substantial transaction fees (insurance, appraisal, legal, prepayment penalties) and demands a premium above the $16,000.

The main point is that this $16,000 calculation is simply a starting point in a sale price negotiation. We will show you how to calculate exact amounts to account for this benefit, but the real answer to how much an assumed mortgage is worth depends entirely on the participants in the deal.

Addition of Personal Property

House:
Market Value $400,000

House and Car Package:
Market Value $430,000

Addition of Beneficial Financing

House:
Market Value $400,000

House and Assumed Mortgage Package:
Market Value $416,000

Questions to consider:

1. What is the calculated financial benefit?
2. How much extra, if anything, does it add to the deal? Separate other real property benefits from the real estate.

Illustration 11.4(a)

Assume that John Smith bought his house 2 years ago at which time he arranged an $85,000 mortgage. This loan was written at a rate of 10.25% per annum, compounded semi-annually, with a 5-year term and a 25-year amortization period. It calls for monthly payments of $774.66 and an outstanding balance at

the end of the 5 years of $80,065.92. (See the amortization schedule in Table 11.1.)

Today, 24 months into this loan, John has received an offer from Mary Jones to buy his house for $40,000 cash, plus assumption of the existing mortgage on the property. The loan has a remaining balance of $83,315.93 and 3 years remaining in the term.

If current mortgage rates for 3-year terms are 13% per annum, compounded semi-annually, calculate the market value of Mary's offer.

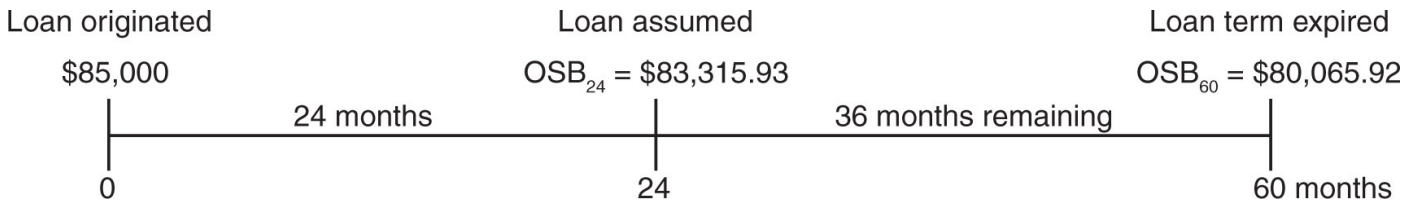


Table 11.1: Amortization Schedule

Month	Beginning Balance	Payment	Interest	Principal	Ending Balance
1	$85,000.00	$774.66	$711.01	$63.65	$84,936.35
2	$84,936.35	$774.66	$710.47	$64.19	$84,872.16
. . .					
23	$83,469.48	$774.66	$698.20	$76.46	$83,393.03
24	**$83,393.03**	**$774.66**	**$697.56**	**$77.10**	**$83,315.93**
25	$83,315.93	$774.66	$696.92	$77.74	$83,238.19
26	$83,238.19	$774.66	$696.27	$78.39	$83,159.80
27	$83,159.80	$774.66	$695.61	$79.05	$83,080.75
28	$83,080.75	$774.66	$694.95	$79.71	$83,001.04
29	$83,001.04	$774.66	$694.29	$80.37	$82,920.67
30	$82,920.67	$774.66	$693.61	$81.05	$82,839.62
31	$82,839.62	$774.66	$692.94	$81.72	$82,757.90
32	$82,757.90	$774.66	$692.25	$82.41	$82,675.49
33	$82,675.49	$774.66	$691.56	$83.10	$82,592.39
34	$82,592.39	$774.66	$690.87	$83.79	$82,508.60
35	$82,508.60	$774.66	$690.17	$84.49	$82,424.11
36	$82,424.11	$774.66	$689.46	$85.20	$82,338.90
37	$82,338.90	$774.66	$688.75	$85.91	$82,252.99
38	$82,252.99	$774.66	$688.03	$86.63	$82,166.36
39	$82,166.36	$774.66	$687.30	$87.36	$82,079.00
40	$82,079.00	$774.66	$686.57	$88.09	$81,990.92
41	$81,990.92	$774.66	$685.84	$88.82	$81,902.09
42	$81,902.09	$774.66	$685.09	$89.57	$81,812.52
43	$81,812.52	$774.66	$684.34	$90.32	$81,722.21
44	$81,722.21	$774.66	$683.59	$91.07	$81,631.14
45	$81,631.14	$774.66	$682.83	$91.83	$81,539.30
46	$81,539.30	$774.66	$682.06	$92.60	$81,446.70
47	$81,446.70	$774.66	$681.28	$93.38	$81,353.33
48	$81,353.33	$774.66	$680.50	$94.16	$81,259.17
49	$81,259.17	$774.66	$679.72	$94.94	$81,164.22
50	$81,164.22	$774.66	$678.92	$95.74	$81,068.48
51	$81,068.48	$774.66	$678.12	$96.54	$80,971.94
52	$80,971.94	$774.66	$677.31	$97.35	$80,874.60
53	$80,874.60	$774.66	$676.50	$98.16	$80,776.43
54	$80,776.43	$774.66	$675.68	$98.98	$80,677.45
55	$80,677.45	$774.66	$674.85	$99.81	$80,577.64
56	$80,577.64	$774.66	$674.01	$100.65	$80,477.00
57	$80,477.00	$774.66	$673.17	$101.49	$80,375.51
58	$80,375.51	$774.66	$672.32	$102.34	$80,273.17
59	$80,273.17	$774.66	$671.47	$103.19	$80,169.98
60	**$80,169.98**	**$774.66**	**$670.60**	**$104.06**	**$80,065.92**

Today

Current Mortgage Balance

Owing 36 months from today

Solution:

1. Calculate/Verify the Loan Information based on the Contract Rate

- Monthly payment: $774.66
- OSB at end of 2 years (24 months): $83,315.93
- OSB at end of 5 years (60 months): $80,065.92

Therefore, the loan has monthly payments of $774.66 over the 5-year term; Mary will take over the remaining payments on John's mortgage and she will be

required to repay the outstanding balance of $80,065.92 at the end of another 3 years when the loan term expires.

HELPFUL HINT!

Students should note that the outstanding balance when the loan is assumed (OSB_{24}) is $83,315.93. Mary has offered a down payment of $40,000, plus she will take over the remaining payments on John's mortgage. Thus, her offer has a stated price of $40,000 + $83,315.93, or $123,315.93. This is called the face value of the offer, which is the amount that would be recorded as the sale price in MLS® or the Land Title Office. However, what we are looking for is the worth of this offer in cash-equivalent or market value terms. In other words, what is the value of the financial benefit from this assumable financing?

If Mary offered $40,000 cash, plus the proceeds from a new mortgage at the market rate of interest, which required the same payments as she is offering to assume, she would be able to borrow less money and, in turn, be able to pass less money to the vendor.

Given that she has agreed she can make 36 payments of $774.66 and a lump sum payment of $80,065.92 at the end of 3 years, how much could she borrow at the market rate of interest?

Calculation

Press	Display	Comments
774.66 +/– PMT	–774.66	Enter given rounded payments
80065.92 +/– FV	–80,065.92	Enter given rounded OSB_{60}

2. Calculate the Market Value of the Assumed Loan using the Market Rate

a. Calculate the Equivalent Nominal Market Rate with Monthly Compounding

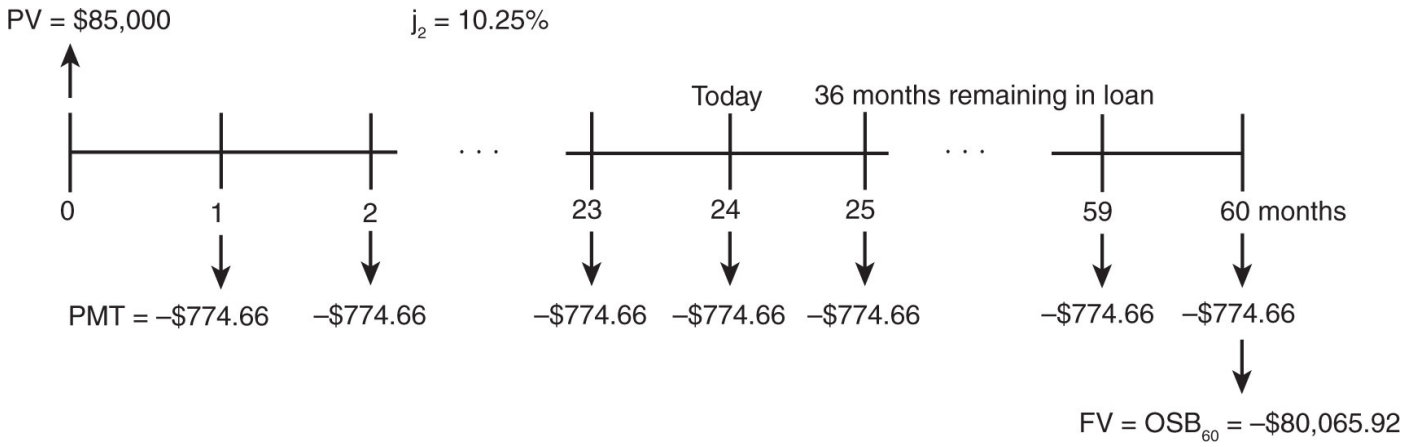
Calculation

Press	Display	Comments
13 ■ NOM%	13	Enter stated nominal rate
2 ■ P/YR	2	Enter stated compounding frequency
■ EFF%	13.4225	Compute equivalent effective annual rate
12 ■ P/YR	12	Enter desired compounding frequency
■ NOM%	12.661289	Compute nominal rate with monthly compounding

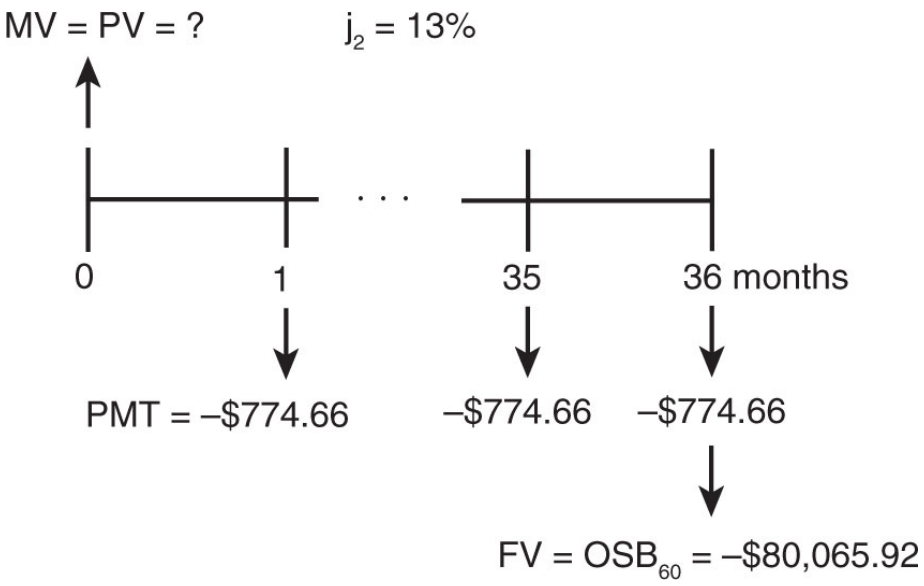
b. Calculate the Market Value of the Assumed Loan

N = 36; j_{12} = 12.661289%; PMT = $774.66; FV = $80,065.92; PV = ?

John Smith's Original Loan: Payments and outstanding balance set out in loan contract.



Mary Jones' Assumed Loan: Find the market value of the remaining 36 payments and outstanding balance, given the current market interest rate.



Calculation (continued)

Press	Display	Comments
	12.661289	j_{12} already stored from previous calculation
36 N	36	36 regular payments remaining
PV	77,974.680152	Market value of remaining payments and OSB

This analysis shows that the payments Mary is agreeing to assume would only purchase a mortgage loan of $77,974.68 at the market interest rate. This is the market value of the mortgage. Note that it is lower than the $83,315.93 current outstanding balance of the mortgage – recall the seesaw in Figure 11.1. Here the market interest rate is higher than the contract rate; therefore, the present value is lower than the face value. This difference, $5,341.25, is the calculated financial benefit to the purchaser from this below-market assumable mortgage.

3. Calculate the Market Value of the Offer

The cash-equivalent price (market value of offer) of Mary's offer is $117,974.68:

	Cash Down Payment	$40,000.00
+	Market Value of Assumed Loan	+ 77,974.68
	Market Value of Offer	$117,974.68

Recall the face value of this offer is $123,315.93. In effect, Mary's offer is $117,974.68 for the real estate plus $5,341.25 for the financial benefit.

Decision Point

Question: Should John accept Mary's offer?

Answer:

- The answer depends in a large part on what John feels his real estate is worth – what is the house and lot worth without considering the beneficial financing? He is offering a $5,341.25 financial benefit – is he being adequately compensated for this? If not, perhaps John may wish to present a counter-offer to Mary, asking for a higher down payment (which means a larger face value offer).
- What other benefits might Mary achieve via this assumable financing? (e.g., savings on insurance, legal and appraisal fees)
- Can Mary qualify for financing on her own?
- Are there any other advantages to John in offering this assumed mortgage? (e.g., savings on prepayment penalties)
- Is John taking on any risk with this option?
- What is John's next-best alternative? Could he port the mortgage to another property and keep the interest savings himself?

Illustration 11.4(b)

What if the loan in Illustration 11.4(a) had been fully amortized? Assuming that market rates are unchanged at j_2=13%, calculate the market value of this fully

amortized assumable mortgage.

Solution:

The calculations below are revised to include 276 remaining payments (300-month amortization less 24 payments already made) and no future value:

Calculation (continued)

Press	Display	Comments
	12.661289	j_{12} already stored from previous calculation
0 FV	0	No outstanding balance
276 N	276	276 regular payments remaining
PV	69,367.42558	Market value of remaining payment

The market value of the mortgage has decreased from $77,974.68 to $69,367.43, reflecting the interest savings now being available for 276 months rather than only 36 months. The potential financial benefit to the purchaser Mary increases to $13,948.50 ($83,315.93 face value less $69,367.43 market value).

Example 11.3

Two years ago, Mark bought a house at which time he arranged a $100,000 mortgage. The loan was written at a rate of 3% per annum, compounded semi-annually, calling for monthly payments of $473.25 and an outstanding balance of $85,474.31 due at the end of the 5-year term.[6]

Mark has just received an offer from Janice to buy his house. Janice offers to provide $20,000 cash and to assume the existing financing for the remainder of the term. If current lending rates for 3-year term mortgages are 6% per annum, compounded semi-annually, what is the market value of Janice's offer?

Abbreviated Solution:

1. **Calculate/Verify the Loan Information Based on the Contract Rate**

- Monthly payments: $473.25
- OSB at end of 5 years (60 months): $85,474.31

Calculation

Press	Display
473.25 +/– PMT	–473.25
85474.31 +/– FV	–85,474.31

2. **Calculate the Market Value of the Assumed Mortgage**

Calculation (continued)

Press	Display
6 ■ NOM%	6
2 ■ P/YR	2
■ EFF%	6.09
12 ■ P/YR	12
■ NOM%	5.926346
36 N	36
PV	87,156.675419

The market value of the assumed mortgage is $87,156.68.

3. Calculate the Market Value of the Offer

	Cash Down Payment	$20,000.00
+	Market Value of Assumed Loan	+ 87,156.68
	Market Value of the Offer	$107,156.68

The outstanding balance 24 months into this loan was $94,447.84, so the face value of the offer is $114,447.84. This means the purchaser Janice is receiving a $7,291.16 calculated financial benefit due to assuming this loan. Mark will need to consider this amount in deciding whether to accept this offer, refuse the offer, or make a counter-offer with a higher cash down payment required.

Example 11.4

The condominium next door to you sold for $380,000 today. However, it included an assumed mortgage; you want to know how much the condominium really sold for, ignoring any impact from the beneficial financing. The current mortgage balance is $205,000, calls for monthly payments of $1,280, and will have $191,902.70 owing at the end of the term, in 29 months. The market rate for similar financing is j_{12} = 8.25%. What is the market value of the condominium?

Abbreviated Solution:

1. Calculate/Verify the Loan Information Based on the Contract Rate

- Monthly Payments: $1,280
- OSB at end of 29 months: $191,902.70

Calculation

Press	Display
1280 +/– PMT	–1,280
191902.7 +/– FV	–191,902.7

2. Calculate the Market Value of the Assumed Mortgage

Calculation (continued)

Press	Display
8.25 I/YR	8.25
12 ■ P/YR	12
29 N	29
PV	190,871.806933
+/– + 205000 =	14,128.193067

The market value of the assumed mortgage is $190,871.81. The loan's current outstanding balance or face value is $205,000, which means the purchaser received a $14,128.19 calculated financial benefit due to assuming this loan. Based only on the calculated benefit, you can assume the real estate value alone, removing the financing benefit, was approximately $366,000 ($380,000 – $14,000). However, to be more certain how this assumed mortgage might have influenced the purchase price, you might want to interview the vendor, purchaser, or licensees involved and ask for their input on how this was accounted for in the negotiations.

Exercise 11.2

In each of the following situations, a vendor has offered to let a purchaser assume the existing mortgage. Calculate the market value of the mortgage in each situation. For parts d, e, and f, round the monthly payments up to the next higher dollar.

	Original Loan Amount	Payments	OSB End of Term	Remaining Term	Market Interest Rate (j_2)	Contract Interest Rate (j_2)	Amortization/Term
a.	$1,200,000	$8,565, monthly	$866,973.31	37 months	5%	3.5%	-
b.	$375,000	$2,077, monthly	$0	191.882324 months	6%	3%	-
c.	$450,000	$2,368, monthly	$404,287.59	24 months	8%	4%	-
d.	$600,000	$?, monthly	$0	135.981617 months	5%	10%	300 months/300 months
e.	$800,000	$?, monthly	$?	26 months	6.2%	8.4%	240 months/5 years
f.	$212,000	$?, monthly	$?	17 months	9%	5%	180 months/3 years

Abbreviated Solution:

a. Market value of mortgage = $1,037,870.25
b. Market value of mortgage = $257,147.89
c. Market value of mortgage = $398,013.28
d. PMT = $5,367; Market value of mortgage = $557,762.82

   Note that the contract rate is higher than the market rate on this loan. This means that the purchaser is paying a higher interest rate than is currently available on the market. This situation is a lot less common – it could potentially arise if the purchaser cannot obtain their own financing (possibly risky) or if prepayment penalties are prohibitively high for the vendor.
e. PMT = $6,820

   OSB_{60} = $702,687.55

Market value of mortgage = $781,282.62

f. PMT = $1,671

OSB_{36} = $181,147.64

Market value of mortgage = $186,517.05

PORTABLE MORTGAGES

A portable mortgage gives a borrower the flexibility to sell one home and buy another before the current mortgage matures. The borrower may be able to transfer the terms, conditions, and interest rate of the current mortgage to the home the borrower would like to purchase. This feature can save the borrower money when the existing mortgage has a lower interest rate than current market rates.

If a borrower is selling a mortgaged property but looking to purchase another, then a portable mortgage allows the borrower to maintain a below-market interest rate, as well as save the fees involved in originating a new mortgage. This greatly reduces the benefits of offering assumable financing as an incentive to sell the mortgaged property.

However, while most mortgages are portable, this is true only if you re-qualify under today's "stress test" guidelines. Chapter 12 provides additional information on the mortgage qualifying rate and application of the stress test. The period allotted to complete the port varies between 30 and 120 days, which may not be enough time to complete the sale of the existing property and purchase the new property. Additionally, most variable rate mortgages are not portable, requiring borrowers to pay a prepayment penalty for breaking the mortgage early.

Rather than asking if a mortgage is portable, it is more important to determine if the borrower currently qualifies to move the mortgage to a new property. For example, one day into a 5-year fixed rate mortgage, the borrower is subject to the *stress test. This will reduce the borrower's maximum mortgage approval if the mortgage qualifying rate is greater than the contract rate*. This means that the borrower *may only be able to port part of the current balance* to another property. To avoid this scenario, the borrower may pay a penalty to break the current five-year fixed mortgage and then apply for a new five-year fixed mortgage. However, these penalties can be significant – typically the

higher of an amount equal to 3 months' interest on what is still owed or the interest rate differential (IRD). Prepayment penalties are discussed in Chapter 13.

If the current mortgage is not large enough to cover the purchase of the new home, i.e., additional capital is needed, then the lender will often increase the mortgage and extend the borrower's loan term, provided the borrower's income and new property meet the lender's criteria. This allows the borrower to extend the term of the mortgage before the maturity date and potentially decrease their existing contract rate. If the current posted rate for the new term is lower than the existing mortgage contract rate, the lender will blend the interest rates and the result will be a lower interest rate for the borrower.

If the current mortgage is too large for the new home, many institutions allow the borrower to pay down a portion (e.g., 10%) of the original balance without penalty. If there was any remaining excess balance, it would be subject to a prepayment charge (the cost associated with discharging a mortgage mid term).

Summary of the Chapter So Far ... Breaking Down Advanced Mortgage Analysis

The mathematics of advanced mortgage analysis can get quite complex, so let's pause for a moment to see what we have done so far and look ahead to what we are covering next.

Covered so far:

Vendor Financing:

- Confirm contract terms: PMT calculation, OSB calculation
- Change market interest rate, then calculate revised PV

Assumed Mortgages:

- Confirm contract terms: PMT calculation, OSB calculation
- Change N (number of payments remaining in term)
- Change market interest rate, then calculate revised PV

Next topic:

Bonused Mortgages:

- Confirm contract terms based on face value of loan (gross amount): PMT calculation, OSB calculation
- Change PV to funds advanced (net amount of loan), then calculate revised interest rate

Conclusion: Maybe there is actually less math required in these questions than it appears!

- Mortgage analysis relies on the introductory finance steps you learned in prior chapters: interest rate conversions, PMT, and OSB calculations.

- Then you change one or two numbers and recalculate another ... keep in mind that it takes practice, practice, practice!

IMPACT OF BROKERAGE AND OTHER FEES

Fees that are often connected with originating a mortgage include a *lender bonus* and a mortgage *brokerage fee*. A lender bonus is a fee that may be charged by lenders as a means of increasing their yield on a loan. A brokerage fee is charged by mortgage brokers if their services are rendered in arranging a mortgage loan.

lender bonus
a fee charged by lenders as a means of increasing their yield on a loan

brokerage fee
a fee charged by mortgage brokers if their services are rendered in arranging a mortgage loan

These fees may increase the real rate of interest paid by the borrower on the loan to above what is specified in the loan terms. Alternatively, if the lender is paying the brokerage fees, then the real yield or return the lender earns on the loan investment will be lower than that specified in the loan contract.

Where the borrower pays brokerage fees (also called bonuses), these fees can be added on top of the funds advanced, e.g., the borrower receives a $100,000 loan but pays back a loan of $110,000. Alternatively, the fees may be deducted from the face value of the loan, e.g., the borrower arranges a loan of $200,000, and pays this amount back but is only advanced $185,000. In some cases, the funds advanced are called the net amount of the mortgage, while the loan payments are based on the gross amount of the mortgage, with the bonus and other fees included.

Whenever the amount advanced to a borrower is less than the face value of the mortgage or the net amount is less than the gross amount (that is, whenever a bonus is charged), the loan is referred to as a bonused mortgage. Bonused mortgages are subject to specific legal requirements under the provisions of the *BC Business Practices and Consumer Protection Act*, which specifically requires that disclosure be given by mortgage brokers and lenders to individuals who borrow for primarily personal, family, or household purposes, regardless of whether the broker or lender is charging additional fees or expenses.

There are other fees that may be charged to borrowers in the process of establishing a mortgage loan. These include fees for appraisals, surveys, legal assistance, and other disbursements. The lender may pay these fees but under the assumption they are made on behalf of the borrower in arranging the loan. In this case, the lender may deduct these fees from the gross amount of the loan, advancing an amount to the borrower less than the loan's full face value. In other words, the borrower makes a series of payments based on the face value of the loan (the loan amount); however, the borrower receives a lesser amount, i.e., the loan amount less the bonus or brokerage fee AND the cost of other fees, such as appraisal, survey and legal fees. In this case, the borrower would want to calculate the rate of interest charged on the mortgage loan amount after all of these fees have been deducted. This true or real rate is known as the *cost of funds advanced to the borrower,* which will be discussed in detail later in this section of the chapter.

Discounts and Bonuses

The fees connected with originating a mortgage loan may be deducted from the loan advance or added to the face value of the loan. When a fee is deducted from the loan advance, it is referred to as a *discount*. A discount does not change the face value of the loan. When a fee is added to the face value of a loan, it is referred to as a *bonus*. The effect on the borrower is the same: reducing the amount received relative to the loan amount and, as a result, increasing the real interest rate paid for the funds actually received.

Bonused loan origination is common in the United States, where it is referred to as *points up front* or front-end loading. Points-up front represents a payment made at the beginning of the loan period, typically set as a percentage of the loan amount.

In Canada, bonusing at the time a loan is initiated is a common arrangement among both commercial and residential mortgage lenders in two general situations:

- In cases where a mortgage broker adds a bonus to the mortgage as a part of the brokerage fee, e.g., the borrower arranges a loan for $100,000 to be advanced but signs for a face amount of $103,000, where the $3,000 represents a brokerage fee.
- In cases where a private lender extends funds and, for whatever reason, demands (and the borrower agrees to) compensation more than the contractual rate.

Comparing Loan Alternatives

It can be challenging to directly compare conventional mortgage loan options, when accounting for the wide variety of payment options, terms, and other loan variables. This is complicated further when brokerage fees and other fees are

involved. The terms of the typical mortgage contract do not necessarily provide enough information to analyze the real cost of borrowing since bonus arrangements and brokerage fees are often not stated in the mortgage contract. Consequently, the analysis of a mortgage contract generally only provides information about the contractual financial obligation of the borrower but not the actual cost of financing in terms of funds received.

Mortgage analysis techniques can be applied to determine the impact of alternative financing arrangements. For example, consider a potential borrower with two loan alternatives. In the first alternative, the face value of the loan is \$90,000, the interest rate is $j_2 = 13.5\%$, the amortization period is 15 years, and the amount of the bonus and other fees is \$5,245. In the second alternative, the face value of the loan is \$93,000, the interest rate is $j_2 = 12.5\%$, the amortization period is 16 years, and the amount of the bonus and other fees is \$8,245. Both loans are fully amortized.

The following information can be directly compared by the prospective borrower:

	Alternative 1	Alternative 2
Face Value	\$90,000	\$93,000
Contract Rate (j_2)	13.5%	12.5%
Amortization Period	15 years	16 years
Bonus and Fees	\$5,245	\$8,245
Net Proceeds	\$84,755	\$84,755

At first glance, the borrower cannot determine the more attractive alternative. In each case, the same net proceeds are received, but different amounts are to be repaid (\$90,000 versus \$93,000) at different nominal rates (13.5% versus 12.5%) over different time periods (15 years versus 16 years). The first step in analyzing these two financing options is to calculate the monthly payments required:

	Alternative 1	Alternative 2
Monthly Rate (j_{12})	13.135263%	12.186387%
Monthly Payments	\$1,146.74	\$1,102.94

The monthly payments are lower for Alternative 2, for the same net amount of funds $84,755. This would appear to be more attractive, but Alternative 2 requires more payments (16 years versus 15 years) and higher fees ($8,245 versus $5,245). The borrower still cannot determine which loan is more attractive without comparing the actual cost of the funds received under each alternative. That is, the borrower must compare the interest rates[7] at which 15 years of monthly payments of $1,146.74, and 16 years of monthly payments of $1,102.94, will amortize $84,755:

	Alternative 1	Alternative 2
Cost of Funds (j_2)	14.749308%	14.315959%

The cost of funds analysis confirms that Alternative 2 is more attractive. Despite the larger face value, larger bonus, and longer amortization period, with all things considered its true rate of interest is lower and thus more attractive to the borrower. These calculations will be examined in more detail in this chapter.

Cost of Funds Advanced to the Borrower – Fully Amortized Loan

As stated previously, in a loan where fees are charged, for brokerage or other activities, the borrower makes a series of payments based on the face value of the loan (the gross amount of the loan) and receives a lesser amount (the net amount of the loan, after deducting the brokerage fee and the cost of other fees, such as appraisal, survey, and legal fees). In this case, the borrower would want to calculate the rate of interest charged on the mortgage loan amount after all fees have been deducted – this is known as the cost of funds advanced (COFA) to the borrower. This is a measure of the true cost of borrowing that can be compared against the contract interest rate. However, the lender is NOT required to disclose this value to the borrower.

HELPFUL HINT/CHECKLIST!

The following steps could be followed when calculating the cost of funds advanced to the borrower on a fully amortized loan:

1. Calculate the loan information with the gross amount/face value of the loan and contract rate:
   - Perform an interest rate conversion, if necessary
   - Use the face value or gross amount of the loan as PV

- Calculate the required payment and enter the rounded payment as a negative number

2. Calculate the deductions from the face value/net amount:
   - In determining the funds advanced to the borrower, deductions such as the brokerage, appraisal, survey, and legal fees should be subtracted from the face value of the loan
   - Re-enter the funds advanced to the borrower (net amount of the loan) in PV
3. Calculate the cost of funds advanced to the borrower:
   - Determine the cost of funds advanced to the borrower on the net amount of the loan by pressing I/YR
   - Read the question as to how the nominal rate should be displayed (j_1, j_2, j_4, etc.) and convert to the appropriate equivalent interest rate, if necessary

Calculation Tip: a question may state either *gross amount/face value* OR *net amount/funds advanced*. For both of these:

Step 1: use the **LARGER** number (funds received by the borrower plus all fees) to calculate payments

Steps 2 and 3: use the **SMALLER** number (funds received by the borrower after all fees are deducted) to calculate cost of funds advanced

Illustration 11.5(a)

A borrower signs a second mortgage contract to repay $90,000 with interest at 13.5% per annum, compounded semi-annually, with monthly payments over a 15-year amortization period. The mortgage is arranged through a mortgage broker who has included a $5,000 bonus in the $90,000 face value that will be deducted before the mortgage funds are advanced to the borrower. An additional $245 will be deducted for appraisal costs, leaving the borrower with net funds advanced of $84,755.

What is the interest rate per annum, compounded semi-annually, charged on the funds advanced (actually received) by the borrower?

Solution:

1. **Calculate the Loan Information with the Gross Amount/Face Value of the Loan and Contract Rate**

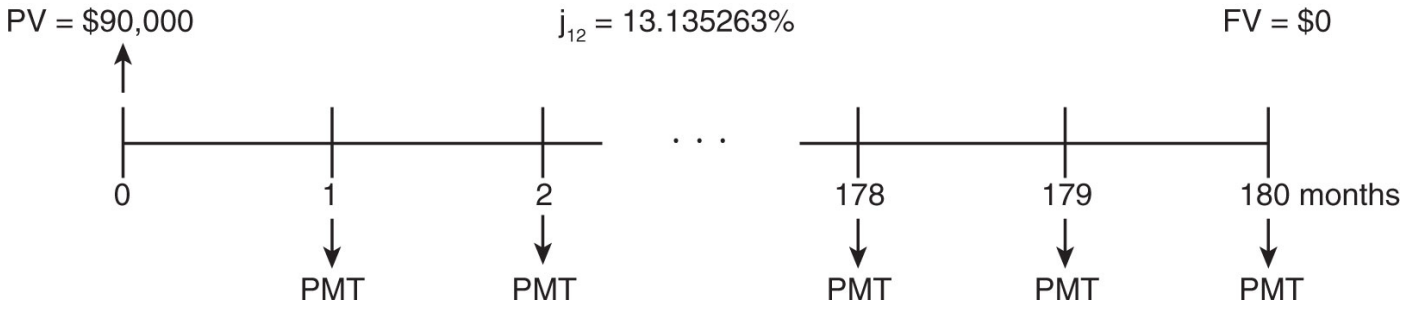
a. Calculate the Nominal Rate with Monthly Compounding equivalent to j_2 = 13.5%

Calculation

Press	Display	Comments
13.5 ■ NOM%	13.5	Enter stated nominal rate
2 ■ P/YR	2	Enter stated compounding frequency
■ EFF%	13.955625	Compute equivalent effective annual rate
12 ■ P/YR	12	Enter desired compounding frequency
■ NOM%	13.135263	Compute nominal rate with monthly compounding

b. Calculate the Required Monthly Payments on the Face Value of the Loan

j_{12} = 13.135263%; PV = $90,000; N = 180; PMT = ?



Calculation (continued)

Press	Display	Comments
	13.135263	Already stored from previous calculation
90000 PV	90,000	Enter loan amount
180 N	180	Enter number of payments
0 FV	0	Payments fully amortize loan over 180 months
PMT	–1,146.739869	Monthly payment
1146.74 +/– PMT	–1,146.74	Enter rounded payment

Thus, the borrower has agreed to repay $90,000 at a nominal rate of 13.5% by 180 monthly payments of $1,146.74. Actually, the borrower is required to make 179 payments of $1,146.74 and a final 180th payment of $1,146.67. However, once again, the impact of rounding the payments has been ignored on fully amortized loans to keep the calculations simple; 180 even payments of $1,146.74 are presumed.

2. Calculate Deductions from Face Value

The face value of the loan is $90,000, but the borrower does not receive this full amount. The $5,000 brokerage fee and $245 appraisal costs are deducted from the gross amount of the loan. The net proceeds actually received by the borrower are:

$$\$90{,}000 - \$5{,}000 - \$245 = \$84{,}755$$

Calculation (continued)

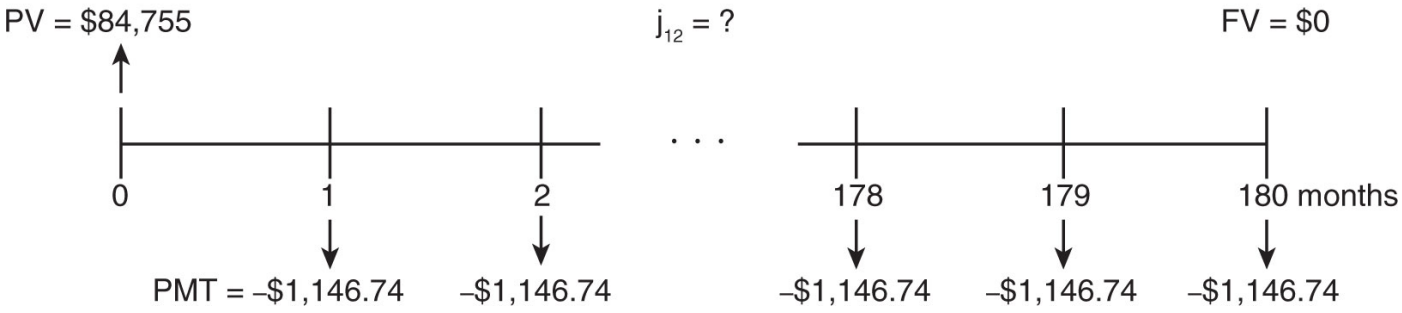
Press	Display	Comments
84755 PV	84,755	Net proceeds of loan

When calculating the cost of funds advanced to the borrower, deductions could include the cost of appraisal, survey, and legal fees, as well as the bonus (or brokerage fee).

3. Calculate the Cost of Funds Advanced to the Borrower

a. Calculate the Nominal Rate with Monthly Compounding Paid on Funds Advanced

PV = $84,755; PMT = $1,146.74; N = 180; j_{12} = ?



Calculation (continued)

Press	Display	Comments
I/YR	14.31551	Compute nominal rate with monthly compounding

Note that because all other loan information was already entered in the financial keys, once the net proceeds of the loan are entered, the nominal rate can be calculated without re-entering any other information. Since the borrower is making payments of $1,146.74 on a loan of $84,755, this means the interest

rate is 14.31551% per annum, compounded monthly. This is greater than the j_{12} contract rate of 13.135263%.

b. Calculate the Equivalent Nominal Rate with Semi-Annual Compounding (j_2)

Calculation (continued)

Press	Display	Comments
	14.31551	Already stored from previous calculation
■ EFF%	15.293163	Compute equivalent effective annual rate
2 ■ P/YR	2	Enter desired compounding frequency
■ NOM%	14.749308	Compute nominal rate with semi-annual compounding

Although the contract indicates that the borrower is to pay interest at a nominal rate of j_2 = 13.5%, the borrower pays a *higher* rate of approximately j_2 = 14.75% on the funds received. Why? Because the borrower is making payments on a larger amount of money ($90,000) than the cash received ($84,755). The cost of funds advanced to the borrower is j_2 = 14.749308%. Referring to our interest rate/present value see-saw, Figure 11.2 shows that if the present value drops, the interest rate rises.

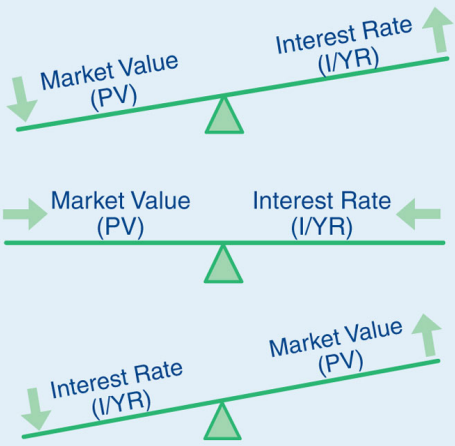
FIGURE 11.2: Comparison of Bonused Mortgages

Interest rates and market value (present value) are inversely related. When one goes up, the other goes down, and vice versa.

Net Amount of Loan (Funds Advanced) less than Gross Amount (Face Value)
Where the net amount is lower than the gross amount, e.g., a brokerage fee is paid by the borrower, the cost of funds advanced will be higher than the contract rate (PV decreases, I/YR increases).

Net Amount of Loan (Funds Advanced) equals Gross Amount (Face Value)
Where the net amount and gross amount are equal, e.g., no brokerage fees, the cost of funds advanced will equal the contract rate (no change in PV, no change in I/YR).

Net Amount of Loan (Funds Advanced) more than Gross Amount (Face Value)
Where the net amount is higher than the gross amount, e.g., a brokerage fee is paid by the lender, the yield to the lender will be lower than the contract rate (PV increases, I/YR decreases).



What If Brokerage Fees Are Added On Rather Than Deducted?

Illustration 11.5(a) had a borrower who arranged a $90,000 loan but only received $84,755 after bonuses were considered (ignoring fees). In practice, this problem might more commonly be structured as follows: “A borrower requires $84,755 in funds. A mortgage broker arranges an $84,755 second mortgage but charges $5,245 in fees, added on to the loan amount”.

In this example, the calculations would be identical – the borrower is making payments based on a $90,000 gross loan amount but only receives a net amount of $84,755.

Keep in mind that the impact of these fees will be more pronounced when the loan’s term is short. For example, if this loan had a 1-year term, the outstanding balance at the end of 12 months is $87,939.75, or nearly $3,000 more than the borrower initially received. In other words, in addition to not being paid down over the first year, the borrower also owes more than they started with. That will substantially increase the rate of interest paid, to nearly 20% in this example. This will be explained further in the next section.

Illustration 11.5(b)

Referring to the previous illustration, assume the brokerage fee is $10,000, rather than $5,000. All other facts are unchanged. Calculate the revised cost of funds advanced to the borrower, expressed as a nominal rate with semi-annual compounding.

Solution:

1. Calculate the Loan Information with the Contract Rate

Calculations are the same as Illustration 11.5(a):

Payment = $1,146.74

N =180

2. Calculate the Deductions from Face Value

The face value of the loan is $90,000, but the borrower does not receive this full amount. The $10,000 brokerage fee and $245 appraisal costs are deducted from the gross amount of the loan. The net proceeds received by the borrower are:

$90,000 – $10,000 – $245 = $79,755

Calculation (continued from Illustration 11.5(a))

Press	Display	Comments
79755 PV	79,755	Net proceeds of loan

3. Calculate the Cost of Funds Advanced to the Borrower

Calculation (continued)

Press	Display	Comments
I/YR	15.555502	j_{12}
■ EFF%	16.713896	j_1
2 ■ P/YR	2	Desired compounding frequency
■ NOM%	16.068412	j_2

The cost of funds advanced to the borrower (calculated as j_2) is 16.068412%. This is significantly higher than the j_2=14.749308% cost of funds advanced when the brokerage fee was $5,000 (and both are substantially above the contract interest rate of j_2=13.5%). The dramatic rise in the interest rate highlights the need for disclosure regulations when brokerage fees are involved. It is reasonable to charge fees, even large fees, but the impact of these fees must be made clear to the borrower. If a borrower is misled into accepting a loan based on an artificially low interest rate when the true cost of borrowing was much higher, that would be inappropriate and unethical.

Example 11.5

An individual requires a loan of $100,000 for house renovations. Ace Equity will loan the funds at a j_{12} = 7% interest rate, fully amortized with monthly payments over 20 years. However, they will charge a brokerage fee of 10% on the loan proceeds, raising the gross amount or face value of the loan to $110,000. Calculate the cost of funds advanced, expressed as a j_{12} interest rate and an effective annual interest rate (j_1).

Abbreviated Solution:

1. **Calculate the Loan Information with the Gross Amount/Face Value of the Loan and Contract Rate**

Calculation

Press	Display
7 I/YR	7
12 ■ P/YR	12
110000 PV	110,000
240 N	240
0 FV	0
PMT	–852.828829
852.83 +/– PMT	–852.83

2. **Calculate the Net Amount of the Loan (Deductions from Gross Amount/Face Value)**
   $110,000 – $10,000 = $100,000

Calculation (continued)

Press	Display
100000 PV	100,000

3. **Calculate the Cost of Funds Advanced to the Borrower**

Calculation (continued)

Press	Display
I/YR	8.262175
■ EFF%	8.582343

The cost of funds advanced for the borrower is j_{12} = 8.262175% and j_1 = 8.582343%. The rate has increased from the contract rate because the borrower received funds of $100,000. However, the borrower is making payments based on $110,000. The borrower is paying slightly more on each payment than the 7% interest rate the mortgage contract calls for.

Cost of Funds Advanced to the Borrower – Partially Amortized Loan

This section continues the calculations from the previous examples but builds in a contractual term for the loan that is shorter than the full amortization period. This is more relevant to real estate practice, since fully amortized loans are uncommon in finance today. The calculations will examine the impact of fees on the cost of borrowing. We shall see that the shortening of the time frame over which fees are repaid will have a significant impact in magnifying the increase in the cost of borrowing.

HELPFUL HINT/CHECKLIST!

The following steps could be followed when calculating the cost of funds advanced to the borrower on a partially amortized loan:

1. Calculate the loan information with the gross amount/face value of the loan and contract rate:
   - ☐ Perform an interest rate conversion, if necessary
   - ☐ Use the face value or gross amount of the loan as PV
   - ☐ Calculate the required payment and enter the rounded payment as a negative number
   - ☐ Calculate the OSB at the end of the term and enter the rounded OSB into FV as a negative number

2. Calculate the deductions from the face value/net amount:
   - In determining the funds advanced to the borrower, deductions such as the brokerage, appraisal, survey, and legal fees should be subtracted from the face value of the loan
   - Re-enter the funds advanced to the borrower (net amount of the loan) in PV
3. Calculate the cost of funds advanced to the borrower:
   - Enter the number of payments into N
   - Determine the cost of funds advanced to the borrower on the net amount of the loan by pressing I/YR
   - Read the question as to how the nominal rate should be displayed (j_1, j_2, j_4, etc.) and convert to the appropriate equivalent interest rate, if necessary

Calculation Tip: a question may state either *gross amount/face value* OR *net amount/funds advanced*. For both of these:

Step 1: use the **LARGER** number (funds received by the borrower plus all fees) to calculate payments and outstanding balance

Steps 2 and 3: use the **SMALLER** number (funds received by the borrower after all fees are deducted) to calculate cost of funds advanced

Illustration 11.6

Based on the scenario in Example 11.5, calculate the cost of funds advanced to the borrower if the loan is now written with a one-year term. All other terms of the contract are unchanged.

Solution:

1. **Calculate the Loan Information with the Gross Amount/Face Value of the Loan and Contract Rate**

Calculation

Press	Display	Comments
7 I/YR	7	Enter stated nominal rate
12 ■ P/YR	12	Enter stated compounding frequency
110000 PV	110,000	Enter loan amount
240 N	240	Enter number of payments
0 FV	0	Payments fully amortize loan over 240 months
PMT	–852.828829	Monthly payments
852.83 +/– PMT	–852.83	Enter rounded payment
12 INPUT ■ AMORT	PER 12–12	
= = =	107,383.140383	OSB_{12}
107383.14 +/– FV	–107,383.14	Enter rounded OSB_{12}

The outstanding balance due, immediately after the 12th payment, is $107,383.14. Note that this is higher than the $100,000 the borrower receives at the start of the loan.

2. Calculate the Net Amount of the Loan (Deductions from Gross Amount/Face Value)

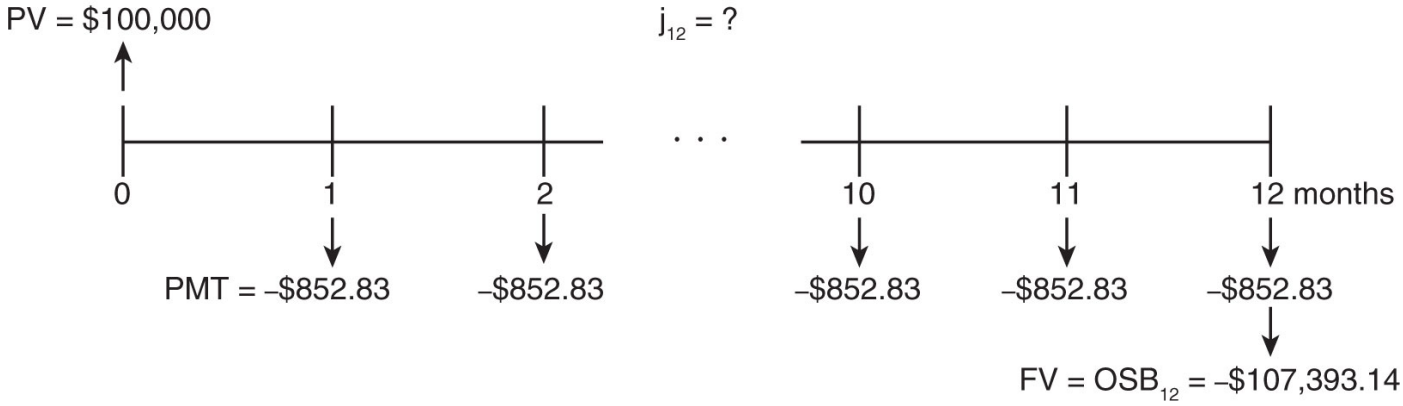
$110,000 – $10,000 = $100,000

Calculation (continued)

Press	Display	Comments
100000 PV	100,000	Net proceeds of loan

3. Calculate the Cost of Funds Advanced to the Borrower

PV = $100,000; PMT = $852.83; FV = $107,393.14; N = 12; j_{12} = ?



Why is the monthly interest rate calculated over a 12-month period instead of the amortization period of 240 months? At the end of 12 months, the mortgage contract expires. The borrower will either repay or refinance the outstanding balance she owes. Therefore, there is no way of knowing what, if any, payments will be made after 12 months. The amortization period is only used to calculate the borrower's regular payments under the terms of the mortgage document. Note that because all other loan information was already entered in the financial keys, once the funds advanced to the borrower and the number of payments is entered, the nominal rate can be calculated without re-entering any other information.

Calculation (continued)

Press	Display	Comments
12 N	12	Enter loan term
I/YR	17.057527	Compute nominal rate with monthly compounding
■ EFF%	18.456345	Compute equivalent effective annual rate

Although the contract indicates that the borrower is to pay interest at a nominal rate of $j_{12} = 7\%$, the borrower pays a higher rate of approximately $j_{12} = 17.06\%$ on the funds received. Why? The borrower is making payments on a larger amount of money ($110,000) than the cash received ($100,000). The cost of funds advanced to the borrower is $j_{12} = 17.057527\%$ and $j_1 = 18.456345\%$.

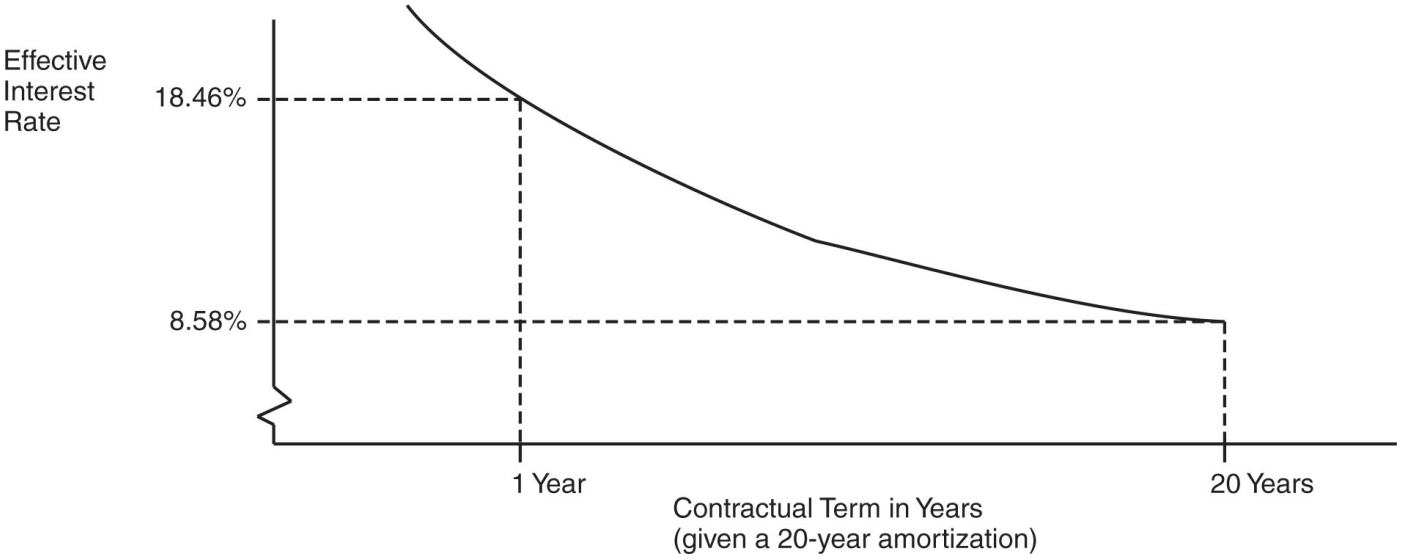
The rate calculated for the partially amortized loan ($j_{12} = 17.057527\%$) is higher than the rate calculated if the loan was fully amortized ($j_{12} = 8.262175\%$). The difference is a result of the fact that since the loan is partially amortized, the bonus is repaid over a shorter period.

In the fully amortized loan, the $10,000 brokerage fee is repaid by the borrower over a 20-year period. Reducing this period to one year, for the same size brokerage fee, substantially increases the effective cost of borrowing. In other words, with a bonus of a given size, all other terms being equal, the effective rate paid by the borrower increases dramatically as the term of the loan is shortened. Thus, a loan with a short contractual term (for example, one year) may have a cost of funds advanced that is much greater than its contract rate. This relationship is illustrated in Figure 11.3.

HELPFUL HINT!

With a brokerage fee of a given size, all other terms being equal, the cost of funds advanced paid by the borrower increases dramatically as the term of the loan is shortened.

FIGURE 11.3: The Impact of Partial Amortization on Effective Rates on Bonused Mortgage Loans



This impact of the shortened term on the cost of funds advanced is not known to most borrowers. The dramatic increase in the effective rate paid is another reason for the need for consumer protection in mortgage loans, in terms of disclosing the true rate of interest on a loan where fees are deducted from the funds advanced.

Note that a borrower prepaying some or all of a loan before the end of the contractual term will also increase the cost of funds advanced on a loan with brokerage fees. The cost of funds advanced calculations shown here only produce the true cost of borrowing if the funds remain outstanding for the contractual term of the loan. With prepayments, the calculations can get very complex, to the point that a spreadsheet application is helpful and possibly necessary.

Example 11.6

An individual is shopping for a home equity loan and has found two alternatives, summarized below, both of which will provide $84,755. Given the loans have different payments and terms, the borrower is

not sure which is a better deal. Calculate the cost of funds advanced to the borrower, expressed as a j_{12} rate.

	Loan 1	Loan 2
Funds Advanced/Net Proceeds	$84,755	$84,755
Face Value/Gross Amount	$90,000	$95,000
Monthly Payments	$1,000	$900
Term	5 years	2 years
Outstanding Balance	$70,640	$92,135

Abbreviated Solution:

1. **Confirm the Loan Information with the Gross Amount/Face Value of the Loan and Contract Rate**

   The payment and outstanding balance are given for both loans, so no calculations are required – you can enter these into the calculator (calculations are done separately for each loan). As well, make sure your compounding frequency is entered as monthly, due to the monthly payments.

2. **Calculate the Net Amount of the Loan (Deductions from Gross Amount/Face Value)**

   The net amounts are given for both loans and can be entered into the calculator (calculations are done separately for each loan).

3. **Calculate the Cost of Funds Advanced to the Borrower**

   Since each loan is partially amortized, be sure to change N to the length of the term before pressing I/YR.

Loan 1

Press	Display
12 ■ P/YR	12
1000 +/– PMT	–1,000
70640 +/– FV	–70,640
84755 PV	84,755
60 N	60
I/YR	11.691136

Loan 2

Press	Display
12 ■ P/YR	12
900 +/– PMT	–900
92135 +/– FV	–92,135
84755 PV	84,755
24 N	24
I/YR	16.448898

At first glance, Loan 2 seems attractive because the borrower receives the same amount of funds but with a lower monthly payment. However, its higher brokerage fee amortized over a shorter term leads to a substantially higher cost of funds advanced than Loan 1: j_{12} = 16.448898% cost of funds advanced for Loan 2 vs. j_{12} = 11.691136% for Loan 1.

Exercise 11.3

A real estate investment firm has arranged mortgage loans with the following terms:

	Face Value	Contract Rate	Amortization	Term	Brokerage Fee
a.	$250,000	j_2 = 7.2%	20 years	20 years	$7,000
b.	$175,000	j_2 = 5.75%	25 years	5 years	$5,000
c.	$300,000	j_2 = 8%	20 years	4 years	$9,000
d.	$520,000	j_2 = 4.85%	15 years	1 year	10%

For each situation, calculate the cost of funds advanced (the rate paid by the borrower based on funds advanced), expressed as a j_{12} rate and an effective annual rate (j_1). Deduct the brokerage fee from the face value for all cost of funds advanced calculations. All payments are monthly.

Abbreviated Solution:

a. PMT = $1,952.43; j_{12} = 7.465241%; j_1 = 7.726041%
b. PMT = $1,093.79; OSB60 = $156,652.78; j_{12} = 6.383767%; j_1 = 6.573901%
c. PMT = $2,485.07; OSB48 = $270,910.39; j_{12} = 8.801567%; j_1 = 9.165452%
d. Fee = $52,000; PMT = $4,058.61; OSB_{12} = $495,736.19; j_{12} = 15.913304%; j_1 = 17.126825%

Disclosure Requirements: Annual Percentage Rate

The examples and illustrations in the previous sections have shown the need to more accurately disclose the true cost of borrowing rather than simply disclosing the contract rates. For example, the *Interest Act* specifies a minimum requirement that mortgage contracts specify the interest rate as either compounded annually or semi-annually but interprets brokerage fees and other similar charges as "principal monies". Therefore, the stated interest rate does not necessarily provide the borrower with an accurate indication of the true cost of borrowing.

To provide borrowers with some help in determining the actual cost of borrowing, most provincial governments in Canada have legislated that certain disclosure requirements must be met for specific types of mortgages. The cost of funds advanced is one example of measuring of the true cost of borrowing, but there are other forms of this calculation. For example, in British Columbia, mortgage lenders and brokers must satisfy the requirements of the *Business Practices and Consumer Protection Act* (the BPCPA) by disclosing to the borrower the Annual Percentage Rate (APR). The APR is the contractual interest rate plus any non-interest finance charges, which is calculated with a specified formula.

The BPCPA requires that disclosure be given by mortgage brokers and lenders to individuals who borrow for primarily personal, family, or household purposes, regardless of whether the broker or lender is charging additional fees or expenses. For example, where a mortgage broker arranges a mortgage loan and the lender does not carry on the business of lending money, the mortgage broker is responsible for providing the disclosure statement to the borrower.

A disclosure statement must be given to a borrower two days prior to the borrower incurring an obligation under a credit agreement unless the two-day period is waived by the borrower in accordance with Section 15 of the *Disclosure of the Cost of Consumer Credit Regulation*.

While the BPCPA does not prescribe the use of a specific form, Section 84 outlines the requirements for a disclosure statement for fixed credit (such as a mortgage loan). The disclosure statement must include the following:

- Effective date of the statement
- Interest accrual date and the details of any grace period
- Term and amortization period of the mortgage and timing of all advances and payments
- Initial outstanding balance of the mortgage with an accounting of every payment, advance, or charge that makes up that balance
- Total of all advances made or to be made
- Description of prepayment rights
- Total cost of credit to the borrower
- Annual interest rate and compounding frequency
- Method of determining the annual interest rate at any time (if it changes) and the lowest annual interest rate at which payments would not cover accruing interest, unless the amount of the scheduled payments is adjusted automatically with interest rate changes
- Annual Percentage Rate (APR)
- Nature and amount of any charges other than interest
- Nature, amount, and timing of payments for optional services and the conditions for termination of optional services
- Nature of any default charges
- Description of the security interest

Most provinces require the disclosure of the APR on various types of loans. This allows a borrower to compare APRs across loans to get a true sense of the cost of borrowing. Since the APR is all-inclusive (meaning all costs of borrowing are included in the rate), it provides a straightforward comparison method, allowing borrowers to easily compare loans presented to them, regardless of the varying terms of each loan. The calculation of the APR varies slightly in each

province in which it is required. The APR calculation for BC,[8] as one example, will be explained in this section.

The APR is like the cost of funds advanced (COFA), in that both measure the impact of brokerage and other fees on the true interest rate paid. The primary difference is that the APR uses a legislated formula that approximates the true cost of borrowing, while the COFA is the most mathematically accurate measure of this cost. The APR is an easy option for calculating the cost of borrowing in all situations, simply by applying the formula. In comparison, the COFA can be a straightforward calculation in non-complex situations but becomes difficult to calculate when complexity is added, such as varying payments during the loan term. In these situations, APR is a simpler option.

The APR is determined by first calculating the total value received by the borrower and then the total value paid by the borrower. The difference between these two values is the total cost of credit for the borrower, which will ultimately be used in the calculation of the APR.

APR Simplified

It is easy to lose sight of the reasoning behind the APR calculation formula. Students may find it helpful to consider the calculation in more simplified terms. The APR formula at its core is calculating the "Total Amount Paid" divided by the "Average Amount Borrowed". Consider a simple interest rate calculation, where the interest rate can be calculated as the "Interest Paid" divided by the "Loan Amount". The APR calculation follows this intuitive equation, but it goes further in also accounting for the fact that brokerage fees are also paid out. The APR is thus the "Interest Paid + Bonus", divided by the "Loan Amount". Finally, for the loan amount we also need to account for the payment of principal over time – so we take the average of the loan balance in each payment period as an approximation (COFA accounts for this more accurately).

1. Total Value Received by the Borrower

The BPCPA defines Total Value Received by the Borrower as:

- funds received by the borrower under the mortgage loan;
- the payout or consolidation of any pre-existing loans or financial obligations;
- insurance premiums, including application fees for high-ratio borrowing insurance, such as CMHC insurance premiums and fees;[9] and

- other expenses incurred or to be incurred by the lender for arranging, documenting, insuring, or securing the mortgage.

To determine the total value received by the borrower:

a. Start with the initial face value of the loan.

b. Deduct:

- broker's fees; and
- commission.

This will determine the Total Value Received by the Borrower.

2. Total Value Paid by the Borrower

The BPCPA defines Total Value Paid by the Borrower as money paid or to be paid by the borrower to the lender, such as regularly scheduled loan payments and the outstanding balance paid out at the end of the term.

To determine the total value paid by the borrower:

a. Determine the amount of the regularly scheduled mortgage payment.

b. Calculate the outstanding balance at the end of the loan term.

c. Multiply the number of payments in the term of the loan by the amount of the individual payment and add the outstanding balance at the end of the loan term.

3. Total Cost of Credit

The Total Cost of Credit is the anticipated dollar cost of the mortgage loan to the borrower, over its term. It is the difference between the value to be paid by the borrower and the value to be received by the borrower, arising from the mortgage loan.[10]

To determine the total cost of credit, subtract the total value received by the borrower from the total value paid.

4. Calculation of the Annual Percentage Rate (APR)

The APR is determined using the following formula:

$$APR = \frac{(100 \times C)}{(T \times P)}$$

where:
C = Total cost of credit
T = Length of the term expressed in years
P = Average outstanding principal over the term

ALERT

In this course, students will ALWAYS be provided with a value for the average outstanding principal, P, when calculating the APR. The calculation of P requires the use of advanced spreadsheet applications, and as such, students will NOT be required to calculate this value in this course.

HELPFUL HINT!

To calculate the Total Cost of Credit and APR for the borrower, the following steps can be used:

1. Calculate the Total Value Received by the Borrower:
   (a) Start with the initial face value of the loan
   (b) Deduct from the initial face value of the loan:
   - Broker's fees
   - Commission*continued next page*

2. Calculate the Total Value Paid by the Borrower:
   (a) Determine the amount of the regularly scheduled mortgage payment
   (b) Calculate the outstanding balance at the end of the term of the loan
   (c) Multiply the number of payments in the term of the loan by the amount of the individual payment, and add the outstanding balance at the end of the term of the loan
3. Calculate the Total Cost of Credit to the Borrower:
   - Subtract the total value received by the borrower from the total value paid
4. Calculate the APR:
   - Determine the term of the mortgage loan
   - The average outstanding principal (P) will always be provided in this course
   - Apply the APR formula

Illustration 11.7

A mortgage broker is arranging a partially amortized mortgage loan with a face value of $500,000. The loan contract is to be written at 6.5% per annum, compounded semi-annually, with monthly payments and an amortization

period of 20 years and term of 5 years. A brokerage fee of $6,000 will be deducted from the face value of the loan. Assume the average outstanding principal over the term of the loan (P) is $466,216.50.

Calculate the total cost of credit for the borrower and the APR that the mortgage broker must include on the disclosure statement.

Solution:

1. Calculate the Total Value Received by the Borrower

	Face Value of Loan	$500,000
–	Brokerage Fee	– 6,000
	Total Value Received	$494,000

The Total Value Received by the Borrower is $494,000.

2. Calculate the Total Value Paid by the Borrower

a. Determine the amount of the regularly scheduled mortgage payment

Calculation

Press	Display	Comments
6.5 ■ NOM%	6.5	Enter stated nominal rate
2 ■ P/YR	2	Enter stated compounding frequency
■ EFF%	6.605625	Compute equivalent effective annual rate
12 ■ P/YR	12	Enter desired compounding frequency
■ NOM%	6.413688	Compute nominal rate with monthly compounding
500000 PV	500,000	Enter loan amount (face value)
240 N	240	Amortization period in months
0 FV	0	Payments amortize loan over 240 months
PMT	–3,702.502086	Monthly payment
3702.5 +/– PMT	–3,702.5	Enter rounded payment

b. Calculate the outstanding balance after five years

Calculation

Press	Display	Comments
60 INPUT ■ AMORT	PER 60–60	
= = =	427,358.466546	Outstanding balance

c. Multiply the number of payments in the term of the loan by the amount of the individual payment, and add the outstanding balance at the end of the term of the loan

	60 monthly payments of $3,702.50	$222,150.00
+	Outstanding balance to be paid at end of term	+ 427,358.47
	Total Value Paid by the Borrower	$649,508.47

The Total Value Paid by Mr. Anthony over the contractual term of the loan is $649,508.47.

3. Calculate the Total Cost of Credit for the Borrower

	Total Value Paid by the Borrower	$649,508.47
–	Total Value Received by the Borrower	– 494,000.00
	Total Cost of Credit for the Borrower[10]	$155,508.47

4. Calculate the APR

$$APR = \frac{(100 \times C)}{(T \times P)}$$

where:

C = $155,508.47
T = 5 years
P = $466,216.50 (Provided)

$$APR = \frac{(100 \times \$155,508.47)}{(5 \times \$466,216.50)} = 6.671084\%$$

The mortgage broker must disclose in a disclosure statement to the borrower that the APR for this mortgage loan is 6.671084%.

The APR shows that the rate of interest on this loan is higher than the 6.5% contract rate. This APR would have to be disclosed to the borrower, so that they can make an informed decision on this loan.

Alternatively, if you applied the cost of funds advanced method, the rate is j_1 = 6.93%. This does not exactly match the 6.67% rate found with the APR method, but the answers are close enough to provide similar information to the consumer: the apparent rate on the loan is lower than the "true" rate being paid. The cost of funds advanced is the more mathematically precise answer, while

the APR formula provides an approximation of the true cost of borrowing. The COFA is more technically accurate, but the APR is the disclosure rate required by the mortgage brokerage legislation. While less accurate, APR does offer the advantage of being much easier to calculate in situations where there are irregular payments during the loan term.

APR and Fees

Provincial regulations have specific requirements regarding how associated mortgage fees are considered in APR calculations. These fees include appraisal fees, legal fees, and survey fees. Since the details regarding the inclusion or exclusion of these fees go beyond the scope of this course, for reasons of simplicity, these fees tend to be omitted from APR examples. Students interested in these details should independently review their locally applicable APR legislation.

Illustration 11.8

A mortgage broker active in residential financing is arranging a partially amortized mortgage loan with a face value of $50,000. The loan will be amortized over 20 years, with a 3-year term, written at j_2 = 10.75% with monthly payments. The borrower will receive less than $50,000 because of a brokerage fee of $3,767.45. Assuming that the average outstanding principal over the term of the loan (P) is $48,736, calculate the APR that must be included on the disclosure statement.

Solution:

1. Calculate the Total Value Received by the Borrower

	Face Value of Loan	$50,000.00
–	Brokerage Fee	– 3,767.45
	Total Value Received	$46,232.55

2. Calculate the Total Value Paid by the Borrower

a. Determine the amount of the regularly scheduled mortgage payment

Calculation

Press	Display	Comments
10.75 ■ NOM%	10.75	Enter stated nominal rate
2 ■ P/YR	2	Enter stated compounding frequency
■ EFF%	11.038906	Compute equivalent effective annual rate
12 ■ P/YR	12	Enter desired compounding frequency
■ NOM%	10.516864	Compute nominal rate with monthly compounding
50000 PV	50,000	Enter loan amount (face value)
240 N	240	Amortization period in months
0 FV	0	Payments amortize loan over 240 months
PMT	–499.756462	Monthly payment
499.76 +/– PMT	–499.76	Enter rounded payment

b. Calculate the outstanding balance after three years

Calculation

Press	Display	Comments
36 INPUT ■ AMORT	PER 36–36	
= = =	47,407.712637	Outstanding balance

c. Multiply the number of payments in the term of the loan by the amount of the individual payment, and add the outstanding balance at the end of the term of the loan

	36 monthly payments of $499.76	$17,991.36
+	Outstanding balance to be paid at end of term	+ 47,407.71
	Total Value Paid by the Borrower	$65,399.07

3. Calculate the Total Cost of Credit for the Borrower

	Total Value Paid by the Borrower	$65,399.07
–	Total Value Received by the Borrower	– 46,232.55
	Total Cost of Credit for the Borrower	$19,166.52

4. Calculate the APR

$$APR = \frac{(100 \times C)}{(T \times P)}$$

where:

C = $19,166.52
T = 3 years
P = $48,736 (Provided)

$$APR = \frac{(100 \times \$19,166.52)}{(3 \times \$48,736)} = 13.109077\%$$

The mortgage broker must include in a disclosure statement to the borrower that the APR for this mortgage loan is 13.109077%.

Example 11.7

Terrence needs to borrow $200,000 to buy a studio apartment, so he can move out of his East Vancouver basement suite. He saw an ad on the bus that said, "Bad Credit, No Problem, We Loan to ANYONE!", so he gave them a call. The mortgage broker said a loan of $200,000 would call for monthly payments of $1,400 over a 1-year term. The mortgage broker also gave Terrence a disclosure statement with a lot of fine print that Terrence did not understand. The document says the gross amount of the loan is $224,000 and the outstanding balance at the end of the 1-year loan term is $219,820.63.

a. Calculate the cost of funds advanced (expressed as a j_1) for this loan if it was fully amortized over 25 years.
b. Calculate the cost of funds advanced (expressed as a j_1) for this loan with a 1-year term.
c. Calculate the APR for this loan as if it were both fully amortized and with a 1-year term. Assume the average outstanding principal paid (P) over the amortization is $137,524.09 and over the term is $221,928.11.

Abbreviated Solution:

a. j_1 = 7.11553%

Calculation

Press	Display	Comments
12 ■ P/YR	12	Desired compounding frequency
1400 +/– PMT	–1,400	Monthly payment
200000 PV	200,000	Funds advanced
0 FV	0	
300 N	300	Amortization period
I/YR	6.893503	COFA (j_{12})
■ EFF%	7.11553	COFA (j_1)

b. j_1 = 19.019559%

Calculation (continued)

Press	Display	Comments
219820.63 +/– FV	–219,820.63	OSB_{12}
12 N	12	Length of term
I/YR	17.5387	COFA (j_{12})
■ EFF%	19.019559	COFA (j_1)

c. APR fully amortized: 6.398879%
APR 1-year term: 16.501123%

Full amortization over 25 years:

Cost of Credit (C)

Total Value Paid by Borrower ($1,400 × 300)	$420,000
– Total Value Received by Borrower	– 200,000
Cost of Credit for the Borrower (C)	$220,000

$$APR = \frac{(100 \times C)}{(T \times P)}$$

$$APR = \frac{(100 \times \$220{,}000)}{(25 \times \$137{,}524.09)}$$

$$APR = \frac{\$22{,}000{,}000}{\$3{,}438{,}102.25}$$

$$APR = 6.398879\%$$

One-Year Term:

Cost of Credit (C)

Value Paid by Borrower:

$1,400 × 12 = $16,800 + $219,820.63 = $236,620.63

Value Received by Borrower: $200,000

Cost of Credit = Value Paid by Borrower – Total Value Received by Borrower

Cost of Credit = $236,620.63 – $200,000 = $36,620.63

$$APR = \frac{(100 \times C)}{(T \times P)}$$

$$APR = \frac{(100 \times \$36{,}620.63)}{(1 \times \$221{,}928.11)}$$

$$APR = \frac{\$3{,}662{,}063}{\$221{,}928.11}$$

$$APR = 16.501123\%$$

Example 11.8

A home equity finance company has recently advertised the following loan:

> You sweated for that home equity, now enjoy it! Attractive second mortgage terms:
>
> Net Amount of Loan: $100,072
>
> Interest Rate: j_2 = 8.75% Year 1, j_2 = 9.75% Year 2
>
> Monthly Payment: $832.25 Year 1, $925.50 Year 2

The fine print on the back of the ad states this loan is interest only and that the gross amount of the loan is $116,200. Calculate the APR for this loan.

Abbreviated Solution:

Because of the irregular payment stream and interest only payments, it is difficult to calculate the cost of funds advanced with the HP 10bII+ calculator. The APR formula is easier to apply in this example.

The brokerage fee is $16,128, which is the gross amount of $116,200 (which the payments are based on) minus the loan's net amount of $100,072.

C = $37,221 = (12 × $832.25) + (12 × $925.50) + $16,128

T = 2 years

P = $116,200 (Because the loan is interest only, there is no repayment of principal; the average outstanding balance over the term equals the gross amount of the loan.)

$$\text{APR} = \frac{100 \times \$37,221}{2 \times \$116,200} = 16.015921\%$$

The mortgage broker must include in a disclosure statement to the borrower that the APR for this mortgage loan is 16.02%.

Yield to the Lender

Mortgage brokers once only worked with unusual loan situations, such as borrowers who might not qualify for conventional financing and the lenders willing to loan to these people. In these scenarios, the broker would typically be paid through fees charged to the borrower, as shown in the calculations in the previous sections.

Today, mortgage brokers are increasingly involved with conventional financing, and in most of these conventional deals, it is the lender, not the borrower, who pays the brokerage fee. In practice, this fee is usually a percentage of the face value of the loan, e.g., 1.5%. This means the cost of borrowing is the same as the contract rate on the loan. However, the return to the lender is diminished by these fees – the lender advances a larger amount, and when fees are deducted upfront, the lender receives back a smaller amount over time.

In the previous section of this chapter, it was shown how the brokerage fee paid by the borrower increases the cost of funds advanced to the borrower. This section covers the effect on the lender's yield if the *lender* pays a mortgage broker a fee for finding a borrower to use their funds.

Illustration 11.9

You are an investment analyst at a pension fund, arranging mortgage loans with the help of a mortgage broker. Your year-end performance (and your bonus) will be assessed using the real rate of interest earned on the pension fund's return, net of all fees paid. A $75,000 loan will be made at a rate of 12% per annum, compounded semi-annually. The loan will have a 25-year amortization with monthly payments and a 5-year term. The mortgage broker will charge 1.5% of the face value of the loan to find a qualified borrower for these funds.

What is the yield to the lender, expressed as an annual rate, compounded semi-annually?

Solution:

Since the lender and borrower will eventually enter into a mortgage contract for $75,000 based on the terms listed above, calculate the monthly payments and outstanding balance payment the lender will receive during the loan term. Then calculate the monthly interest rate that equates the sum of the present value of 60 monthly payments and the present value of the outstanding balance of the loan after 60 months to the amount of money the lender has spent today:

	Funds paid out to the borrower	$75,000
+	Funds paid out to the mortgage broker (1.5% of the loan amount, or 0.015 × $75,000)	+ 1,125
	Total funds paid out by the lender	$76,125

Since the lender has paid out $76,125 today and will only receive a payment stream from the borrower based on loan proceeds of $75,000, the lender expects their yield to be less than the contract rate of 12% per annum, compounded semi-annually.

1. Calculate the Monthly Payments and Outstanding Balance of the Loan

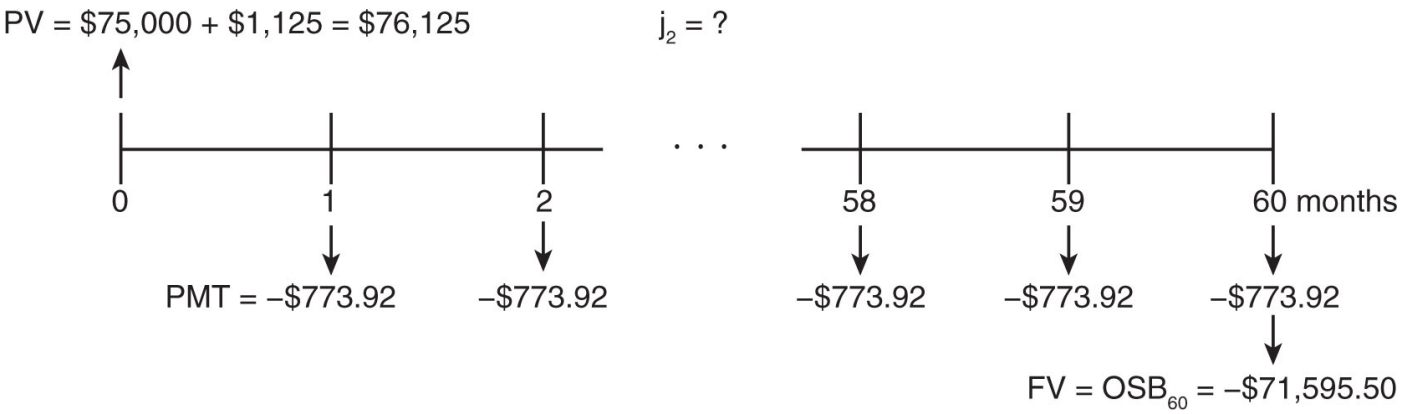
Calculation

Press	Display	Comments
12 ■ NOM%	12	Enter stated nominal rate
2 ■ P/YR	2	Enter stated compounding frequency
■ EFF%	12.36	Compute equivalent effective annual rate
12 ■ P/YR	12	Enter desired compounding frequency
■ NOM%	11.710553	Compute nominal rate with monthly compounding
75000 PV	75,000	Enter actual loan amount
300 N	300	Amortization period in months
0 FV	0	Payments fully amortize loan over 300 months
PMT	–773.924666	Compute monthly payment
773.92 +/– PMT	–773.92	Enter rounded monthly payment
60 INPUT ■ AMORT	PER 60–60	
= = =	71,595.495673	Outstanding balance after 60th payment
71595.5 +/– FV	–71,595.5	Enter rounded outstanding balance

The monthly payment from the borrower to the lender is $773.92 and the outstanding balance payment after 60 monthly payments is $71,595.50.

2. Calculate the Yield Earned by the Lender over the Term of the Loan

The next step is to calculate the yield earned that equates 60 monthly payments of $773.92 and an outstanding balance payment of $71,595.50 to a present value of $76,125, the total that the lender paid out at the time the loan was originated.



Calculation (continued)

Press	Display	Comments
60 N	60	Number of payments lender will receive
76125 PV	76,125	Enter present value (amount paid out by lender)
I/YR	11.309167	Compute j_{12} rate to the lender

The final step is to convert this monthly rate to an equivalent annual rate with semi-annual compounding, so it can then be compared to the contract rate of 12% per annum, compounded semi-annually. Note that because all other loan information was already entered in the financial keys, once the amount paid out by the lender and the number of payments the lender will receive are entered, the nominal rate can be calculated without re-entering any other information.

Calculation (continued)

Press	Display	Comments
	11.309167	j_{12} rate already stored
■ EFF%	11.914174	Compute equivalent effective annual rate
2 ■ P/YR	2	Enter desired compounding frequency
■ NOM%	11.578991	Compute nominal rate with semi-annual compounding

The rate of interest earned by the lender would be 11.578991% per annum, compounded semi-annually. This is lower than the 12% contract rate of interest. In conclusion, we can see that the yield to the lender decreases when the lender pays the brokerage fee. Again, our see-saw graphic illustrates this – when the present value increases, the interest rate decreases.

Example 11.9

You have inherited some funds and are considering mortgage loans as a reasonably safe investment with moderate returns. You plan to originate a $200,000 loan, with monthly payments based on a 25-year amortization and a 1-year term. You have found a borrower who will pay 5.75% per annum, compounded semi-annually. Alternatively, a mortgage broker has offered to arrange another loan, at an interest rate of 6.25% per annum, compounded semi-annually but in return for a brokerage fee of 1% of the loan amount. This loan will also have a 25-year amortization, a 1-year term, and monthly payments. Based on yield to lender (expressed as an annual rate, compounded semi-annually), which option is preferable?

Abbreviated Solution:

1. Calculate the Monthly Payments and Outstanding Balance of the Mortgage Broker's Loan

Calculation

Press	Display
6.25 ■ NOM%	6.25
2 ■ P/YR	2
■ EFF%	6.347656
12 ■ P/YR	12
■ NOM%	6.17014
200000 PV	200,000
300 N	300
0 FV	0
PMT	–1,309.483283
1309.48 +/– PMT	–1,309.48
12 INPUT ■ AMORT	PER 12–12
= = =	196,529.465122
196529.47 +/– FV	–196,529.47

2. **Calculate the Yield Earned by the Lender over the Term of the Mortgage Broker's Loan**
   The brokerage fee is $2,000 (0.01 × $200,000). Therefore, the funds advanced (net amount of the loan) from the lender's perspective totals $202,000.

Calculation (continued)

Press	Display
12 N	12
202000 PV	202,000
I/YR	5.134043
■ EFF%	5.256592
2 ■ P/YR	2
■ NOM%	5.18927

The brokerage option appears to pay an interest rate of 6.25% per annum, compounded semi-annually, but once the impact of the brokerage fee is accounted for, it only yields the lender a rate of approximately 5.19% per annum, compounded semi-annually. The first option, at 5.75% per annum, compounded semi-annually, is preferable since it generates a higher yield to the lender.

Exercise 11.4

Given the following mortgage loan information, calculate the yield to the lender, expressed as an annual rate with semi-annual compounding. All loans have monthly payments, rounded up to the next higher dollar. Brokerage fees are a percentage of the loan amount, paid by the lender to the broker.

	Loan Amount	Contract Rate	Amortization	Term	Brokerage Fee
a.	$550,000	$j_2 = 4.25\%$	20 years	5 years	1.5%
b.	$275,000	$j_2 = 6.75\%$	25 years	3 years	2.0%
c.	$350,000	$j_2 = 9.5\%$	15 years	4 years	1.25%
d.	$225,000	$j_2 = 5.35\%$	20 years	2 years	1.75%

Abbreviated Solution:

	a.	b.	c.	d.
Rounded payment	$3,395.00	$1,884.00	$3,617.00	$1,522.00
Outstanding balance	$452,405.84	$260,760.95	$297,922.19	$211,616.76
Brokerage fee	$8,250.00	$5,500.00	$4,375.00	$3,937.50
Total advanced	$558,250.00	$280,500.00	$354,375.00	$228,937.50
Lender's yield (j_{12})	3.853312%	5.910251%	8.919120%	4.350197%
Lender's yield (j_2)	3.884378%	5.983504%	9.086502%	4.389814%

Investment Yield

A related calculation evaluates the yield to an investor who purchases a mortgage loan as an investment. The loan will have a scheduled series of cash flows, usually with periodic payments and a lump sum outstanding balance paid in the future at the term's end. The two calculations that may flow from this situation are:

1. Given the investor's desired yield, what price should the investor pay?
2. Given the price the investor is willing to pay, what yield will the investor earn on the investment?

The first calculation was covered in the early part of this chapter – this is the same calculation that is required for vendor financing. The examples below will focus on the second calculation – this is a variation on the cost of borrowing calculation.

Perhaps the most common application for this situation would be an investor who provides a "buy-out" for a lender who has originated a mortgage loan but does not wish to be a long-term mortgage holder. For example, developers who provide vendor financing will likely want to free up their equity more quickly than a mortgage loan allows. In this case, they sell the loan to the investor,

usually at a discount from the face value. The investor receives the scheduled cash flows from the loan, which are paid at the loan's specified interest rate. However, the discount on purchase will increase the investor's yield above the loan interest rate.

Note that the calculations illustrated below are not restricted to mortgage loans – they would be the same for any investment where cash flows occur in equal amounts at regular intervals and where a discount is involved. The most common application of this is in establishing yield rates on long-term bonds, treasury bills (t-bills), and other money market investments.

Illustration 11.10

A mortgage broker has proposed a mortgage loan where the prospective borrower will make 60 quarterly payments of $2,500 to repay $70,000 principal. Immediately after the contract is initiated, the broker will sell the right to receive the required payments to a private investor for $60,000.

Calculate the nominal rate, with quarterly compounding, anticipated by the investor. In other words, if the investor pays $60,000 for the right to receive the required payments, what is the investor's expected yield on this investment, expressed as a j_4?

Solution:

To determine the investor's yield, equate the investor's purchase price with the contract terms and solve for the investor's yield, expressed as an annual rate, compounded quarterly.

Calculation

Press	Display	Comments
4 ■ P/YR	4	Desired compounding frequency
60 N	60	Length of investment (quarters)
2500 +/– PMT	–2,500	Quarterly payment
0 FV	0	
60000 PV	60,000	Price paid by investor
I/YR	14.775903	Investor's yield (j_4)

If the investor pays $60,000 for the right to receive these cash flows, then the investor earns an investment yield of j_4 = 14.775903%.

Illustration 11.11

A borrower has signed a second mortgage contract where the loan amount is specified to be $12,500 and the contractual rate of interest is 9% per annum, compounded annually. The loan is to be amortized over five years, has a two-year term, and has monthly payments rounded up to the next higher dollar. The mortgage lender, immediately after receiving the sixth monthly payment, sells the right to receive the remaining payments to an investor for $9,000.

Calculate the yield earned by the investor, expressed as an effective annual rate (j_1).

Solution:

1. Calculate the Monthly Payments and Outstanding Balance

Calculation

Press	Display	Comments
9 ■ NOM%	9	Stated nominal rate
1 ■ P/YR	1	Stated compounding frequency
■ EFF%	9	Effective annual rate
12 ■ P/YR	12	Desired compounding frequency
■ NOM%	8.648788	Equivalent j_{12} rate
12500 PV	12,500	Loan amount
60 N	60	Amortization
0 FV	0	
PMT	–257.353953	Monthly payment
258 +/– PMT	–258	Rounded monthly payment
24 INPUT ■ AMORT	24-24	Length of term
= = =	8,117.848726	OSB_{24}

2. Calculate the Investor's Yield

The investor is purchasing the right to receive the monthly payments of $258 and an outstanding balance of $8,117.85 over the remaining term, less the six payments already made (N = 24 – 6 = 18 months). Therefore, if the investor pays $9,000 for the remaining payments, the calculator steps are as follows:

Calculation (continued)

Press	Display	Comments
8117.85 +/– FV	–8,117.85	Rounded OSB
24 – 6 = N	18	Remaining term
9000 PV	9,000	Price paid
I/YR	29.11102	Yield earned (j_{12})
■ EFF%	33.32709	Yield earned (j_1)

The calculation shows that paying $9,000 for a loan that calls for 18 payments of $258 and an outstanding balance owing of $8,117.85, the investor earns a yield of 29.11102% (j_{12}) or 33.32709% (j_1).

CONCLUSION

Using mortgage finance tools, carrying out a financial analysis, and being able to creatively solve problems for your clients will be helpful in your mortgage brokerage business. As mentioned earlier, mortgage brokers who provide financing solutions can be the key to facilitating a successful real estate transaction.

In this chapter, it was pointed out that mortgage brokers need to understand the requirements of the *Business Practices and Consumer Protection Act* (BPCPA). While you likely have computer programs that will allow you to calculate the Annual Percentage Rate (APR) that must be disclosed to the borrower, understanding how the APR is calculated and the disclosure statement requirements is very important for all mortgage brokers.

1 The slight difference between this answer and the present value of the payment stream is due to rounding of the payment.

2 You can calculate the exact interest rate if you wish: for a loan of $300,000, amortized over 300 months with payments of $1,500, the loan's interest rate is 3.488369%.

3 As fully amortized loans are very rarely granted in practice, it would be difficult (if not impossible) to justify the interest rate used in this example. The rate chosen here is only for illustrative purposes and is not intended to suggest that fully amortized mortgages are readily available.

4 Note that this analysis did not consider the impact of upward rounding of the regular stream of payments on the final mortgage payment. In fact, this loan would require 299 payments of $1,155.69 and a slightly lower final, 300^{th} payment of $1,152.50 because the payments have been rounded to the nearest cent. Since this smaller final payment does not affect the analysis significantly it has been ignored here.

5 For students wanting more practice with these calculations: assume the original $300,000 loan was written at j_{12} = 4%, with monthly payments over a 25-year amortization and a 60-month term. The payments are $1,583.51 per month and the OSB_{60} = $261,313.88. At the market rate of j_{12} = 7%, the present value of these 26 payments is $262,737.69, a benefit of just over $16,000.

6 You do not need to calculate the payments or outstanding balance, as these are given. However, if you wish to verify these amounts, the amortization period is 25 years.

7 Ignoring, in each case, the impact of payment rounding on the size of the final payment.

8 The following provides a general outline of the APR calculation. It is important to note that the information provided is general in nature and does not include all details and specifications of the BPCPA. For more information, see the BC Financial Services Authority's website at *www.bcfsa.ca*.

9 CMHC insurance premiums and fees and payout of existing loans are deducted as fees paid by the borrower, then added back on as funds received. As such, they cancel each other out and are omitted for brevity.

10 The total cost of credit disregards the possibility of default or prepayment, as the costs associated with default and prepayment are not included in this calculation.

11 Shortcut: use the AMORT key to calculate interest paid in months 1-60 ($149,508.47), then add the $6,000 brokerage fee.