UBC SAUDER SCHOOL OF BUSINESS

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CHAPTER 13

INTRODUCTION TO MORTGAGE FINANCE

Learning Objectives

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

- ☑ Explain the importance of financing in the purchase of real estate
- ☑ Discuss the market in which financial arrangements (including mortgages) are traded and who the participants are in these markets
- ☑ Identify the specific characteristics of mortgage loans as investments and discuss the way these characteristics influence the supply of mortgage funds
- ☑ Differentiate between some of the different types of mortgages and repayment plans currently available
- ☑ Differentiate between nominal and periodic rates of interest
- ☑ Solve financial problems on the calculator

ROLE OF FINANCING IN REAL ESTATE TRANSACTIONS

Why is Debt Needed?

When an interest in land such as a fee simple estate or a long-term prepaid lease is purchased, a large lump sum amount is paid on the purchase date in exchange for receipt of periodic benefits for a long time in the future. The periodic benefits might be the annual income an apartment building produces for an investor/owner or the rent a home owner "saves" by living in their house instead of renting similar accommodation. The purchase price paid is several times greater than the value of each individual periodic benefit expected.

Most potential purchasers would have difficulty saving enough money to make an outright (i.e., debt free) purchase of an interest in land. Similarly, many vendors would have to retain their interest longer than they wished, while a potential purchaser saved the purchase price. Therefore, real estate transactions seldom occur without purchasers relying on borrowed funds (debt financing) to make up the full purchase price. The majority of homes, new and old, are encumbered with debt.

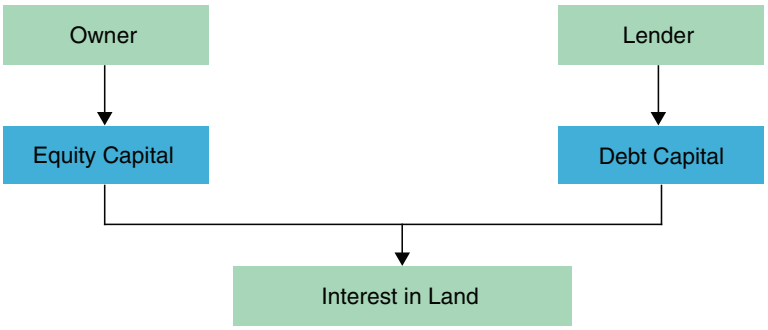
The use of credit in real estate transactions increases a purchaser's ability to buy, by combining a small down payment with a large debt. In effect, credit is an advance of future savings or purchasing power because it substitutes for capital not yet saved. After the loan has been advanced, the borrower saves the required capital by repaying the amount borrowed plus interest. The interest paid represents the cost to the borrower for the convenience of using someone else's capital to buy now rather than later.

There are other reasons besides a lack of capital that an investor might use borrowed funds:

- To diversify investments and reduce overall risk by using only part of the total funds for any one investment
- To invest the borrowed funds at a higher rate of interest (yield) than the borrowing rate; for example, borrow at an annual interest rate of 5% and invest the borrowed money in a project that returns 8%
- To purchase real estate as a hedge against inflation. The investor may expect price levels and the returns on real estate investments to rise with inflation. Since the payments on borrowed capital would remain fixed, the investor would pay off the debt in cheaper dollars
- To save (or release) equity for other activities; for example, a merchandising or manufacturing business may prefer to use available funds to buy inventory instead of investing all of it in land and buildings

For these and other reasons, the capital used to buy or maintain ownership of an interest in land is usually provided in part by the owner and in part by lenders. Both owner and lender, as suppliers of capital, are investors as shown in Figure 13.1:

FIGURE 13.1: Suppliers of Capital (Investors)



The motivations and objectives of owner-investors and lender-investors are quite diverse. Owner-investors purchase an investment for:

- use (owner occupancy);
- regular return (rental income or "saved" rent); and
- potential growth in the property value over time (appreciation).

The primary objectives of the lender-investor are generally more limited and specific:

- a regular and predictable return *on* capital as specified in the loan contract; and
- a return *of* capital through the scheduled repayment.

As lenders are concerned not only with receiving interest on the money advanced but also with the return of funds (principal) advanced, they generally seek some form of risk protection. When this risk protection gives the lender the right to take over ownership of the borrower's interest (under certain circumstances and subject to all previous claims on the interest), the loan is referred to as a mortgage loan.

Significance of Mortgages

Mortgage loans are the most common form of financing used in contemporary real estate practice. The mortgage market has two separate components:

1. **Primary Mortgage Market.** Loans are initiated in the primary market to facilitate the sale of interests in land. For example, where a borrower receives funds secured by a mortgage from such sources as a bank, a credit union, a trust company, an insurance company, a mortgage broker, or the vendor of the property, the transaction is considered to be a *primary* market transaction.
2. **Secondary Mortgage Market.** In the secondary market, existing mortgages are bought and sold as financial investments. The purchaser of a mortgage is buying the right to receive the stream of payments that the borrower had agreed to make to the original lender. Investment options offered by the Canada Mortgage and Housing Corporation (CMHC), such as Mortgage-Backed Securities and Canada Mortgage Bonds, have increased the strength of the secondary market.

While mortgages are the most common form of real estate financing, other financing arrangements used in the industry include agreements for sale, leases, sale/leasebacks, equity syndications, and bonds.

Since the public is generally unfamiliar with the impact of varying the financial aspects of a mortgage, those advising the public must be well informed. For example, the highest dollar offer presented to a vendor may not be the best offer because of low-rate vendor financing. By the same token, a mortgage loan with the highest (lowest) rate stated on the contract may not offer the highest yield to an investor (lowest cost to the borrower). As real estate sales are often very sensitive to financial arrangements, an understanding of real estate financing will help clients successfully achieve their objectives.

CAPITAL MARKET

Basis of the Capital Market

The primary mortgage market determines the cost and availability of mortgage funds. The supply of mortgage funds, in turn, affects the amount of activity in the real estate market since most transactions require debt financing. While the mortgage market is a distinct segment of the economy, it is only a part of the overall market for funds known as the capital market.

savers
groups or individuals whose current net income exceeds current expenses

borrowers
groups or individuals with expenses larger than their income in that period

The capital market exists because, in any one period of time, some segments of the economy do not spend all the income received in that period, while other segments desire to spend more than received or accumulated. *Savers* are groups or individuals whose current net income exceeds current expenses. *Borrowers* are groups or individuals with expenses larger than their income in that period. Borrowing may be regarded as committing oneself to save in the future, through debt repayment, to increase current consumption; saving may be regarded as consuming less in the current period to increase future consumption.

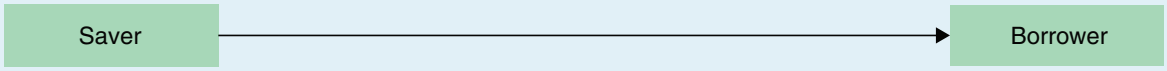
The capital market is the mechanism by which savers and borrowers interact. Every economic unit (i.e., households, businesses, and government) must either spend or save their income. Funds that are spent go to purchase products from businesses or government,[1] creating incomes for other portions of the economy. Funds that are saved are invested in segments of the economy wanting to spend more than their current income. Figure 13.2 shows how saved funds are invested.

[1] Funds spent on taxes are payment for a product or service, which the taxing authority provides.

FIGURE 13.2: Transfer of Funds from Savers to Borrowers

Savers supply their funds to borrowers in several ways:

Through direct contact with the borrower:



For example, a parent loans their child money to purchase a house.

Through a broker who receives compensation for bringing the saver and the borrower together:

For example, a mortgage broker finds an investor who wants to invest in a new apartment building and a developer who needs money to construct an apartment building.

By "lending" money to a financial institute that re-lends these funds to borrowers:

For example, a person deposits money with a bank and the bank then lends the money to someone who wishes to purchase a new car.

The existence of the capital market relies on the fact that some segments of the economy supply funds (save) and other segments demand funds (borrow). The supply of funds depends on expectations of future economic conditions, consumer demand (particularly *changes* in consumer demand), the relative productivity of capital goods, and the cost of borrowing. Thus, conditions in capital markets reflect (and are affected by) the expectations of both savers and users of capital.

Interest rates balance the savers and borrowers in the economy; they are the cost of borrowing or the *reward* for saving.

The supply of savings in any period of time is a function of the amount people will save at each possible interest rate. The demand for funds is the amount that people will borrow at each interest rate. The point at which the amount borrowed and the amount saved are balanced determines the average interest rate for the particular time period. In this sense, the interest rate is the price of borrowed money.

An increase in demand for debt financing will increase the level of competition between borrowers for available funds; this causes interest rates to increase. If interest rates increase, more economic units will be motivated to save. This increased supply of funds will slow the increase in interest rates. The changing group of savers and borrowers will work towards balancing the demand and supply of funds.

FIGURE 13.3: The Supply and Demand for Funds

If the demand for funds decreases, the capital market works in the opposite direction. As the demand for debt financing drops, borrowers find they can shop around for lower interest rates and savers find that they earn less on saved funds. Thus, interest rates on both the borrowing and the saving side of the capital market will decline. As these rates drop, a balance will be reached as savers have less incentive to save, and it becomes less costly to borrow. The supply of funds will reduce to a point where the yields are too low to induce some savers to continue to forego consumption.

This discussion of the forces affecting the supply and demand of funds is simplified. It omits the role of the Bank of Canada in setting monetary policy, by controlling the overall supply of money in the economy and by setting the policy interest rate. It does not consider the role of each level of government in affecting the legal, taxation, and economic climate in which the capital market operates. It does not stress the role of expectations – and changes in expectations – on both the demand and supply sides of the capital market. Finally, it treats the capital market as a single entity, when it is actually a large number of smaller markets.

Saving is simply another term for *investment,* which is defined as the spending of capital today to receive benefits in the *future*. This differs from *consumption*, which is defined as the use of capital today to receive benefits *today*. Whenever an investment decision is made, the investor must compare the benefits he will receive in the future with the money he spends today.

investment
the spending of capital today to receive benefits in the future

There are a wide range of competing investment alternatives available to investors/savers including:

- saving accounts
- government securities
- stocks
- foreign currencies
- mortgages
- loans to individuals
- art and antiques
- commodities and futures
- term deposits
- tax-free savings account
- bonds
- real estate equity investments
- units in real estate syndicates
- venture capital loans
- registered retirement saving plans

Each of these investment alternatives represents borrowers competing for the funds of savers by offering different combinations of risk and reward to potential investors. Prospective borrowers seeking mortgage funds must compete with all other segments of the economy to obtain the desired funds.

Interest Rates in the Capital Market

When people invest capital, they allow someone else to use it on agreed conditions, one of which involves periodic repayments of the capital invested. A fee, known as *interest,* is charged for the use of capital. This fee is usually expressed and calculated as a percentage of the amount of capital. While the overall level of interest rates is set by supply and demand factors in the capital market, there is a structure of relative interest rates within the capital market. In other words, the rates paid between alternative investments (e.g., mortgages versus bonds) depends on the level of risk each investment presents and the length of the loans. The more risk an investment poses (risk of not receiving the benefits an investor paid for), the higher the rate of interest charged. Generally, the longer the term of the investment, the higher the rate of interest that must be paid to the investor to induce the investor to lock in the funds. A federal government bond represents a promise by the Canadian government to pay the interest stated and to repay the capital at a given date. The holder of the bond has little worry in terms of income security because it is unlikely that the government would fail to meet its obligations; the only capital risk is price fluctuation before the date the bond is redeemed (cashed in) and the possibility of a fall in the value of money. Due to the very low risk present with a government bond, the rate of interest is relatively low.

interest
a fee charged for the use of capital

In contrast, the promise of a mortgagor to pay interest and principal is much less secure than that of the Canadian government. A mortgage lender may have more trouble than a bondholder in collecting interest and recovering their capital when due. Furthermore, a mortgage investment is more difficult to sell than a government bond and requires more management during the term of the investment.

As compensation for the extra risks and management time involved, the mortgage lender requires a higher yield on a mortgage loan than that paid on a government bond. Generally, the rate on a well-secured

first mortgage will be greater than the yield on a government bond of a similar term. Less secure investments, such as second or third mortgages, will require even higher interest rates to compensate for the higher risk.

The interest rate charged on a mortgage loan is, from the lender's viewpoint, comprised of three components:

1. the return on the invested capital that is determined by current interest rates in investment markets and by the supply and demand for mortgage funds;
2. an inducement to accept risk on the capital resulting from an uncertain investment; prime investments will generally be granted a lower rate than investments involving greater risks; and
3. a payment to the lender for part of the costs of managing mortgage lending activities.

The lender seeks an interest rate on a loan that will be acceptable to the borrower and still satisfy their objectives. Generally, the elements considered in the setting of a rate include the following:

- the credit rating of the borrower and the value of the security;
- the amount of administrative attention required; higher rates are charged on loans involving greater administrative work;
- the type of property used for security; generally, a different rate is charged on each type of property (e.g., unimproved land, owner-occupied residential, revenue residential, commercial, industrial, and hotel); and
- the amount of the borrower's equity; the rate being lower as the amount of equity increases.

However, individual lenders will not usually change the interest rate to suit the risk on a specific loan. They prefer to use the overall market rate for mortgage funds and adjust instead the non-rate factors of loans, (such as the length of the term or the amortization period) to compensate for differing levels of risk on individual loans.

Mortgage Market

Supply of Mortgage Funds

The mortgage market is linked with the capital market because it competes for a share of the total supply of savings. If the *demand* for funds in the mortgage market increases, the interest rate on mortgages will increase. Investment funds will then be attracted from other segments of the capital market into the mortgage market.

Increases in the demand for capital outside the mortgage market will draw the supply of investment funds away from the mortgage market, and through short supply, will also cause mortgage interest rates to increase. Funds will leave the mortgage market until mortgage interest rates are at least as high as those offered in other investment vehicles of similar risk.

Changes in the level of savings affect all sectors of the capital market (including the mortgage market) because it changes the total supply of investment funds. Thus, the supply of mortgage funds depends on the total amount of savings available and the competitive position of mortgages as compared to other available alternatives.

Finally, changes in government policies are very important in determining the supply of mortgage funds.

Demand for Mortgage Funds

Just as the supply of funds depends on savings and the relative attractiveness of mortgage investment, demand for real estate credit depends on the level of activity in the real estate market and on the terms and price of the mortgage loan (i.e., the interest rate). Since most mortgage loans are repaid over a long period of time, changes in interest rates can have large effects on monthly payments and the individual's ability to qualify for a loan.

For instance, a borrower considering a $300,000 mortgage written at 4% per annum, compounded annually over 25 years will face monthly payments of $1,571.69. If rates were 7% per annum, compounded annually for the same loan, the monthly payments would be $2,079.36. If the lender would only permit the borrower to commit 27% of their income to principal and interest repayments, the borrower would have to earn approximately $69,853 per year to qualify for the 4% loan and $92,416 per year to qualify for the 7% loan – a significant difference in annual income.

In general, mortgage interest rates move with fluctuations in the national economy: rates rise when the economy is expanding and decline during periods of recession. Mortgage rates are sluggish compared to rates in the other sectors of the capital market; changes have tended to lag behind changes in bond yields in both upward and downward movements. This *stickiness* in mortgage rates results from factors such as the wide use of advance commitments where the lender and borrower commit to a rate of interest some time (e.g., 30 or 60 days) before the loan is advanced, the long-term nature of the loan contract, and a weak secondary mortgage market. However, mortgage rates have tended to fluctuate within a narrower range than other security yields.

Mortgage investments typically lack the liquidity of investments that are traded in an organized security market. The mortgage market involves a complicated lending process and relatively costly management procedures. The greater expenses of acquisition and administration, the difficulty in selling the mortgage investment, and the greater risk involved explain why mortgages usually have higher interest rates than bonds.

CHARACTERISTICS OF MORTGAGE LOANS AS INVESTMENTS

Historically, mortgage investments have the following characteristics:

- Each mortgage is essentially a *unique* investment.
- Mortgages are difficult to trade (*illiquid*).
- Mortgages have long repayment terms, which make it difficult for the lender/investor to reinvest the periodic (monthly) payments at a good rate.
- Mortgages involve a great deal of administrative work.
- Mortgage investment requires a large capital outlay.

Because of these traditional characteristics, the government of Canada introduced two investment options – *National Housing Act* Mortgage-Backed Securities (MBS) and Canada Mortgage Bonds (CMBs) – to encourage individual investment in mortgages.

Uniqueness

The terms of the mortgage contract will specify the conditions under which the borrowed money is to be repaid and the compensation the lender receives for making the loan. The risk associated with any particular mortgage loan is dependent upon a unique set of characteristics:

- the characteristics of the borrower who has promised to repay the loan;
- the characteristics of the interest in land pledged as security; and
- the specific terms of the mortgage document itself.

Liquidity

Government bonds are very *homogeneous*; each bond is secured by the government and is identical in every aspect to all other bonds in the issue. Investors can trade existing bonds with greater ease and much less caution than in the case with mortgages. As mortgages tend to be more difficult to trade than bonds, mortgage investments are said to be illiquid compared to bond investments. In the past, there has been very little trading of existing mortgages among investors (i.e., a weak secondary market). Recently, the use of mortgage default insurance, shorter contractual terms on mortgages, and the introduction of new investment options have increased the liquidity of these investments.

homogeneous
of the same kind; alike

Reinvestment Problem

During the repayment period of a mortgage, the borrower is usually required to make monthly payments consisting of interest due and a small portion of the outstanding principal. The lender/investor receives a long series of relatively small monthly payments. Since large investors have many mortgage investments, they can reinvest the total of all the monthly payments received into new mortgage loans. The small investor with only a few loans may find that they are only able to reinvest the mortgage payments in a lower interest rate investment such as a savings account.

For instance, a private investor with $100,000 may choose to advance four $25,000 second mortgages. If these loans are created at the same time, earn interest at the rate of 5% per annum, compounded semi-annually and are to be repaid over 20 years with equal monthly payments, the investor would receive approximately $164 per month from each of the four borrowers, or a total of $656 per month. At the end of one month, the investor could not initiate a new mortgage loan for such a small amount; thus, the investor might have to reinvest the monthly amounts of $656 in a savings account until enough money was accumulated to advance another mortgage. During this holding period, the interest rate earned on reinvested funds would be much lower than 5% per annum, compounded semi-annually. On the other hand, an investor with $3,800,000 to lend would receive approximately $25,000 per month in payments, which is enough to initiate a new mortgage, allowing reinvestment at the mortgage rate.

The reinvestment problem facing the smaller investor is one of the major reasons that the mortgage market is comprised of a small number of small investors, a few medium-sized participants, and a number of large financial institutions.

Administration

Mortgage lending involves a great deal of initial and ongoing management. The lender must thoroughly analyze the characteristics of the property pledged as security, which involves an appraisal, legal work, a frequent survey of the property, and the gathering of other specialized information. The ongoing administration of a mortgage portfolio can be time-consuming. It requires overhead expenses to receive and record monthly payments and to ensure that collections are on time. Large investors are, again, in a better position since they have economies of scale[2] in the administration of mortgage loan accounts.

Capital Cost

The final investment characteristic of mortgages to be considered is the large capital outlay an investor requires to participate in the market. An investor must have enough capital to invest thousands, rather than hundreds, of dollars. Many potential lenders cannot participate in the mortgage market because they do not have enough funds to advance even one mortgage loan. Even if a lender does have enough money, they may be very reluctant to commit all (or even a significant portion) of their funds to one loan due to the high risk associated with default. Diversification within classes of investments allows the investor to protect against losing from default situations but may prevent their direct participation in mortgage investment.

Mortgage-Backed Securities

The *National Housing Act* Mortgage-Backed Securities (NHA MBS) program was developed by the government of Canada to encourage small investors to participate in residential mortgage investment through mortgage securitization. NHA MBS are comprised of pools (groups) of amortized residential mortgages insured by the Canadian Mortgage and Housing Corporation (CMHC) under the *National Housing Act*. These mortgage loans are converted into securities and then marketed to investors in small individual units. Investors can choose the category of NHA MBS pools they would like to invest in. These categories include:

mortgage-backed securities
pools of amortized insured residential mortgage loans that are converted into securities, then marketed to investors in small individual units

- exclusive home owner;
- multi-family;
- social housing (such as co-ops and seniors residences); and
- mixed (a combination of any of the three categories).

The NHA MBS are issued by financial institutions that are already operating as approved lenders of NHA-insured mortgages, such as: banks, trust companies, insurance companies, loan companies, credit unions, and caisses populaires. Although other financial institutions that are not originators of the underlying mortgages, such as investment dealers, may become issuers, it is important to note that all issuers must be approved by CMHC.

[2] As the number of mortgage loans a lender initiates increases, the average cost of administering each loan tends to decrease. Thus, the actual dollar cost per mortgage for administration (or "servicing") is usually significantly lower for large mortgage lenders than it is for smaller investors.

The NHA MBS gives investors an undivided interest in a pool of NHA-insured residential mortgages that are secured by the value of the underlying real estate. The timely payment to the investor of principal and interest is guaranteed by CMHC and is paid to investors monthly by the Central Payor and Transfer Agent (CPTA). Other benefits for investors include, but are not limited to, attractive yields and the ability to trade NHA MBS certificates, Registered Retirement Savings Plan (RRSP), and Registered Retirement Income Funds (RRIF) eligibility.

Canada Mortgage Bonds

In 2001, CMHC launched a new investment product, Canada Mortgage Bonds (CMBs), to improve the supply of low-cost mortgage funds in Canada and to provide the mortgage market with an alternative and competitive source of funds. The program was introduced to help lower financing costs for Canadians by assisting the mortgage lending industry with liquidity, capital, and risk management. As well, the program allows institutional investors and individuals to invest in Canadian residential mortgages through easily tradable investments.

Under the CMB program, the Canada Housing Trust (CHT), a special purpose trust created and managed by CMHC, issues CMBs to investors and uses the proceeds to purchase NHA mortgage-backed securities. Under a CHT, investors purchase the bonds and receive fixed-interest payments every six months. These payments are guaranteed by the CMHC, as all the underlying mortgages are CMHC-insured. This reduces the risk associated with the bond, making them an attractive and conservative investment. The proceeds received from the sale of the bonds are then used to purchase mortgage-backed securities. The proceeds from the underlying mortgages of the mortgage-backed securities are used to pay the principal and interest payments to the bondholders. A benefit of investment in a CMB is that through CMHC, the federal government guarantees the timely payment of interest and principal on the CMB.

The CMB program has evolved over time to facilitate changes in the mortgage market. For example, CMBs are now offered in different maturities (e.g., 5 or 10 years), and types of interest rates (e.g., fixed rate and floating rate). The launch of the 10-year CMB in 2008 not only helped address funding pressures during a period of financial crisis but also facilitated the provision of mortgages with terms longer than five years in Canada. Currently, 10-year fixed CMBs account for approximately 55% of the total issued; the remainder consists of 5-year fixed and floating issues.

Mortgage Investment Corporations (MICs)

Mortgage Investment Corporations (MICs) are an alternative class of mortgage investment. Investors purchase shares in the MIC and the pooled capital is invested in mortgages secured by Canadian real estate. The *Income Tax Act* establishes the basic rules for qualification that allows the fund to pass on 100% of its net income to investors. MICs typically permit registered funds such as RRSPs, RESPs, and RRIFs. They are professionally managed and have varying degrees of risk.

There are over 100 MICs in BC with anywhere from a handful of investors to several thousand investors. The available capital of each fund varies dramatically from under $1 million to several hundred million dollars. For example, the BC MIC Managers Association is a group of BC-based MICs that represent over $2 billion in lending capacity. MICs continue to gain popularity among investors looking for alternatives to traditional investments. As with any investment, not all funds are created equal and investors must perform their own due diligence.

DEVELOPMENT OF CONTEMPORARY MORTGAGE LENDING

To understand the contemporary context of financial analysis, it is helpful to review the historical development of mortgages. The following subsections provide a brief summary of the changing mortgage landscape in Canada from the early 20th century to today.

Early 20th Century

From 1900 to the late 1920s, residential mortgage financing involved long-term loans where interest was paid periodically throughout the life of the loan. Partial payments of principal seldom occurred; rather, the entire principal amount was repaid (or refinanced) at the end of the loan term.

This arrangement suited the lender since the borrower's income was considered as security for the interest payments and the property served as security for the principal. This *interest only* repayment plan minimized borrowers' current expenditures and allowed them to save for the principal repayment at maturity. Periods of stable interest rates, low inflation, and stable property values permitted interest only loans to be satisfactory investment vehicles during this period.

Depression Years

During the economic collapse of the Depression in the 1930s, many borrowers were forced to live off their savings rather than pay off their mortgage when due. Consequently, many lenders found they were owed the full amount of principal outstanding on a large number of loans by individuals without any income and whose property was worthless. Lenders and borrowers suddenly became aware of the principal risk associated with interest only loans.

The market responded by turning to the use of repayment plans where periodic payment of both interest and principal occurred. The most common form of these repayment plans was the long-term, fully amortized mortgage, where each payment was constant in amount and was comprised of interest due, plus a partial repayment of principal. Rather than the full amount of principal being due at maturity, the full amount of principal was repaid throughout the term of the mortgage. This form of repayment was used in residential mortgage lending for almost 35 years.

Post-World War II Period

A major innovation during this period was the use of mortgage default insurance. The federal government wanted to stimulate the demand for and supply of housing during the post-World War II period; however, direct federal intervention in housing was not allowed by the Constitution (formerly the *British North America Act*). Therefore, to implement its housing policy, the federal government used indirect measures, largely through the mortgage market.

To increase the supply of mortgage money, the federal government tried to encourage financial institutions to increase their participation in mortgage lending by reducing their risk of loss in the event of default. The most successful method (which is still used) took the form of government insurance against default on residential mortgage loans granted under the *National Housing Act*. Borrowers paid insurance fees that went into a fund to compensate lenders if default occurred. This insurance, the steady expansion in the economy, *relatively* low inflation, and slow growth in interest rates meant the characteristics of mortgage loans did not change much between the early 1950s and the late 1960s.

Late 1960s to 1970s: Partially Amortized Mortgages

By the end of the 1960s, there was rapid price inflation as well as rising consumer demand. The increase in consumer demand also increased competition between investment and consumption demands for the money supply. Consequently, to ration funds, interest rates rose significantly and long-term lenders found themselves faced with a new type of risk – *interest rate risk*. Mortgage lenders had no protection from being locked into long-term loans at rates below current market rates. Individual borrowers were protected, to some extent, from holding long-term debt at rates above the going rate because they were allowed to prepay the loan (paying an interest penalty) under Section 10 of the federal *Interest Act*. From the lenders' viewpoint, the opportunity cost of a heavy commitment to long-term fixed rate assets was shown by the 31% increase (9% to 11.8%) in conventional mortgage rates in the three-year period following January 1972.

In these circumstances, the mortgage agreement needed to be altered to give both borrowers and lenders increased protection against interest rate fluctuations. The result of this need for protection was the emergence of the partially amortized mortgage, which has periodic payments based on a long-term fully amortized loan but which matures on a short-term basis. At maturity, the full amount of the outstanding balance must be repaid or refinanced at the market interest rate. This feature permits both lenders and borrowers to share the risk of possible fluctuations in the long-term lending rate. Rates on short-term loans (e.g., 1-3 years) are generally ¼ to ¾ of one percent less than rates on the standard 5-year term loan. For example, a 3-year loan term may be offered at 3.39% while a 5-year term rate would be at 4.64% for similar loan amounts and amortization periods. This difference in rates reallocates a portion of the risk caused by swings in interest rates to the borrower. On the other hand, borrowers who prefer to have the rate set over a longer term pay a higher contract rate to compensate the lender.

1980s: Refinancing Concerns and Mortgage Supply Stability

The short-term partially amortized mortgage permits periodic readjustment of mortgage rates. This allows lenders to balance the rates offered on their liabilities and their assets, i.e., to match deposits to mortgages and other loans. If interest rates drop, borrowers can receive interest savings, helping with affordability and spurring the residential market. Alternatively, in a period of rising rates, a borrower's payments will increase, possibly doubling or more upon refinancing. This raised serious affordability concerns – for example, consider the sub-prime crisis in the US in the late 2000s, where a wave of foreclosures was prompted primarily by interest rate hikes upon renewal.

Interest rates rose dramatically between 1978 and 1982, from a low of 10.31% in August of 1978 to a high of 21.46% in September of 1981. Consider a hypothetical borrower who took out an $80,000 mortgage in September 1976. The mortgage had a rate of 11.76%, per annum, compounded semi-annually, with monthly payments, a 25-year amortization period, and a 5-year term. The loan would have monthly payments of $812.11. At the end of the contractual term, the outstanding balance was $76,242.11. On the date of refinancing, the interest rate was 21.46% per annum, compounded semi-annually. With a 25-year amortization, the new payments on the outstanding debt were $1,314.26. This 62% increase in the payment poses an affordability issue for the borrower.

Dramatic payment increases significantly increase a borrower's risk of default. The extent of the impact of the recession and rapidly increasing interest rates on home ownership in Canada was shown by claims on the default insurance funds. From its inception under the *National Housing Act* until 1979, this fund grew steadily, with revenues consistently exceeding expenditures. However, from 1979 to 1983, claims greatly exceeded revenue. For example, in 1983, revenue to the fund was $89,390,000 and expenses were $349,683,000. Clearly, many established owners defaulted on their mortgages, unable to make payments in the restrained 1980s on homes purchased in the optimistic late 1970s.

As an attempt to reduce such risks, the federal government introduced an interest rate insurance program in 1984. Borrowers could pay an initial insurance fee to protect against having to make payments based on an interest rate that is more than a specified number of percentage points greater than the rate specified in the original mortgage. The introduction of interest rate protection in the 1980s was a major development in Canadian mortgage lending practice towards assisting housing affordability. This particular affordability concern differs from the acquisition of housing issues in the 1970s; rather, it is focused on maintaining the affordability for those who already own.

The federal government also took steps to stabilize the flow of mortgage funds by attempting to attract more investors to the mortgage market. In 1986, CMHC created a new financial instrument called NHA Mortgage-Backed Securities (MBS) that were designed to help provide a steady flow of mortgage funds into housing in Canada. Modelled after the successful US "Ginnie Mae" security, the MBS is an investment vehicle that can be bought and sold in financial markets. The MBS represents an undivided interest in a pool of mortgages, generally consisting of residential first mortgages. The MBS program in Canada experienced fairly slow growth in its early years, with an initial issue in 1987 for only $20 million. However, it has grown significantly since then. As of June 2023, the total mortgage-backed securities outstanding is approximately $486 billion.

The 1980s also saw changes to the traditional sources of mortgages. Throughout the 1960s and 1970s, the Canadian financial system was built on the separation of the four pillars: the banking, securities, trust, and insurance industries. However, in the 1980s several regions in Canada suffered major declines in real estate prices. Mortgage defaults led to the failure of a number of trust companies and three regional banks, drawing down Canadian Deposit Insurance Corporation reserves. Changes to federal and provincial regulations in 1987 ended the traditional separation of banks, investment dealers, trust companies, and insurance companies. This led to a diversification of trust companies into broader areas as they moved into commercial and consumer lending areas, and a reduction of their role as housing finance specialists, with mortgage loans reduced to less than 50% of their portfolios. Banks took on more mortgage finance as well as investment dealing. In 1987, CIBC became the first Canadian bank to operate an in-house investment dealer, CIBC Securities, offering mutual funds and discount brokerage services to the public.

1990s and 2000s: Finance Industry Reorganization

With a strong worldwide economy through the mid-2000s, the availability of mortgage funds was high and interest rates were at all-time lows. Mortgage lenders became more aggressive in trying to attract and retain

creditworthy customers, through mortgage rate discounts and innovative mortgage terms and options. Borrowers found themselves with much stronger negotiating positions, assisted by increased knowledge of competitive mortgage offerings and internet availability of credit reports and credit scores from major credit reporting agencies.

Legislative changes in the 1990s further reduced barriers separating banks, trust companies, and insurance companies. Changes to the *Bank Act* in 1992 allowed banks to acquire trust companies. Technological and market changes also impacted the structure of mortgage finance. For example, the popularity of the internet as a means of banking in the late 1990s brought "virtual" banks into the market, such as ING DIRECT (now Tangerine, a division of ScotiaBank) and President's Choice Financial (now Simplii Financial, a division of CIBC). While traditional banks continue to retain the majority share of the residential mortgage market, the presence of the internet banks and mortgage brokers has changed the way that banks market their mortgage products.

Significant legal changes to mortgage financing in this period included the introduction of the 95% loan-to-value ratio and extending amortization periods up to 40 years. These allowed buyers to qualify for higher loan amounts and purchase properties with smaller down payments, both of which opened up home ownership for many who had previously been unable to buy a home. These financing changes, together with market factors, helped contribute to a nearly 20-year housing boom. However, the economic turbulence in the late 2000s led to the government curtailing these expansionary financing policies, both to protect against loan defaults and to lessen dependence on mortgage debt.

Mortgage brokerage began to grow into a more mainstream aspect of the residential lending market during the 2000s. Through a combination of market knowledge and bargaining power, brokers can help arrange mortgages that have better interest rates and terms than borrowers can find on their own. Although independent mortgage brokers have existed in Canada since at least the 1970s, their influence was initially focused mainly on the sub-prime sector, private lending, and commercial transactions. A significant change was the trend for lenders, in particular chartered banks, to move their front-line mortgage lending business to independent brokers, and absorbing the brokerage fee. What used to be a fee paid by borrowers was now paid by the lender, meaning the borrowers could receive service from an independent mortgage professional but not have to pay for it directly. This has dramatically increased the reliance on mortgage brokers for conventional financing: recent data indicates that approximately half of mortgage originations among first-time buyers were handled by mortgage brokers. Smaller independent firms and brokers have combined to form super brokerages, with wider networks, access to resources, and name/brand recognition.

2010 to 2020: Low Interest Rates and Government Measures

One of the defining characteristics of the 2010s was historically low interest rates. The availability of inexpensive financing provided fuel for the real estate market upsurge. New home owners entered the market while existing home owners seized the opportunity to upgrade or purchase recreational or investment properties. However, prices rose to reflect the increased demand, resulting in higher debt levels to facilitate these purchases, and eventually this spiral caught the government's attention. While borrowers were able to qualify for financing under the existing conditions, concern arose over the inevitable increase in mortgage rates: would these borrowers still be able to make the required loan payments once rates had increased?

The subprime lending crisis in the United States in the late 2000s did not hit Canada as hard, but the economic turbulence served as a reminder to lenders about responsible lending. In times of economic prosperity, lenders must remember to maintain their lending standards to ensure that the mortgages will survive a possible economic downturn. Lenders must also be aware of factors influencing the underlying value of the asset, such as temporary housing bubbles. While we are used to seeing properties increase in value over time, a market correction may actually reduce the value of the property. This means lenders could potentially suffer losses if the need to foreclose on the property arises.

By the end of the 2010s, the federal and BC provincial governments responded to this risk with measures designed to cool the housing market and restrict the financing that fuels it. In 2018, the Bank of Canada made two small interest rate increases to the benchmark interest rate that mortgage rates are based upon. The federal government introduced the stress test (described in more detail in the following text box). The provincial government imposed new speculation taxes on vacant homes, opened up inquiries regarding money laundering in real estate markets, and specified rules for disclosure for foreign buyers. These initiatives contributed to a slowdown in BC real estate markets in 2019.

2020 to Present: Technological and Market Changes

Technology continues to play an important role in the mortgage finance industry. According to a recent CMHC Mortgage Consumer Survey, most first-time home buyers now use the internet to research mortgage options before contacting a broker or lender. Many borrowers will have researched terms and conditions, compared different interest rate scenarios, looked for the best interest rate, and used a mortgage calculator – all contributing to a more informed mortgage decision.

The COVID-19 pandemic presented an example of a sudden, unexpected market change. Through mid-2021, mortgage rates were at historic lows while the federal government initiated restrictive underwriting measures (e.g., modifications to the stress test) in an attempt to slow the real estate market down. Lenders temporarily allowed deferrals of mortgage payments, but those short-term measures have largely passed, and both housing sales and price appreciation continued at near record levels.

In June 2021, the stress test was modified making the minimum qualifying rate for both uninsured mortgages and insured mortgages to be the greater of the 5.25% or the borrower's contract rate plus 2%.

Throughout 2021, mortgages rates increased slightly but were still near historic lows. However, in February of 2022, Russia's invasion of Ukraine resulted in supply chain disruptions, causing a spike in oil, natural gas, and other commodity prices, exacerbating global inflation. In response to the increased inflation, in September 2022, the Bank of Canada increased its policy interest rate to 3.25% (300 basis points higher than it was in March 2022 when it was at its record low of 0.25% that occurred throughout the pandemic). Two further rate increases occurred in 2022: an October increase to 3.75% and a December increase to 4.25%. A further increase to 4.5% occurred in January 2023 with another increase to 4.75% in June 2023, and an increase to 5% in July 2023, a 22-year high. Canada's big banks followed suit and raised their prime lending rate to 5.45% in September 2022, an increase of 275 basis points since March 2022. As of July 2023, the prime lending rate is at 7.2%. Inflation steadily increased from mid-2021 and peaked in June 2022 at a rate of 8.1%. Since then, inflation declined to 4.3% in March 2023, had a slight increase to 4.4% in April 2023, and declined to 3.4% in June 2023. Inflation remains a significant issue in the Canadian markets.

Historically, the rates on closed VRMs tend to be slightly lower than the equivalent term fixed rate mortgage. This compensates borrowers for taking on additional risk in foregoing the interest rate stability of a fixed rate mortgage. However, towards the end of 2022, the spread between VRMs and fixed rates mortgages was virtually non-existent. In early 2023, VRM rates even exceeded fixed mortgage rates, which is a sign of short-term uncertainty in finance markets. This situation is not expected to prevail for long, with a return to the traditional "spread" in rates between VRMs and fixed rate mortgages.

Higher mortgage rates (for both fixed and variable rate mortgages) put downward pressure on the real estate market, by slowing the volume of sales and putting downward pressure on prices. Variable rate mortgages have become an increasingly popular choice in recent years. In 2021, VRM's percentage of total mortgage initiations was only 10% of the market. By early 2022, this advanced to a peak of 57%. However, with the rising interest rates in 2022, the popularity of VRMs declined greatly. As of April 2023, VRMs accounted for approximately 8% of new mortgage initiations. Borrowers are most interested in VRMs when the lower rates and risk of VRMs outweigh the security of fixed rate mortgages. Presumably once VRM rates decline relative to fixed rate mortgages, VRMs will once again become a more popular option.

Currently, Canadians with existing mortgages would have had to pass a stress test before being approved for their loan and should be able to handle minor increases in debt payments. However, if mortgage rates increase significantly, some Canadians will be unable to enter the housing market. Furthermore, certain Mortgage Investment Corporations are starting to suspend lending. This will reduce the amount of financing available and create additional barriers for Canadians looking to enter the housing market. These factors and mortgage rate increases may reduce demand pressures in the housing market and create downward pressure on prices.

Another significant factor affecting housing prices is the current shortage in housing supply. Housing construction has lagged compared to population growth resulting in minimal supply. Prospective buyers often compete and, at times, engage in fierce bidding wars, leading to elevated house prices. However, the housing supply is anticipated to increase as residential building increases in the country's six major cities compared to 2020 and 2021, and cities shift towards densification, as shown by Vancouver council's approval of the 30-year Broadway Plan and the City of Edmonton's discussions around upzoning lots. This increase in supply and the downward pressure from interest rate hikes could influence a downward price correction in the Canadian real estate market. Some believe that this correction is already underway based

on data from April 2023, with seasonally adjusted existing home sales volume in Canada dropping by 19.5% year over year.

Finally, the past decade has seen society increasingly concerned with issues of sustainability and climate. This is seen in real estate in development of energy-efficient and environmentally-friendly building technologies, as well as an emphasis on sustainable building and living. The government has introduced numerous programs and policies to encourage these advances. One that is specific to finance is the CMHC Green Home program, which gives a partial refund on mortgage loan insurance premiums to home owners who make use of energy-efficient and energy-saving technologies.

Summary of Federal Government Mortgage Lending Restrictions: 2010-Present

2010: Ottawa introduces a requirement that all borrowers meet the standards for a five-year fixed rate mortgage even if they choose a mortgage with a lower interest rate and shorter term. The government also lowers the maximum amount Canadians can withdraw in refinancing their mortgages.

2011: The maximum amortization period for government-backed insured mortgages is cut to 30 years and the maximum amount Canadians can borrow in refinancing their mortgages is reduced to 85%. Ottawa withdraws government insurance backing on lines of credit secured by homes, such as home equity lines of credit.

2012: The maximum amortization period for new government-backed insured mortgages drops to 25 years. Ottawa lowers the maximum amount Canadians can borrow when refinancing to 80% and stops offering insurance on mortgages for homes worth more than $1 million.

2016: The minimum down payment for new government-backed insured mortgages increases to 10% for the portion of the house price over $500,000.

- A stress test used for approving high-ratio mortgages applies to all new insured mortgages – including those where the buyer has more than 20% for a down payment. The home buyer would need to qualify for a loan at the negotiated rate in the mortgage contract but also at the Bank of Canada's 5-year fixed posted mortgage rate, which is an average of the posted rates of the big six banks in Canada. In addition, the stress test requires that the home buyer will be spending no more than 39% of gross income on home-carrying costs like mortgage payments, heat and property taxes (gross debt service ratio or GDSR), and no more than 44% when all other debt payments are considered.
- New restrictions are imposed on insurance for low-ratio insured mortgages, where a borrower has more than 20% for a down payment. Insurance for these types of mortgages will be available only if the amortization period must be 25 years or less, the purchase price is less than $1,000,000, the buyer has a credit score of 600, and the property will be owner-occupied.

2018: The stress test implemented in 2016 expands to apply to uninsured mortgage loans issued by federally regulated financial institutions. The minimum qualifying rate for uninsured mortgages is specified as the greater of either the 5-year benchmark rate published by the Bank of Canada or the contractual mortgage rate plus 2%.

September 2019: The federal government introduces the First-Time Home Buyer Incentive program, which is aimed at easing affordability for first-time home buyers with a household income under $120,000. The program provides interest-free shared-equity loans to interested buyers in the form of down payment insurance. Participants must provide a minimum 5% down payment, while the government (through CMHC) would contribute an additional 5% of the down payment if the purchase is on a resale, or 10% if it's new construction. The mortgage amount plus the incentive cannot be more than four times the participants' annual household incomes. Buyers do not have to make any monthly payments; however, the loan must be repaid in 25 years or when the home is sold, whichever comes first. CMHC also shares in any future gains or losses in home value.

May 2021: First-time buyers will be able to purchase a home up to 4.5 times their household income (increase from 4). First-time buyers can participate if their household income is $150,000 or less (vs. $120,000).

June 2021: Under the stress test, the minimum qualifying rate for uninsured and insured mortgages is the greater of 5.25% or the borrower's contract rate plus 2%, subject to periodic adjustment.

CLASSIFICATION OF MORTGAGE LOANS

Mortgage loans may be classified according to the following criteria:

- Type of property used as security for the loan
- Use of mortgage default insurance
- Source of the mortgage funds
- Rank or priority of the mortgage

Type of Property

Loans are secured by either residential or non-residential property. Residential loans include owner-occupied residential property or income producing (rental) residential property. Non-residential mortgage loans include loans on completed and occupied retail, office, recreational, and industrial property; and loans to facilitate the development of real estate including subdivision, construction, and development financing. The development loans tend to be short term (less than two or three years), whereas loans on completed and occupied property in both non-residential and residential categories tend to have a longer contractual term.

Use of Mortgage Default Insurance

With an *insured mortgage*, an insurance company guarantees that the lender can recover all of the funds loaned (including foreclosure costs, interest and taxes during foreclosure, legal fees, etc.) in case of default. This default insurance is paid for by the borrower and the insurance payments go into a pool of funds used to compensate lenders. An uninsured mortgage loan, where the lender has only the personal covenant of the borrower and the value of the property as security, is generally referred to as a *conventional mortgage*. A conventional mortgage is a mortgage loan up to a maximum of 80% of the lending value (appraised value) of the property. If a mortgage loan has a loan-to-value ratio of more than 80%, it is known as a high-ratio or insured mortgage. There are two types of insured mortgage loans in Canada.

insured mortgage
a mortgage whereby an insurance company guarantees that the lender can recover all of the funds loaned in case of default

conventional mortgage
an uninsured mortgage loan where the lender has only the personal covenant of the borrower and the value of the property as security

Canada Mortgage and Housing Corporation (CMHC), a federal crown corporation responsible for administering federal government housing programs, insures mortgages granted under the *National Housing Act*. These NHA insured mortgages may be direct loans by CMHC or loans made by financial institutions under the provisions of the *National Housing Act*. For up-to-date information on CMHC, visit their website at: *www.cmhc-schl.gc.ca*.

The second type of insured loan involves private mortgage insurance. Currently, mortgage insurance is available from Sagen™ (formerly Genworth Financial Canada) and Canada Guaranty Mortgage Insurance Company. For up-to-date information, visit their websites at: *www.sagen.ca* or *www.canadaguaranty.ca*.

In general, the process of obtaining mortgage loan insurance is similar for all programs: the prospective borrower applies for a mortgage loan and loan insurance at the same time. This generally requires the borrower to pay an application fee for both the mortgage and insurance applications. However, CMHC has eliminated its application fees for their high-ratio mortgage insurance products. Then, if both applications are accepted, the lending institution will calculate the amount of mortgage insurance premium the borrower pays, which will be roughly 0.6% to 4.0% of the amount of funds requested by the borrower (the premium varies according to the loan-to-value ratio). The insurance premium may either be paid in cash by the borrower or added to the loan amount. While the premium is paid to the insurer in either case, the borrower will make slightly larger mortgage payments if the insurance fee is added onto the loan amount. Typically, the insurance fee would be added to the loan amount since the borrower will usually have used all of their available cash for the down payment and other moving or transaction costs.

Source of Mortgage Funds

Institutional Lenders

The largest share of mortgage loans is initiated by institutional lenders; i.e., banks, credit unions and caisses populaires, trust and loan companies, and life insurance companies.

Chartered Banks

Up to the middle of the 20th century, the primary function of a bank was to accept deposits and grant commercial loans. Revisions to Canada's *Bank Act* in 1954 and 1967 enabled banks to offer new services such as mortgages and consumer loans.

Chartered banks are currently the largest single source of institutional mortgage funds in Canada, a position they have held since 1979. Their dominance results from their large market share in the residential mortgage field; their activity in non-residential mortgages is less significant.

Credit Unions and Caisses Populaires

Credit unions and caisses populaires are co-operative financial institutions owned and controlled by their members. Credit unions and caisses populaires play an integral role in local development by reinvesting their deposits and profits in the community through personal and business loans, mortgages, and dividends paid on members' shares. These co-operative financial institutions have grown into a co-operative movement that is one of the most active in the world. Credit unions and caisses populaires maintain a strong market share.

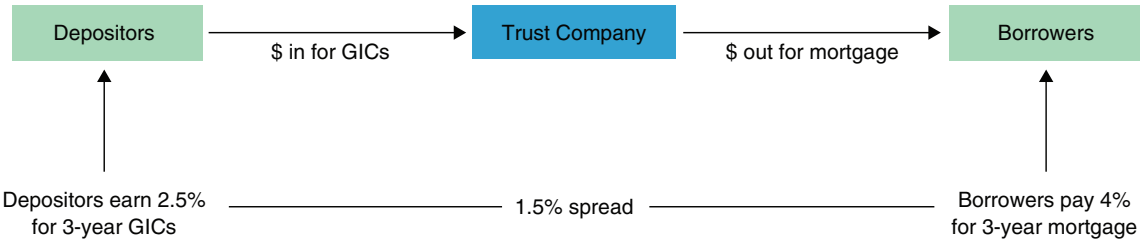
Trust and Loan Companies

Trust and loan companies offer similar services as banks, including accepting deposits and making personal and mortgage loans. However, trust companies can also administer estates, trusts, pension plans and agency contracts, activities that banks are not permitted to undertake directly. It should be noted that mortgage loan companies known as *monolines* (e.g., MCAP, First National, Street Capital), only focus on mortgages, which differentiates them from banks and trust companies. Monolines do not have storefront locations and this reduction in overhead allows them to offer reduced rates and focus on specialized mortgages. Their products are only accessible through mortgage brokers.

monoline lender
a mortgage loan company that only focuses on mortgage loans

Mortgage investments became increasingly attractive to trust companies due to the popularity of both longer term deposit certificates (such as five-year guaranteed investment certificates) and the shorter term call (or partially amortized) mortgages, such as the five-year term mortgages. By matching the term of their deposits with the term of their mortgage investments, "spread" lenders, such as trust companies, were able to virtually eliminate risks of the spread narrowing between the rate paid for funds and the rate earned on these funds once invested. Typically they required roughly a 1.5% spread between their borrowing and lending rates as illustrated in Figure 13.4.

FIGURE 13.4: Illustrations of "Spread Lending"



In fact, trust companies were the largest source of mortgage funds in Canada from 1967 to 1978. However, financial reforms in 1987 and major changes to the *Bank Act* in 1992 increased competition by permitting banks to operate trust companies. Therefore, there has been some consolidation of the Canadian financial system, with the banks acquiring trust companies. In fact, the largest trust companies are actually subsidiaries of the major banks. As well, trust and loan companies experienced major difficulties following the collapse of the real estate market in the early 1990s.

Life Insurance Companies

The life insurance industry was at one time the most important source of mortgage funds in Canada for three reasons:

1. they were the largest single depository of long-term savings in Canada;
2. their large size allowed for economies of scale in the administration of mortgage portfolios; and
3. due to the long-term nature of their liabilities and their annual net inflow of funds, they were not greatly concerned with liquidity and found the relatively high yield on mortgages attractive.

Due to concerns with inflation and cost-of-living protection for policy holders, the fixed dollar yield on mortgages (particularly in the residential mortgage market) made this form of investment less attractive for the life insurance companies. Therefore, they turned to non-residential mortgage loans and equity participation in commercial property to obtain some form of constant dollar protection for their policy holders.

Over the past decade, the percentage of assets in mortgage loans has declined steadily owing to the sharp decline in commercial real estate values in the early 1990s and increased competition from banks, caisse populaires and credit unions, and trust and loan companies.

Private Lenders

Private corporations and individuals represent a much smaller share of the Canadian mortgage market. Loans initiated by these non-deposit taking companies or individuals are generally referred to as "private loans". Since the advantages of large-scale operations favour large financial institutions, private lenders often concentrate on lending areas that are underserviced by the institutional lenders, including mortgages that the institutions cannot accept because of law or corporate policy, mortgages or properties that are below the institutional standards set, and mortgages that represent a higher proportion of the lending value than the institutional lender can or will accept.

The amount of private lending activity in the mortgage market is difficult to determine as it tends to focus on small segments of the market and changes as market conditions change.

The following is a partial list of potential private lenders:

- Private individuals investing extra funds
- Vendors of property who carry a part of the purchase price by granting a mortgage loan on the property, either through a formal mortgage or an agreement for sale
- Investment groups (e.g., mortgage syndication, where two or more individuals pool their investment funds and lend money in the form of a single mortgage), mortgage corporations (public or private limited liability companies), and finance companies who decide to undertake mortgage investment programs
- Trust companies and other professional concerns whose estate and trust funds may be invested in mortgages
- Pension funds – due to their highly centralized nature, pension funds do not usually finance mortgages; however, they have been somewhat active in the secondary mortgage market, purchasing packages of mortgages from primary lenders or brokers who continue to manage the loans for the pension fund

Borrowers should be aware that if they use a private lender for a mortgage loan, there are additional costs to consider. Private lenders typically charge the borrower a higher interest rate as well as lender, mortgage broker, legal, and appraisal fees. For example, the borrower may be responsible for paying the lender a fee that is based on a percentage of the mortgage amount. As well, the borrower may be asked to pay legal fees for both the lender and the borrower. In many cases the fees are added to the mortgage amount; however, this may not be possible in all cases, so borrowers (or their representatives) should ask the lender to disclose all fee related information.

Government

Government mortgage loans are those where a government or government agency acts as the *source of mortgage funds*. They differ from loans provided by lending institutions, which are insured by government agencies. Both federal and provincial governments provide mortgage loans, primarily for the residential sector, through many programs and agencies.

Government and government agencies are an important source of funds particularly during "tight money" periods. When there is a shortage of funds, the government uses direct mortgage lending to expand the supply of credit beyond the level created by institutions.

Mortgage Investment Corporations

MICs provide financing to borrowers in a number of different scenarios, and they can be a good source of financing for borrowers that may not qualify elsewhere. MICs can provide different types of lending programs including residential, commercial, industrial, agricultural, development, and construction financing. The full loan management process is most often handled in-house by a designated management company.

A key feature of MICs is that they provide financing based on their own lending policies. Mortgages in a MIC are not insured. The lending policies of MICs in BC tend to revolve around loan to value limitations, property location, and property type. A MIC may offer first, second, or third mortgages with interest only or amortizing payments. Most mortgages will have a term of 1-3 years, and the mortgage may be open or closed.

MICs usually charge higher rates of interest based on the borrower's risk profile. Most MICs will require an appraisal of the subject property or properties. Borrowers may be subject to additional fees, including but not limited to:

- lender fees;
- broker fees;
- legal fees for both the lender and borrower; and
- appraisal fees.

MICs will continue to be an excellent source of mortgage funds, as increasing regulation is making it more difficult to place borrowers with traditional institutions.

Priority of the Mortgage

By creating a mortgage loan, the borrower (mortgagor) pledges their property rights as collateral for a loan. Since possession and the right to eventually redeem the clear title to the property remain with the mortgagor, they are able to build up a series of claims against the remaining collateral. However, in each case the borrower can only pledge those rights that are left, which means mortgages can be classified by rank: first mortgage, second, third, etc. The first or legal mortgage is simply the earliest dated claim registered against the collateral; it does not need to be the largest loan. Since the rank of a mortgage has important legal implications to the lender, significant differences exist in the terms attached to first, second, and subsequent loans. Generally, the first mortgage is distinguished from all subsequent mortgages, which are referred to as junior mortgages. A second mortgage is the second registered mortgage (or the first equitable mortgage) on a property.

MORTGAGE REPAYMENT PLANS

The main financial element of a mortgage contract is the borrower's promise to repay the principal money borrowed and to pay interest on this money.

The *face value of a mortgage* loan is the amount of money the borrower promises to repay (at the contract rate of interest). The face value of the loan does not necessarily correspond to the number of dollars that are actually advanced to the borrower. Borrowers often agree to repay more than the actual funds they receive through the mortgage arrangement. Why? Because the expenses such as insurance, taxes, surveying charges, legal fees, "bonuses" (or brokerage fees) must be paid by the borrower and borrowers may prefer to borrow a slightly higher amount to cover these extra expenses, so they can use their available cash for the down payment.

face value of a mortgage
the amount of money the borrower promises to repay (at the contract rate of interest)

book value of a mortgage
the outstanding balance of the loan at any particular point in time

term
the duration of the loan contract

Another word commonly used in discussing mortgages is the *book value of a mortgage*. This term refers to the outstanding balance of the loan at any particular point in time; note that the face value and book value of the mortgage would be the same the day the loan is advanced.

The mortgage contract will specify the rate of interest payable for the life of the loan (the duration of the loan contract is referred to as the *term*) and the way in which the interest is to be calculated. The contract will also state the way in which the loan (both principal and interest) is to be repaid (including the size of payments), and how often the payments are to be made. There are several different methods by which mortgage loans can be repaid.

Interest Accruing Loans

An interest accruing loan is one on which no payments of interest and no repayments of principal are made during the life of the loan. The full amount of principal and all interest that accumulates during the term are payable when the mortgage contract expires. A loan with interest charged during the life of the loan that is added to the principal amount and, in turn, earns interest over the remainder of the contract, is called an accrual loan. In effect, the lender is actually lending the borrower additional amounts of money equal to the amount of interest due during the life of the loan.

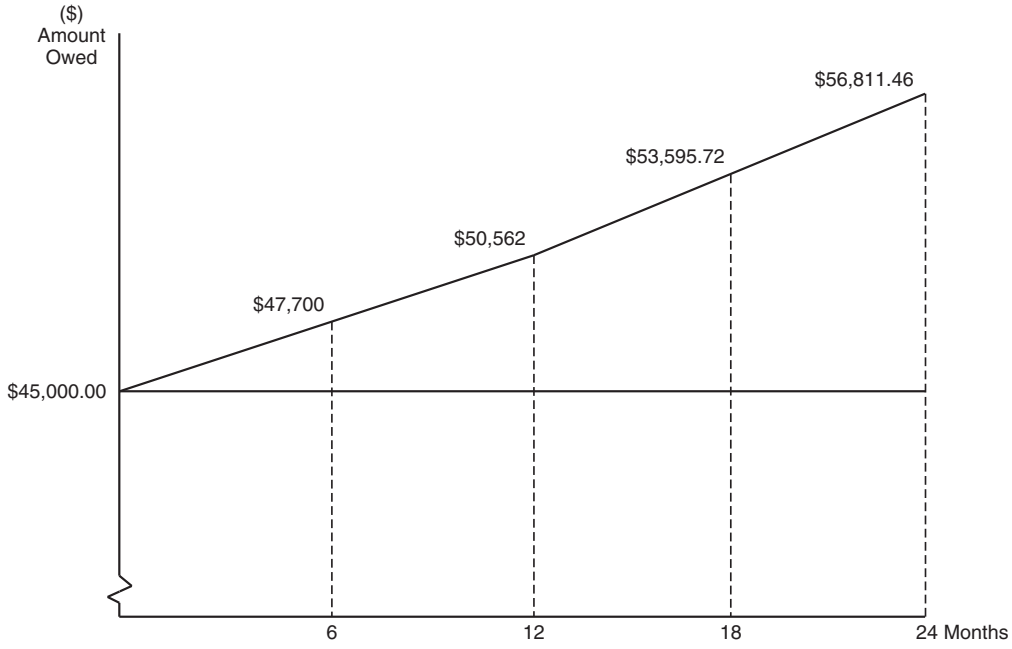
Example

Consider a $45,000 interest accruing loan on which interest is to be charged at the rate of 6% at the end of each 6-month period for a 2-year term. By the end of 6 months, the borrower will owe $47,700, the sum of the $45,000 principal plus $2,700 interest ($45,000 × 6%). At the end of the first year, the borrower will owe $50,562, which is broken down as follows:

$45,000	Principal amount borrowed
+ 2,700	Interest during first six months ($45,000 × 0.06)
$47,700	Owing during second six months
+ 2,862	Interest during the second six months ($47,700 × 0.06)
$50,562	Total amount owing

The outstanding balance (amount owing to the lender) on this loan has grown from $45,000 when it was advanced to $50,562 by the end of one year, and it continues to grow over time to $56,811.46 at the end of the term as shown by Figure 13.5.

FIGURE 13.5: Outstanding Balance on an Interest Accruing Loan



Since the lender receives no payments before the maturity of the loan, the entire $45,000 original investment is at risk throughout the term of the loan. The income to the lender, which is the interest on the monies advanced, is also at risk throughout the entire term. For these reasons, almost all interest accruing loans are written for short terms, one year or less (note that a two-year term is used in this example, for illustration purposes).

Interest Only Loans

To avoid the income risk with interest accruing loans, most lenders require the interest earned be paid periodically rather than permitting it to accumulate as added debt. One common form of such a mortgage is the *interest only* loan where the borrower contracts to make regular payments of only interest to the lender. During the life of an interest only loan, the borrower always owes the principal amount, but this amount never increases since the interest is paid when due.

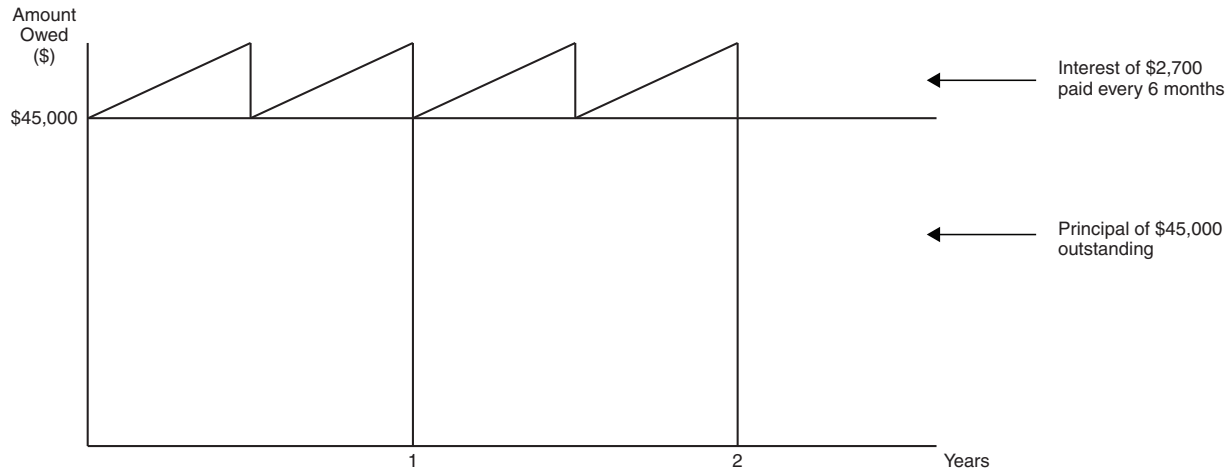
Example

On a $45,000 interest only loan on which interest is to be charged at the rate of 6% at the end of every 6-month period for a 2-year term, the borrower would pay $2,700 every 6 months during the term of the loan, and $45,000 plus the final interest payment at the end of the loan, calculated as follows:

$45,000	Principal amount borrowed
$2,700	Interest to be paid at end of six months ($45,000 × 0.06)
$45,000	Amount owing during second six months
$2,700	Interest to be paid at the end of the second six months
$45,000	Amount owing during third six months
$2,700	Interest to be paid at the end of the third six months
$47,700	Total amount to be paid at the end of the final six-month period of the term

The financial situation during the term of the loan is shown in Figure 13.6.

FIGURE 13.6: Outstanding Balance and Periodic Payments on an Interest Only Loan



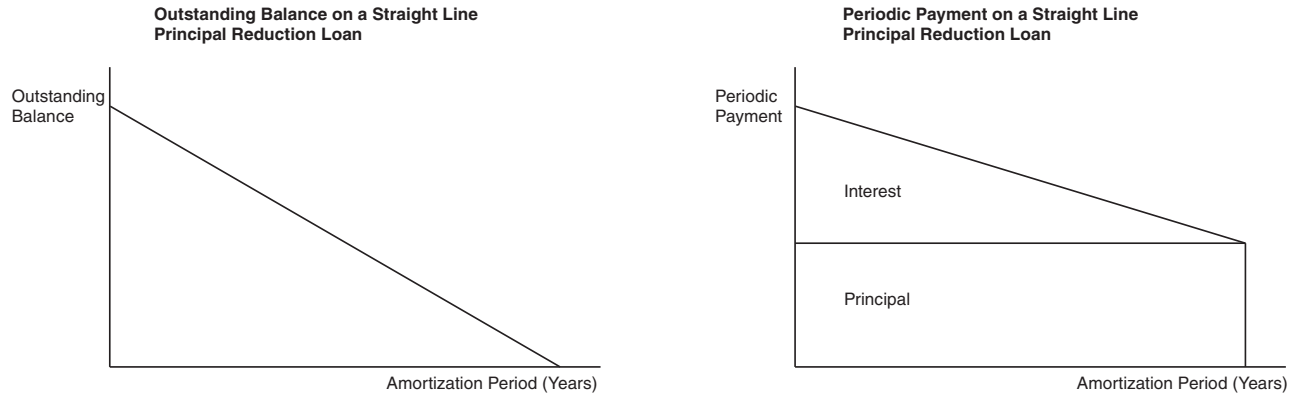
The interest only plan reduces the lender's income (interest) risk but still leaves all of the principal at risk. Interest only loans are often used in real estate development, as they keep a developer's financing payments to a minimum during the period when cash is required for actual construction costs. Upon completion of construction, the developer will likely sell the property and pay out the lender from proceeds of the sale. In the past, lenders have not often approved these loans over long periods because the full amount of principal is outstanding and at risk over the life of the loan. However, it should be noted that interest only loans have been available for a long time in the United States residential lending market.

Straight Line Principal Reduction Loans

The straight line principal reduction loan has an equal amount of principal repaid every interest compounding period plus interest for the period. For example, a mortgage may call for complete repayment of principal over a five-year period through semi-annual payments of principal; therefore, 10 equal principal repayments will be made. The borrower would pay one-tenth of the original loan amount plus interest, due at the end of each six-

month period up to the end of the fifth year. The outstanding principal balance and the amount of interest due decrease from period to period. Given constant amounts of principal repayment and declining interest payments, total payments decline throughout the term of the loan. Figure 13.7 illustrates the outstanding balance periodic payment for a straight line principal reduction loan.

FIGURE 13.7: Outstanding Balance and Periodic Payments on a Straight Line Principal Reduction Loan



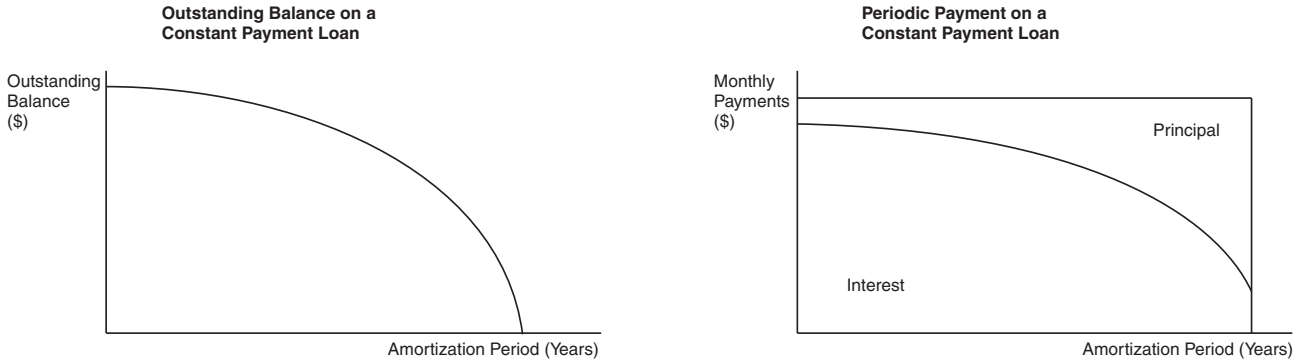
Note: The amortization period is the time necessary for the periodic loan payments to repay the full loan amount.

While the straight line principal reduction loan is useful in some circumstances, it is not widely used. Most real estate investors expect their personal incomes or their property incomes to rise over time; they would find this loan unattractive since the largest payments are required early in the loan when the borrower is least able to afford them. Firms with large investments in depreciating assets, such as machinery or automobile fleets, often use this scheme as the highest payments are made when the machinery is most productive. As time passes and maintenance costs increase, financing costs decrease.

Constant Payment Mortgage Loans

The constant payment mortgage loan has equal payments throughout the life of the loan. Payments are made on a specified day, at a specified frequency, for example, monthly, semi-monthly, biweekly, or weekly. Each payment includes all interest due for that period plus some repayment of principal. By the time a constant payment mortgage loan expires, all of the principal amount has been repaid by periodic payments. As is illustrated in Figure 13.8, the early payments on a fully amortized constant payment loan are mainly interest with a little principal since the borrower must pay interest on a large outstanding principal amount. However, as each payment is made, an increasing portion of the principal is repaid, thereby reducing the outstanding balance on which interest is charged during the next period. As a result of the decreasing balance on which interest is charged, the interest portion of the payment gradually decreases and the principal repayment portion increases. As the end of the loan approaches, little principal remains outstanding and relatively little interest is due. Thus, almost all of the payment is assigned to principal repayment.

FIGURE 13.8: Outstanding Balance and Periodic Payments on a Constant Payment Mortgage



Constant payment loans can be classified as either *fully amortized* or *partially amortized*. Fully amortized means that the entire amount of principal is repaid by periodic payments and the final regular payment will repay the remaining principal balance and accrued interest. With a partially amortized loan, the regular payments of principal and interest are calculated to repay the debt over an *amortization period* that is longer than the loan term. The amortization period is the time that it takes to fully pay off a loan, given the required periodic payments.

fully amortized
the entire amount of principal is repaid by periodic payments and the final regular payment will repay the remaining principal balance and accrued interest

partially amortized
the regular payments of principal and interest of a mortgage loan are calculated to repay the debt over an amortization period that is longer than the loan term

amortization period
the time that it takes to fully pay off a loan, given the required periodic payments

At the end of the loan term, a large payment is required to repay the outstanding principal, e.g, the loan contract period is shorter than the amortization period. An example of a partially amortized loan is a mortgage amortized over 25 years with a 5-year contract term. The regular payments made by the borrower are based on the amortization period of 25 years; however, the borrower makes these payments for only 5 years. At the end of the 5 years, the principal balance that remains outstanding is repaid or refinanced by the borrower. Since payments made early in the life of a constant payment loan are largely comprised of interest, the outstanding balance due at the end of 5 years on a loan with a 25-year amortization is large.

Increased Amortization Period

The amortization period selected for mortgage loans has typically been 15-25 years. However, to reflect market trends of rising property prices and larger mortgage loan withdrawals, lenders had extended amortization periods up to 40 years. However, due to government rule changes the maximum amortization period for insured mortgages is 25 years and 30-35 (depending on the lender) for uninsured mortgages with a 20% or more down payment. It is important to note that extending the amortization period decreases the size of the required payment.

To illustrate this, borrowers requiring a mortgage of $400,000 at ($j_2$ = 5%) would decrease their required monthly payment from $2,326 to $2,135 by extending their amortization period from 25 years to 30 years. By extending the amortization period of a loan, the repayment of the principal is spread over a greater number of payments, making each payment smaller. However, this extends only to a given limit, at which point increasing the amortization period has very little impact on reducing the required payment. Figure 13.9 illustrates the aforementioned example, where the amortization period is steadily increased from 15 years onwards. On the graph, it becomes evident that despite significantly increasing the amortization period beyond 50 years, the required monthly payment does not drop significantly below $1,650. This example is intended solely for illustrating the effect of increasing the amortization period on the size of the required payment. More instruction on calculating required monthly mortgage payments is covered later.

Borrowers should be further cautioned that while required mortgage payments may be lower, the time required for complete loan repayment becomes significantly longer; therefore, more interest will be paid.

Balloon and Outstanding Balance Payments

A *balloon payment* is any payment of principal over and above the regular periodic payments, whether it occurs during or at the end of the term. Examples of balloon payments include the outstanding balance at the end of the term on a partially amortized loan, or any extra principal prepayments a lender might allow. For instance, a borrower might arrange with the lender to repay an additional 10% of the original loan amount at the end of each year during the loan term; these prepayments are deducted from the outstanding balance owing at that time, reducing the amount of principal a borrower has left to repay. Some mortgage contracts allow partial or full prepayment during the term of the loan (without penalties), while other contracts completely prohibit them.

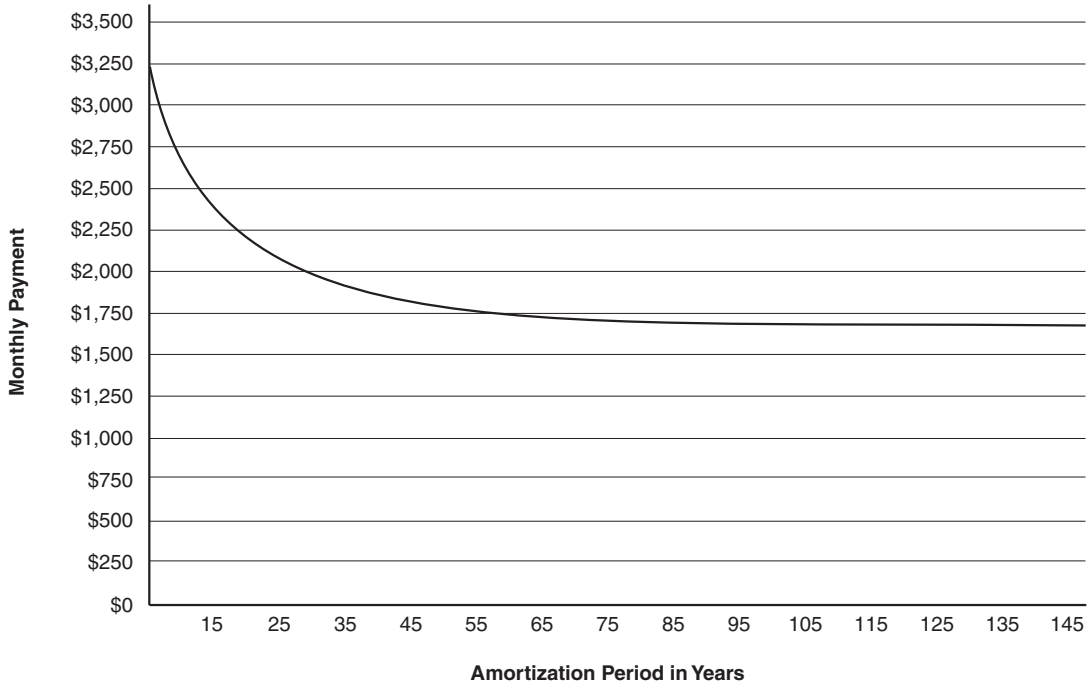
balloon payment
any payment of principal over and above the regular periodic payments, whether it occurs during or at the end of the term

Under the terms of the *Interest Act*, borrowers have the right to tender payment of the total outstanding debt (with an additional three months' interest as a penalty in lieu of notice) after five years from the date of the mortgage. Under normal conditions, the tendered payment will be accepted as a prepayment of the loan; however, the lender is under no obligation to accept this payment but, once tendered, no further interest will

accrue. This right to tender payment extends only to individuals. The borrower, therefore, can refinance at any time after the fifth year and would be particularly likely to do so in times of falling interest rates. In cases of rising rates, lenders have no comparable option because they have no right to ask for full repayment of the mortgage before the contractual date. However, mortgages today are usually for a term of 5 years or less, so this prepayment provision seldom comes into effect.

At the end of the loan term, the lender will demand payment of the outstanding amount and the borrower must repay the total amount then owing, even if the borrower must refinance through another lender. Alternatively, the mortgage may be renegotiated with the same lender based on current lending conditions and rates of interest. This *renewal* permits the lender to earn competitive returns on the investment and ensure that the borrower's income and the value of the property continue to maintain the quality of the investment. If the mortgage is renegotiated, the borrower's right to prepay under the *Interest Act* continues. Any other agreements concerning partial or full prepayment of the debt must be agreed upon by the parties and be written into the mortgage contract.

FIGURE 13.9: Relationship of Monthly Payment to Amortization Period PV = $400,000, j_2 = 5%



Note: the maximum amortization period for insured mortgages is 25 years and 30-35 years for uninsured mortgages with a 20% or more down payment.

Innovative Options for Constant Payment Mortgages

Borrowers are concerned about how long they will be indebted. The simplest way to decrease this time frame is to reduce the amortization period, which has the benefit of saving a significant amount of interest over the loan period. However, reducing the amortization period has the effect of increasing the constant payments to levels that may prove to be unaffordable for borrowers (see Figure 13.10). In recent years, lenders have introduced several innovative options that are aimed at reducing the time required to repay mortgage loans and providing a savings on interest costs. Borrowers can choose options such as increased mortgage payments, lump sum principal prepayments, increased payment frequency, and/or accelerated payments. Other flexible arrangements are continually being developed by mortgage lenders as they compete for borrowers in the residential mortgage market.

FIGURE 13.10: Effect of Reducing the Amortization Period

Mortgage Amount	$250,000	$250,000	$250,000	$250,000
Amortization Period	25 years	20 years	15 years	10 years
Monthly Principal and Interest Payment	$1,461.48	$1,649.89	$1,976.98	$2,651.64
Interest Cost over Amortization Period	$188,441.08	$145,973.33	$105,857.49	$68,196.47
Interest Savings over Amortization Period*		$42,467.75	$82,583.59	$120,244.61

* Assumes a rate of 5% per annum, compounded monthly, over the amortization period.

Increased Mortgage Payments/Principal Prepayments

By increasing the amount of the mortgage payment and/or making additional principal prepayments (balloon payments), borrowers can pay off a mortgage loan much faster. Different financial institutions usually have options with varying rules and regulations that enable a borrower to benefit from an increased mortgage payment plan. For example, one lender may allow borrowers to prepay up to 15% of the loan amount once annually, whereas another may allow borrowers to "double-up" any given payment (pay up to double the regular mortgage payment on any payment due date) or to increase payments by up to 15% over the current payment once annually.

Increased Payment Frequency

Choosing a more frequent payment schedule provides significant benefits to borrowers. By increasing the payment frequency on mortgage loans from monthly payments to semi-monthly, biweekly, or weekly payments, the total mortgage repayment period is reduced and interest costs are saved. As well, borrowers can make mortgage payments that occur at the same frequency as their paycheque or income schedule. Many financial institutions allow you to change the payment frequency without cost whenever the mortgage is up for renewal, or during the mortgage term for a nominal fee.

Accelerated Payments

Constant payment mortgage loans have historically required monthly payments. However, lenders have become more flexible in offering a variety of different payment frequencies, such as biweekly or weekly payments. Biweekly payments are particularly popular because they match most people's earning frequency (paid every two weeks). The more frequent payments can create substantial interest savings and reduce the loan's amortization period. The accelerated biweekly payment is calculated as a monthly payment divided in half, and instead of paying once a month, one-half of the monthly payment is paid every two weeks. The effect of biweekly accelerated payments is that the borrower is making the equivalent of one extra monthly payment per year, thus paying down the principal faster and paying less interest (it should be noted that a borrower could make 26 or 27 biweekly payments in a given year, depending on the payment date).

Accelerating payments is an effective way to pay off a mortgage loan faster and to reduce interest costs. An accelerated payment simply means paying more with each payment than the bare minimum required to fully amortize the loan. If the borrower can afford to pay even just a little more with each payment, this extra goes directly to reducing the loan principal and can have a dramatic impact on interest paid over the loan term as well as the time needed to pay off the loan. This method will save money by reducing the amount of interest paid on the loan.

Going Green!

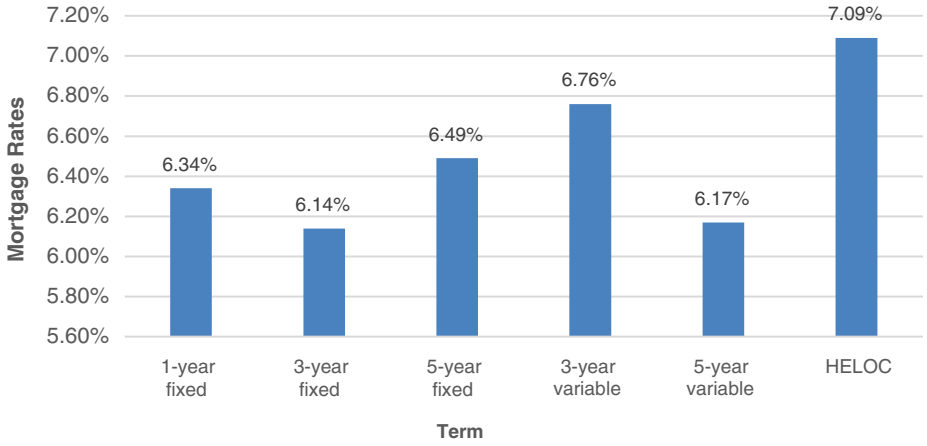
One of the continuing trends in real estate is environmentally sustainable building design. With the addition of energy-saving appliances and designs, home owners can reduce their home's energy consumption and therefore, save themselves money each month. In addition, lenders are also giving home owners an incentive to "go green" with the introduction of *Green Mortgages*. Green Mortgages typically offer savings to borrowers who purchase approved major appliances; heating, cooling and ventilation systems; as well as energy-saving windows, doors and skylights. These savings typically include discounted mortgage interest rates and/or cash rebates on the face value of the loan. Several green mortgage products currently exist; however, the requirements for each differ slightly.

Variable and Fixed Mortgage Interest Rates

Mortgage interest rates in Canada are influenced by the financial markets. The interest rate charged on a variable rate mortgage "floats" alongside the Bank of Canada's target overnight rate and the prime rate, which is the rate that banks charge their best customers. The interest rate on a variable rate mortgage is typically lower than the interest rate on a fixed rate mortgage. This reflects the reduced risk to the lending institution as any future change in the interest rate is passed on to the mortgagor. Only on rare occasions, such as periods of high short-term inflation, does the interest rate on variable rate mortgages exceed that of longer fixed rate term mortgages (which occurred during 2023). Figure 13.11 shows the relationship between rates charged on fixed and variable rates over a variety of terms. This figure confirms that equivalent term variable rate mortgages have rates lower than their fixed rate counterparts (also shown in Figure 13.12) but have been steadily increasing over the past two years. In addition, longer-term mortgages (fixed or variable) typically have higher interest rates.

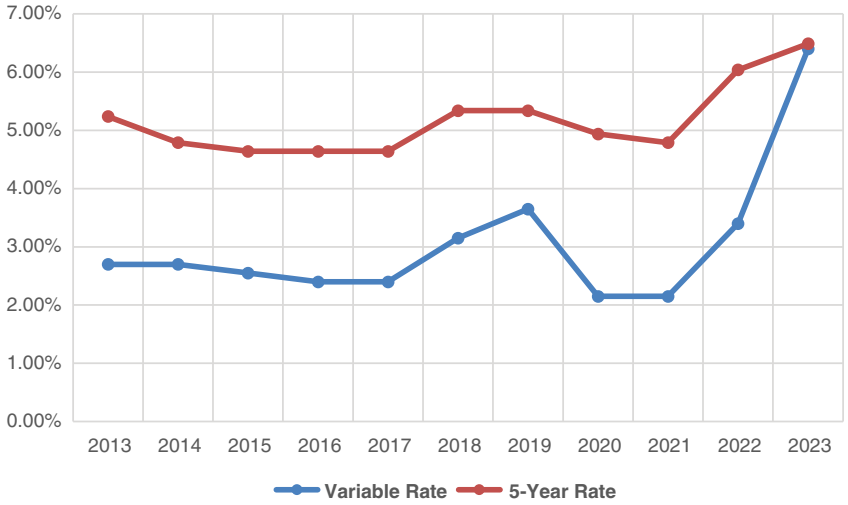
Many consumers prefer the security of a fixed rate mortgage. While the contracted interest rate is typically higher than a variable rate mortgage, the mortgagor has no risk of their mortgage payment increasing during the term of the mortgage. Fixed rate mortgages can have a term of up to 10 years and amortizations up to 25 years (insured) or 30-35 years for uninsured mortgages. The interest rate charged on fixed rate mortgages generally moves in tandem with bond yields and deposit rates of similar maturity, reflecting expectations of inflation. Demand and supply conditions in the growing mortgage-backed securities market also impact both variable and fixed term mortgage rates.

FIGURE 13.11: Mortgage Rate Comparison



Note: HELOC is Home Equity Line of Credit.
Source: *www.ratehub.ca* and *www.superbrokers.ca* (June 2023)

FIGURE 13.12: 5-Year Fixed Rate vs. Variable Rate



Source: *www.superbrokers.ca/tools/mortgage-rate-history* (June 2023)

Open vs. Closed Mortgages

One option for borrowers to consider is whether to choose an open or closed mortgage loan:

- **Open mortgages** allow borrowers to prepay a portion of their mortgage or the entire amount at any time with typically only a small administrative fee. Open mortgages generally have short terms, usually ranging from six months to one year. The flexibility of this option comes at a higher cost to borrowers, through higher interest rates than would be paid on a closed mortgage with a similar term.
- **Closed mortgages** prevent individual borrowers from prepaying their mortgage without penalty, except where they are permitted under the terms of their mortgage contract or by the *Interest Act*. The *Interest Act* allows borrowers to prepay all outstanding debt (with additional three months' interest in lieu of notice) at any time after five years from the initiation of the mortgage.

open mortgage
a mortgage loan in which a borrower is allowed to prepay a portion of their mortgage or the entire amount at any time (with a small administrative fee)

closed mortgage
a mortgage loan in which individual borrowers are prevented from prepaying their mortgage without penalty, except under certain circumstances

Another option for borrowers to consider is a convertible mortgage. These are typically short-term closed mortgage loans (usually with a term of six months or one year) with a fixed rate that allow borrowers to convert their mortgage to a longer term, while locking in at the current interest rate. This option to convert to a longer term at the current rate may be exercised when borrowers expect current rates to rise.

"Alternative" Mortgage Repayment Plans

Increased competition in the supply of mortgages, as well as changes in borrowers' preferences have led to an increase in the number of mortgage products available on the market. Borrowers are now faced with more choice and flexibility in terms of repayment plans, allowing them to select the one that best suits their individual needs.

Variable Rate Mortgage

As previously discussed, the variable rate mortgage (VRM), also known as a floating or adjustable rate mortgage, differs from a constant payment mortgage because the interest rate charged on the loan may be changed during the term of the mortgage. Generally, these loans are initially set up based on the current prime rate of interest. The loan is reviewed at specified intervals and if the market interest rate has changed, the mortgage repayment plan is altered by changing either the size of the payments or the length of the amortization period (or a combination of both). For example, a VRM may stipulate that a borrower pays interest equal to "prime plus 0.5%". Variable rate mortgages may also include a cap feature that still allows interest rates to fluctuate but provides a guarantee to borrowers that rates will not exceed the capped level. This feature provides some security to the borrower while still allowing them to anticipate changes in future rates. Many variable rate mortgages also include the option to convert to a fixed rate.

Vendor Take-Back Mortgage

The vendor take-back (VTB) loan is like a conventional first or second mortgage except that it is the vendor who carries the financing. If the VTB mortgage contract rate is different than the market rate, this could affect the perceived market value of the mortgage, in terms of investment analysis.

Graduated Payment Mortgage

The graduated payment mortgage (GPM) offers lower payments in early years of the loan that gradually increase over time. The low initial payments may facilitate financing for potential purchasers who otherwise might not have been able to qualify, which increases housing affordability. This type of mortgage has been used primarily with federal government home ownership mortgage lending programs, and due to the low interest rate environments, have not been very common in recent years.

Reverse Annuity Mortgage

In a reverse annuity mortgage (RAM), the lender makes a series of payments or advances to the borrower over the term of this mortgage. At the end of the loan term or upon the death of the borrower, the loan balance, consisting of the accumulated principal advances and the interest due, is repaid by refinancing, by sale of the property, or from the proceeds of the borrower's estate. This innovative mortgage has been introduced in Canada as a means of supplementing aged home owners' income, typically upon retirement. The arrangement allows borrowers to keep their home for a period of time while subsidizing a low retirement income.

Combination Mortgage

Combination mortgage products get their name from the fact that they switch between a fixed and variable interest rate during the contractual term of the loan. A combination mortgage can be thought of as having two payment periods. During the first period, the borrower will be locked into a fixed interest rate. Then, during the second period, the interest rate becomes adjustable and will vary with the prime rate. When borrowers enter into a combination mortgage, they will need to determine the duration of the initial payment period, or the period where the fixed interest rate will be used. This can span anywhere from 2 to 10 years depending on the lending institution and the needs of the borrower.

Home Equity Loan

A home equity loan allows home owners to use the equity in their home as security for borrowing money. Most lending institutions provide a home equity loan or home equity line of credit (HELOC) as an option to home owners who are looking to borrow funds. The value of the loan will be a predetermined percentage (typically up to 65%) of the home's purchase price or appraised value (whichever is less), minus the outstanding balance of any existing mortgage charges. The remaining amount can then be used by the home owner to do as they wish, whether it be to complete renovations, repay other loans, or for other purposes. It is sometimes referred to as a collateral mortgage.

Two types of home equity loans exist. Fixed rate home equity loans provide borrowers with a single lump-sum payment at the beginning of a term and the borrower repays this throughout the term at an agreed-upon interest rate. Variable rate loans, such as a home equity line of credit, provide borrowers with a pre-approved maximum amount to withdraw money from as they wish, when they wish. The borrower must then make at least a minimum payment each period, typically every month. Note that the government has withdrawn insurance backing on lines of credit secured by homes.

A home equity loan/line of credit can benefit both home owners and lenders. Home owners can extract cash from the value of their home. Though the interest rate charged on a home equity loan/line of credit may be higher than the interest rate charged on a first mortgage, it will typically be less than the interest rate charged on other types of loans (e.g., credit cards) because it is secured. Thus, many home owners will use a home equity loan to consolidate other debts at a lower rate of interest. Another appealing option for some borrowers is that if a home equity loan/line of credit is used to purchase an investment, the interest costs may be tax deductible. On the other hand, lenders benefit from the fees charged and the higher interest earned on the home equity loans, as well as the security the home provides for the loan.

Construction Financing

Construction financing (sometimes known as interim financing) is the source of mortgage funds actually received during the development process and used to carry out the development. The loan is secured by the real estate, typically by way of a first mortgage. Construction loans are not advanced to developers in a lump sum, rather, they are advanced incrementally in instalments as specific stages in development are completed. As a result, the developer must draw on other sources of working capital to carry the construction between receiving portions of the mortgage loan. As well, construction financing is typically set up as an interest only loan.

Line of Credit

A line of credit is used to supplement a developer's own reserves. It is arranged through a financial institution whose credit analysis focuses upon the developer's track record, business, and credit history. A line of credit will not necessarily be secured by a development property, as this could interfere with other

financing arrangements but will be secured by other security and personal guarantees. Generally, lines of credit will have a ceiling on the amount that can be obtained, will require periodic payment of interest and debt reduction, and are payable in full on demand of the lender. A line of credit gives additional liquidity to the developer beyond the cash reserves and allows the developer to expand beyond the limits imposed by the construction loan and available cash resources.

Hybrid Mortgage

A hybrid mortgage allows borrowers to diversify and have exposure to both variable and fixed rates. Depending on the lender, the borrower can choose how much of the mortgage is at the variable rate and how much is at the fixed rate, e.g., 50/50; 70/30. This allows borrowers to reduce their exposure to the fluctuations of a variable rate and enjoy the security a fixed rate offers.

Improvement Mortgage

CMHC and Sagen™ (formerly known as Genworth Financial Canada) have insured mortgage programs available that will allow a borrower to purchase a property, renovate it, and pay for it with one mortgage by putting as little as 5% to 10% down. The amount of the down payment is based on the lower of the purchase price plus the actual costs of the improvement or the "as improved" value. As well, the percent of the down payment required is based on the number of units; up to a maximum of four with one of them being owner-occupied. The additional amount borrowed for the renovation is held in trust and is not released until the work has been completed, inspected, and appraised. Therefore, it may be necessary for the borrower to finance the renovation costs until completion or pay an initial deposit or instalment to the renovation contractor.

Participation Mortgage

While mortgages are generally considered to be a form of debt financing, lenders have occasionally attempted to obtain some element of equity participation in various ventures they are asked to finance. During periods of tight mortgage funds and rapidly rising property values, such as in the 1970s and 1980s, lenders may see advantages in participating in the return to the property. Advantages of participation may include improved investment yields and tax advantages. Adding a participation element may help convince lenders to place their funds in mortgages rather than bonds or other competing investments. In an inflationary environment, equity participation adds a hedge against the impact of unexpected inflation on long-term fixed yield investments. In development situations, participation mortgages are commonly used as mezzanine loans[3] but not as primary mortgage financing.

On the borrower side, participation loans can help builders/investors gain access to additional financing sources and help offset the increased demands for capital caused by higher cost of land, materials, and labour. The improved financing takes the form of higher loan-to-value ratios (within legal limits) and extended amortization periods. However, given that the lender is taking on increased risk with participation loans (due to the uncertainty of the participation amount), the lender must receive a return that is greater than that possible with a standard repayment scheme.

Shared Appreciation Mortgage

A difficulty with income-sharing participation mortgages is that they cannot be used in cases where there is no income, e.g., owner-occupied residences. Shared appreciation mortgages (SAMs), provide the lender with a fixed percentage of the gain (appreciation) in property values, in exchange for a reduction in the mortgage rate. The participation clause usually states that the share is payable whenever the property is sold, or at some deemed date of sale, e.g., 10 years after the loan is initiated. By participating in the appreciation of the property, the lender takes an additional risk that is related to its value. Whether or not this is a favourable trade-off depends on the real estate market conditions. When markets are declining, lenders will not be willing to take on this type of loan. Borrowers must look ahead and forecast how much their property's equity will appreciate.

[3] A mezzanine loan is a hybrid loan of debt and equity, generally subordinate to any senior debt.

SAMs were introduced in the 1980s when interest rates were in the double digits and loan qualification was a major concern. Since then, their popularity has declined – but we know business is cyclical, and as conditions change, what was once a profitable alternative may return.

Risk of Shared Appreciation Mortgages

For a brief period in the late 1990s, the UK's Barclays Bank sold SAMs. Borrowers made zero repayments throughout the term of their loan, and instead agreed to repay on sale of their property the original sum borrowed, plus a percentage of the house price increase (equity) up to a maximum of 75%. Thus, if the house price were to decrease, the borrower would only need to repay the original sum borrowed. A condition of the loan indicated that it could not be transferred to another property.

Borrowers who took advantage of these SAMs saw the value of their homes increase at an unprecedented rate. Subsequently, some of the SAM customers found themselves in situations of substantial hardship, which is often exacerbated by the terms of the product. As these loans were sold to third party investors in 1999, Barclays is unable to vary the terms of the outstanding SAMs. To assist the customers undergoing financial difficulties, Barclays Bank set up the Barclays Shared Appreciation Mortgage (SAM) Hardship Scheme in June 2007. The SAM Hardship Scheme aims to help customers who are in a situation of substantial hardship, and as a result need to move to a more suitable property or adapt their existing home to make it suitable to their needs.

MORTGAGE INTEREST RATES AND THE FEDERAL *INTEREST ACT*

Essentially, interest is rent charged for the use of borrowed funds, i.e., the principal amount. A loan contract will specify that interest will be charged at the end of a specified time period, e.g., interest might be charged at the end of each month that the borrower has had the use of the funds. These interest periods are referred to as "compounding" periods; if interest is charged monthly, the loan is said to have monthly compounding. The amount of interest charged at the end of a compounding period is some specified percentage of the amount of principal the borrower has had use of during the *entire compounding period*. The percentage is referred to as the periodic interest rate or the interest rate per compounding period. The amount of interest charged at the end of the compounding period is equal to the amount of principal outstanding during the compounding period multiplied by the interest rate expressed as a decimal.

Borrowers and lenders are concerned with the interest rate per compounding period, and how often these payment periods occur (or the length of the compounding periods). For example, if $1,000 is borrowed at 1.5% per compounding period, the borrower will pay more interest in a year if this 1.5% is charged monthly than if it is charged semi-annually (that is, monthly compounding rather than semi-annual compounding). When analyzing a financial arrangement, whether it is a credit card balance, a demand loan, or a mortgage, it is important to know both the interest rate per compounding period and the frequency of compounding. Borrowers and lenders may agree on any interest rate, frequency of compounding, or frequency of payment. However, in Canada, a provision of the *Interest Act* requires the rate of interest to be quoted in a mortgage contract with either annual or semi-annual compounding. This provision has resulted in semi-annual compounding becoming the industry rule for mortgages.[4]

Financial Fluency

Mathematics is often described as another form of language. Like learning a new language, this requires understanding the grammar and then a lot of memorization and repetition until you can use it without really thinking about it. For financial analysis, the mathematics involves the use of formulas. These are usually pre-programmed into a financial calculator or into a spreadsheet; therefore, most financial analysts do not work with the formulas directly. However, in all cases, the interest rate must be correctly applied, or the calculator/spreadsheet will not operate accurately. To be successful in financial analysis, you must be *fluent* in your understanding of how interest rates are stated and in how to work between the different types as required for the financial tool you are working with.

The financial calculations in this chapter will start out with basic problems, such as interest accrual loans and investments involving the present and future value of a single cash flow. The calculations will advance to more complicated examples in future chapters. Much like the construction of a high-rise, you need a solid foundation before you can start building the upper floors.

[4] The reason semi-annual compounding is quoted rather than annual compounding is because it results in interest rates that appear to be lower than those based on annual compounding.

SETTING UP THE HP 10bII+ CALCULATOR

The Hewlett Packard (HP) 10bII+ will be used in the demonstration of analytical techniques in the financial chapters of the course. For your assistance, wherever mortgage finance calculations are required in this chapter, and all subsequent chapters, the correct sequence of key punching for the HP 10bII+ calculator is provided.

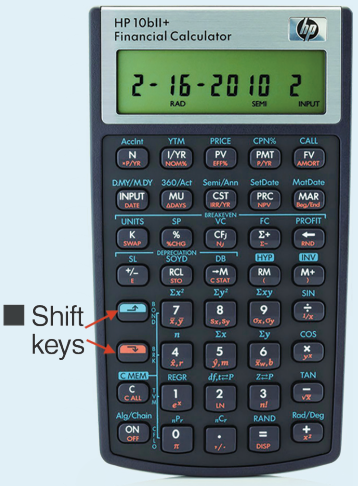
However, there are a variety of pre-programmed financial calculators on the market, some of which perform more sophisticated calculations or have greater programming capacity. While there is no particular type of calculator that is required for this course, only silent, cordless, hand-held calculators that are not both alphanumeric and programmable are permitted in the examination room. If you elect to use a calculator other than the HP 10bII+ it is strongly recommended that you ensure that the alternate calculator will perform all necessary calculations. It will then be up to you to consult the owner's manual to determine how the calculator of your choice operates.

ALERT

Students may wish to view the "Introduction to the HP 10bII+ Calculator" online video tutorial found under "Tutorial Assistance" and "Course Materials" on the Course Resources webpage. As well, students can consult the HP 10bII+ owner's manual for more information.

Orientation Tips for the HP 10bII+ Calculator

The HP 10bII+ has some unique features; some basic orientation will help avoid difficulties.



1. Setting Up Your Calculator

Many keys on the calculator have multiple programmed functions. The additional functions are accessed by using the ■ (shift) key. When the ■ (shift) key is pressed, pressing the next key will activate the function printed in orange or blue on or above that key.

The HP 10bII+ has two ■ (shift) keys. One is orange for financial functions; the other is blue for statistical functions. To access the financial functions on the calculator, students should always use the ORANGE ■ (shift) key. All functions that are activated by the ORANGE ■ (shift) key are located on the lower half of each of the calculator keys, and are also labeled in ORANGE. We do not use the BLUE ■ (shift) key in this course.

Decimal Places: The HP 10bII+ allows you to set the number of decimal places displayed using the ORANGE ■ then DISP key. It is best to display more decimal places than you need, so you are working with the most accurate numbers possible. For ease of presentation, the examples presented in this course are based on the calculator's display set to six decimal places. This is accomplished by turning the calculator ON, pressing the ORANGE ■ then DISP and then the 6 key. You will see 0.000000 on your display screen. **However, note that we will not list these zeros in the calculator step descriptions as they are mathematically insignificant and do not impact the results.**

2. Positive and Negative Cash Flows

The internal operation of the HP 10bII+ calculator requires that all financial calculations have at least one positive and one negative cash flow. This means that at least one of the PV, FV, and PMT keys will have to be shown and/or entered as a negative amount. Generally, looking at problems from the borrower's perspective, cash flowing in is positive, while cash flowing out is negative.

For example, in mortgage loan problems, the borrower receives loan funds at the beginning of the term (cash in, so a positive amount) and pays back the loan funds either during or at the end of the term (cash out, so negative amounts). In this type of problem, PV will be shown/entered as a positive, while PMT and FV will be shown/entered as negative values. When entering a negative amount, the +/– key is used, not the – key! However, from the lender's/investor's perspective, the initial amount is paid out (cash out, so negative amount) and the lender/investor receives money in the future (cash in, so positive amount). This problem could also be set up with PV shown/entered as a negative and PMT and FV shown/entered as positive values.

continued next page

Problems can be solved either way – the key is to ensure that the PV is one sign and the PMT/FV are the opposite sign.

Summary	
Borrower's Perspective	**Lendor's/Investor's Perspective**
PV +	PV –
PMT –	PMT +
FV –	FV +

3. Clearing Information on Your Calculator

Note that if you enter an incorrect number on the screen, it can be cleared by pushing C once or by pressing the ← key to delete the last entered digit. If you enter an incorrect number into any of the six financial keys, N, I/YR, PMT, PV, FV, or P/YR, it can be corrected by re-entering the desired number into that key. You can verify what information is stored in each of the above financial keys by pressing RCL and then the corresponding financial key you are interested in. For example, if you obtained an incorrect solution for a financial problem, you can check what is stored in N by pressing RCL N; I/YR by pressing RCL I/YR, etc. The HP 10bII+ calculator has a "constant memory". This means that whatever is stored in the keys remains there until it is expressly changed (even when the calculator is turned off), unless the ■ C ALL function is used or the batteries are removed.

4. Troubleshooting

i. Please be aware that the HP 10bII+ calculator has both Begin and End modes. To switch between modes, press ■ Beg/End. The Begin mode is needed for annuity due calculations, or those that require payments to be made "in advance". For example, lease payments are generally made at the beginning of each month, not at the end. On the other hand, interest payments are almost always calculated at the end of each payment period, or "not in advance". These types of calculations each require a different setting on the calculator. When your calculator is set in Begin mode, the bottom of the display screen will show BEG. If BEG is not on your display screen, your calculator must be in End mode, as there is no annunciator for this mode.

In this course, there are no examples that require your calculator to be in Begin mode, so your calculator should be in End mode at all times. You should not see the BEG annunciator on your calculator's display for any calculations in this course.

ii. Please be aware that if the calculator is displaying a comma (,) instead of a decimal place (.), this can be fixed by pressing ■ ,/.

5. Calculator Tutorial

Students may wish to view the Introduction to the HP 10bII+ Calculator online video tutorial found under Tutorial Assistance on the course website. As well, students can consult the HP 10bII+ owner's manual for more information.

BASIS OF INTEREST CALCULATIONS

Nominal and Periodic Interest Rates

As discussed in the preceding section, borrowers and lenders are concerned both with the interest rate per compounding period and how often the compounding periods occur. Therefore, it is necessary to have a system of identifying the rate of interest on a yearly basis, the number of times interest is charged each year, and the rate of interest that applies at the end of each compounding period. The annual interest rate generally quoted for compound interest is referred to as the *nominal interest rate per annum*. The nominal rate is represented mathematically as "j_m" where:

nominal interest rate per annum
the annual interest rate generally quoted for compound interest

j_m = Nominal interest rate compounded "m" times per year
m = Number of compounding periods per annum
i = Interest rate per compounding period

The nominal rate of interest compounded "m" times per year (j_m) is equal to the periodic interest rate per compounding period (i) times the number of compounding periods per year (m).

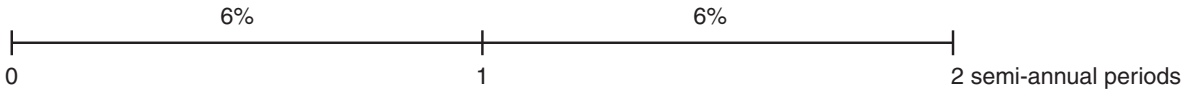
$$j_m = i \times m \quad \text{or} \quad i = \frac{j_m}{m}$$

The nominal rate (j_m) is always expressed as a certain percentage per annum compounded a specific number of times per annum (m). Consider the nominal rate of 12% per annum, compounded semi-annually, not in advance.[5] This would be expressed as:

$$j_2 = 12\% \quad \text{and} \quad i = \frac{j_2}{2} = \frac{12\%}{2} = 6\%$$

Thus, the statement that interest is 12% per annum, compounded semi-annually (not in advance) tells the analyst that there are two (m) compounding periods per annum and that interest is to be 6% ($i = j_m \div m$) per semi-annual compounding period.

This can be illustrated using a time diagram[6] as shown below:



$j_2 = 12\%$	Nominal interest rate (per year)
$m = 2$	Number of semi-annual periods per year
$i = 6\%$	Periodic interest rate (semi-annual period)

Just as the nominal interest rate per annum (j_m) has an indicated frequency of compounding (m), it is also necessary to specify the frequency of compounding for periodic rates. The following shorthand notation is used in these chapters to indicate the frequency of compounding that is intended for periodic rates:

- i_d represents an interest rate per daily compounding period
- i_w represents an interest rate per weekly compounding period
- i_{mo} represents an interest rate per monthly compounding period
- i_q represents an interest rate per quarterly compounding period
- i_{sa} "represents an interest rate per semi-annual compounding period
- i_a represents an interest rate per annual compounding period

For example:

$i_d = j_{365} \div 365$

$i_w = j_{52} \div 52$

$i_{mo} = j_{12} \div 12$

$i_q = j_4 \div 4$

$i_{sa} = j_2 \div 2$

$i_a = j_1 \div 1$

The interest rate j_1, which is the nominal rate per annum, compounded annually, is also known as the *effective annual interest rate*. It will be used in later chapters to find equivalent interest rates.

effective annual interest rate
the nominal rate per annum, compounded annually

Completion of Exercise 13.1 should provide an increased familiarity with periodic interest rates, compounding frequency, nominal rates, and the interrelationship between them.

[5] "Not in advance" refers to the fact that the amount of interest accruing over the compounding period is calculated at the end of the compounding period, so that the borrower pays the interest at the end (or, not in advance) of the compounding period. Almost all rates of interest are calculated "not in advance." Therefore, the statement "not in advance" is frequently not used, and the interest rate would be quoted as 12% per annum, compounded semi-annually. Unless it is explicitly stated to be otherwise, students may assume that all interest rates are "not in advance."

[6] Time diagrams are shown as a horizontal line representing time. The present value is at the left (time 0) and the future value is at the right. In financial arrangements, time is measured by compounding periods, and so two semi-annual compounding periods are shown along the "time" line.

Exercise 13.1

The tables below represent a sample of interest rates. Complete the tables by entering the appropriate values for the question marks for either the periodic rate, the number of compounding periods, or the nominal rate.

Question	Periodic Rate (i)	Number of Compounding Periods per Year (m)	Nominal Rate ($j_m = i \times m$)
SAMPLE	3%	2	$j_2 = 6\%$
(a)	0.625%	12	$j_{12} = ?$
(b)	1.275%	4	$j_4 = ?$
(c)	4%	1	$j_1 = ?$
(d)	3.4%	2	$j_2 = ?$
(e)	6%	2	$j_2 = ?$
(f)	2.5%	m = ?	$j_m = 10\%$
(g)	0.5%	m = ?	$j_m = 6\%$

Question	Nominal Rate j_m	Number of Compounding Periods per Year (m)	Periodic Rate ($i = j_m \div m$)
SAMPLE	$j_2 = 5\%$	2	$i_{sa} = 2.5\%$
(h)	$j_{12} = 6\%$	12	$i_{mo} = ?$
(i)	$j_4 = 10\%$	4	$i_q = ?$
(j)	$j_{365} = 8\%$	365	$i_d = ?$
(k)	$j_{52} = 13\%$	52	$i_w = ?$
(l)	$j_1 = 4\%$	1	$i_a = ?$
(m)	$j_m = 10\%$	m = ?	$i_{sa} = 5\%$
(n)	$j_m = 4.5\%$	m = ?	$i_{mo} = 0.375\%$

Solution:

(a) $j_{12} = 7.5\%$
(b) $j_4 = 5.1\%$
(c) $j_1 = 4\%$
(d) $j_2 = 6.8\%$
(e) $j_2 = 12\%$
(f) m = 4
(g) m = 12
(h) $i_{mo} = 0.5\%$
(i) $i_q = 2.5\%$
(j) $i_d = 0.0219178\%$
(k) $i_w = 0.25\%$
(l) $i_a = 4\%$
(m) m = 2
(n) m = 12

Compound Interest Calculations

As an introduction to the nature of compound interest calculations, consider Illustration 13.1:

Illustration 13.1

A commercial enterprise has arranged for an interest accruing loan whereby the $10,000 amount borrowed is to be repaid in full at the end of one year. The borrower has agreed, in addition, to pay interest at the rate of 8% per annum, compounded annually on borrowed funds and this interest is to be calculated and paid at the end of the loan's one-year term. Calculate the amount of interest due, and the total amount owing, at the end of the term of the loan.

Solution:

Given that the borrower owes $10,000 throughout the year, the amount of interest owing at the end of the one-year term is calculated as follows:

Interest owing = Principal borrowed × interest rate per interest calculation period (in this example, interest is calculated per annual compounding period)

Interest owing = $10,000 × 8%

Interest owing = $10,000 × 0.08

Thus, the amount of interest owing at the end of the one-year term is $800. The total amount owing at the end of the one-year term of this interest accruing loan would be the principal borrowed ($10,000) plus the interest charged ($800) or $10,800.

This example introduces several important definitions and concepts. Financial analysts use short form abbreviations for the loan amount, interest rates and other mortgage items. In this shorthand notation, the following symbols are used:

PV = Present value: the amount of principal owing at the beginning of an interest calculation period

FV = Future value: the amount of money owing in the future

i = Interest rate per compounding period; the fraction (or percentage) used to calculate the dollar amount of interest owing

I = Interest owing, in dollars, at the end of an interest calculation (compounding) period

N = Number of compounding periods contracted for

In Illustration 13.1, calculation of the amount of interest owing is determined as follows:

I = PV × i

I = $10,000 × 8%

I = $10,000 × 0.08

I = $800

The total amount owing at the end of the one-year term would be:

FV = PV + I

FV = $10,000 + $800

FV = $10,800

FV = $10,800

ALERT

For illustrations in this course, the HP 10bII+ calculator is set to six decimal places by pressing ■ DISP 6. However, for ease of presentation, on the display portion of calculator steps, we will not show the display with zeros when they do not impact the result (and are mathematically insignificant).

Calculation

Press	Display	Comments
10000 × .08 =	800	Equals interest owing
+ 10000 =	10,800	Equals total owing

This example can be illustrated on a time diagram:

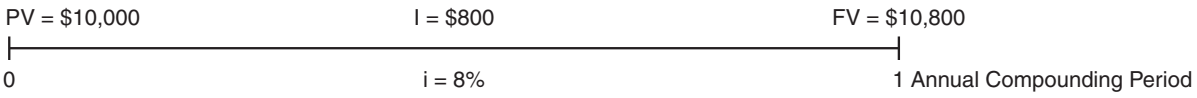


Illustration 13.2

Assume that the commercial borrower in Illustration 13.1 arranged for another loan, which was similar in all respects, except that the contract specified a term of three years. Calculate the amount owing at the end of the three-year term of the interest accruing loan.

Solution:

The amount owing at the end of the three-year term is calculated in a series of steps based on the analysis presented in Illustration 13.1. The amount owing at the end of the first compounding period (in this case, at the end of the first year) must be calculated. This amount was calculated to be $10,800 (the $10,000

originally borrowed plus $800 interest). As a result, the amount owing *during* the second year (or second annual compounding period) would be $10,800. The amount owing at the end of the second year of the contract can be calculated in the same way as in Illustration 13.1.

I = PV × i

I = $10,800 × 8%

I = $10,800 × 0.08

I = $864

Thus, the amount of interest that is charged (but not paid) at the end of the second year of the loan term is $864. As no payments (of principal or interest) are due until the end of the loan term, this amount is added to the balance owing at the end of the second year.

FV = PV + I

FV = $10,800 + $864

FV = $11,664

The total amount owing during the third year of the contract would be $11,664. The amount owing at the end of three years can be calculated in a similar fashion:

I = PV × i

I = $11,664 × 8%

I = $11,664 × 0.08

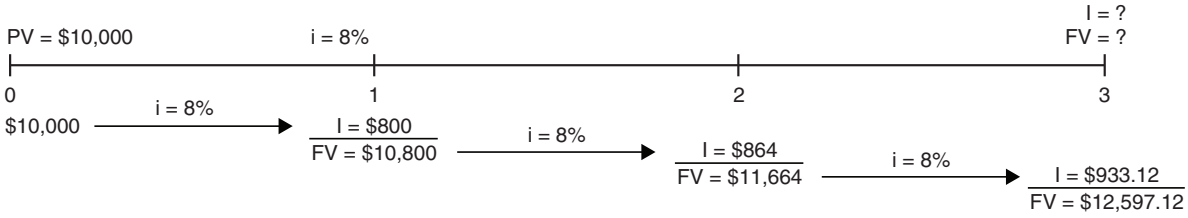
I = $933.12

FV = PV + I

FV = $11,664 + $933.12

FV = $12,597.12

This calculation above can be summarized on a time diagram, similar to Illustration 13.1:



The previous calculations show that the steps involved in determining the amount owing on an interest accruing loan can be time-consuming. Therefore, to reduce the number of calculations involved in interest accruing loans, the financial calculator has been pre-programmed to perform this function.

It was noted earlier that the amount owing at the end of year one could be determined by first calculating the amount of interest at the end of the first (annual) compounding period, then adding this amount to the principal borrowed. The formulas used to perform these calculations were I = PV × i and FV = PV + I. By using these relationships in a repetitive fashion, the amount owing at the end of the term of an interest accruing loan could be determined. However, there is a faster way to do these calculations.

In Illustration 13.2 the amount owing at the end of the first year can by determined by calculating 108% of the amount owing during the year. This would involve multiplying the amount owing during the year by 108% (or 1.08) to get $10,800, the product of multiplying $10,000 by 1.08. The amount owing at the end of the second year will be the amount owing during the second year ($10,800), multiplied by 108% (or 1.08); i.e., $11,664. Finally, and recognizing that the borrower owes $11,664 during the third year, the amount owing at the end of the third year can be calculated by multiplying this value by 108% (or 1.08) with the result of $12,597.12.

To summarize, the problem can be solved as follows:

Amount owing at end of Year 1 = $10,000 × 1.08 = $10,800

Amount owing at end of Year 2 = $10,800 × 1.08 = $11,664

Amount owing at end of Year 3 = $11,664 × 1.08 = $12,597.12

A simpler calculation recognizes that for each annual compounding period the principal outstanding is multiplied by 1.08:

FV = $10,000 × 1.08 × 1.08 × 1.08

FV = $12,597.12

Therefore, in determining the amount owing at the end of the term of an interest accruing loan, the principal amount originally borrowed can be multiplied by one plus the rate of interest per compounding period (expressed as a decimal) for the number of compounding periods during the contract term. To simplify the analysis even further, standard mathematical notation can be used, which represents the value of one plus the rate of interest per compounding period as (1 + i).

A superscript indicates that a number has been raised to a power (or multiplied by itself some number of times) and the relationship may be restated as follows:

$$FV = \$10{,}000 \times (1.08)^3$$

or in more general terms:

$$FV = PV \times (1 + i)^n$$

where: FV = Future value (or amount owing in the future)

PV = Present value (or original amount borrowed)

i = Interest rate per compounding period expressed as a decimal

n = Number of compounding periods in the loan term

The calculator used in this course can do repetitive multiplications as outlined above; i.e., the calculator is pre-programmed for exponential calculations. The following steps show how the calculator can be used to determine the amount owing on the loan by using the exponential function.

Calculation

Press	Display	Comments
1.08 ■ y^x 3 =	1.259712	1.08 raised to the power of 3
× 10000 =	12,597.12	Total amount owed at end of Year 3

The use of the exponential key y^x reduces the number of repetitive calculations required in analyzing interest accruing loans. One need only determine the value of $(1 + i)^n$ at the appropriate rate of interest (expressed as a decimal) and for the appropriate number of compounding periods and then multiply the result by the principal amount borrowed. Since this type of financial analysis is commonly needed in the real estate and finance industries, financial calculators have been pre-programmed with the underlying mathematical relationship developed above.

When using the HP 10bII+ calculator, the above formula, $FV = PV \times (1 + i)^n$, must be slightly modified to consider nominal interest rates. Recall that a periodic rate is equal to the nominal rate divided by the compounding frequency. Thus, the formula becomes:

$$FV = PV \times (1 + j_m/m)^n$$

where: j_m = Nominal interest rate per annum

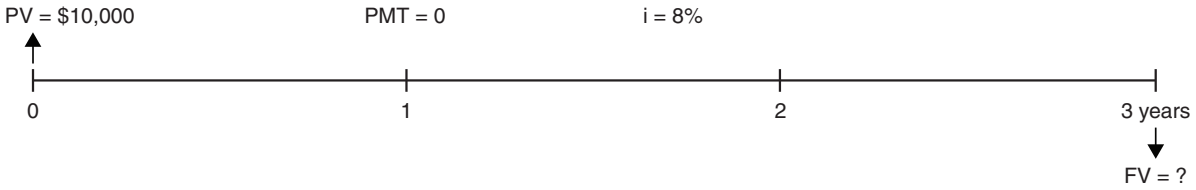
m = Compounding frequency

n = Number of compounding periods in the loan term

This modified version is necessary because this calculator only works with nominal interest rates. This formula for interest accruing loans has been pre-programmed into the mortgage finance keys of the HP 10bII+ calculator. These keys are:

I/YR	Nominal interest rate per year (j_m) – entered as a percent amount (not as a decimal) ■ P/YR "Periods per year" (m) – this indicates the compounding frequency of the nominal rate in I/YR and is located below the PMT key
N	Number of compounding or payment periods in the financial problem – this number will be expressed in the same frequency as P/YR (i.e., if P/YR is 12, then N represents the number of months)
PV	Present value
FV	Future value after N periods
PMT	Payment per period – this is expressed in the same frequency as P/YR and N (i.e., if N is months, PMT represents the payment per month)

Illustration 13.2 is once again illustrated below with a time diagram but with a new feature added. The cash flows are placed along the horizontal line with an arrow representing positive or negative cash flows. An "up arrow" represents a positive cash flow (money received), while a "down arrow" represents a negative cash flow (money paid out).



To solve this problem with the HP 10bII+ calculator, a number should be entered and then "labelled" appropriately. For example, the loan in this example has a 3-year term, so "3" should be entered and then N pressed to enter a value of 3 as the number of compounding periods during the term. **By entering a number and then labelling it, you can enter the information in any order.**

Calculation

Press	Display	Comments
8 I/YR	8	Enter nominal interest rate per year
1 ■ P/YR	1	Enter compounding frequency
3 N	3	Enter number of compounding periods
0 PMT	0	No payments during term
10000 PV	10,000	Enter present value (the borrower receives the cash, so it is entered as a positive amount)
FV	–12,597.12	Computed future value (this will be paid out by the borrower, so it is a negative amount)

This is the same answer as that calculated with either of the two approaches shown earlier but with much less work needed.

FUTURE VALUE AND PRESENT VALUE OF LUMP SUMS

One type of compound interest calculation that is frequently encountered relates to the future and present values of a single payment at some point in time, which is called a lump sum amount. This section will expand on how the financial calculator can be used to solve the following relationship for the future value, present value, interest rate, or term of an interest accruing loan.

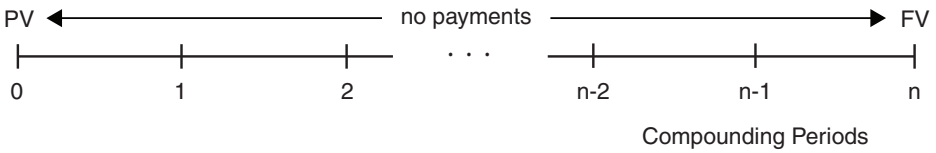
Consider the interest accrual formulas given earlier in this chapter:

$$FV = PV \times (1 + i)^n \quad \text{or} \quad FV = PV \times (1 + j_m/m)^n$$

If the values of any four of the five variables (FV, PV, j_m, m, and n) are known, one may directly calculate the value of the fifth variable. However, you need the following conditions for the above relationship (or the financial calculator) to be used:

1. The present value must occur at the *beginning* of the first compounding period.
2. The future value must occur at the *end* of the last (or n^{th}) compounding period.
3. Interest rates must be expressed as a rate of interest per compounding period when solving using the exponent key y^x, or as a nominal rate per year when using the calculator's pre-programmed functions.
4. There can be no payments (made or received) during the term other than the present value and future value, i.e., PMT = 0.

These conditions are summarized in the following time diagram:



Calculation of Future Value

A common interest accrual problem involves calculating the future value of a lump sum. When you receive (or invest) a lump sum cash flow today and need to find the value of this cash flow with accrued interest at some point in the future, it is known as the future value of a lump sum. The following illustrations demonstrate how to use the pre-programmed feature of the HP 10bII+ calculator to solve these types of problems.

Illustration 13.3

A residential subdivision developer has purchased a 30-acre section of land for $400,000. The firm feels that land values in the area will increase at the rate of 1% per month over the next 3 years. If this rate of increase in property values proves to be correct, calculate the value of the parcel at the end of the three years.

Solution:

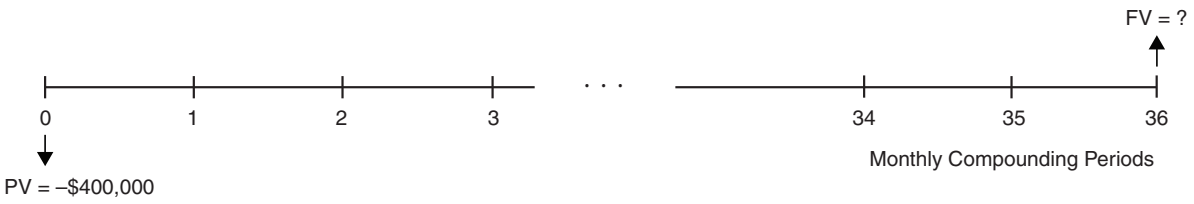
The objective of this problem is to calculate the future value of $400,000 at the end of 3 years, where the rate of interest is 1% per compounding period. This problem can be solved using the exponential y^x key. However, using the pre-programmed financial features, the solution may be done as follows. The number of compounding periods during the investment period must be identified. The periodic rate of interest was given as 1% per month and the investment horizon is three years; this means that the number of compounding periods is 36 (12 × 3) and the nominal interest rate per year is j_{12} = 12% (1% × 12). The development firm will receive no income from the property during the three-year investment horizon and wishes to know the likely future value of the parcel:

$$FV = PV \times (1 + i)^n$$

$$FV = \$400{,}000 \times (1 + 1\%)^{36}$$

$$FV = \$400{,}000 \times (1 + 0.01)^{36}$$

The financial arrangement involved may be illustrated by a time diagram:



Calculation

Press	Display	Comments
1 × 12 = I/YR	12	Enter nominal interest rate per year
12 ■ P/YR	12	Enter compounding frequency
3 × 12 = N	36	Enter number of compounding periods
0 PMT	0	No payments during term
400000 +/– PV	–400,000	Enter present value
FV	572,307.513437	Computed future value

Notice that the present value is shown as a negative in this example. This represents the funds needed to purchase the land, which is an outflow of cash for the developer. The future value that will be calculated represents the money received by the developer for selling the land in three years, which is a cash inflow and a positive amount.

If property values rise at a rate of 1% per month, and the current value of the property is $400,000, the property will have a value of $572,307.51 at the end of 3 years.

ALERT

Rounding Rules Alert!

When calculating monetary amounts, numbers will have to be rounded off, since it is impossible to pay or receive an amount less than one cent. When rounding monetary values (e.g., PV, FV, or PMT), normal rounding rules are applied. This is the common mathematical rule that states:

- If the third decimal is 5 or greater, the number is rounded up: e.g. 8,955.436 would be rounded UP to $8,955.44 (because the third decimal is a 6).
- If the third decimal is less than 5, the number is rounded down: e.g. 8,955.433 would be rounded DOWN to $8,955.43 (because the third decimal is a 3).

Assume all monetary values are rounded to the nearest cent, *unless instructed otherwise.*

Illustration 13.4

An individual deposits $15,000 in an account bearing interest at the rate of 3% per semi-annual compounding period. He intends to let the interest accrue on this deposit and then invest the total amount in real estate. If the funds are deposited for a four-year period, what amount will be available at the end of this time?

Solution:

The information given in the problem is as follows:

PV = $15,000 (paid out, therefore a negative amount)

i_{sa} = 3% per semi-annual compounding period

n = 8 semi-annual compounding periods (4 × 2)

PMT = 0

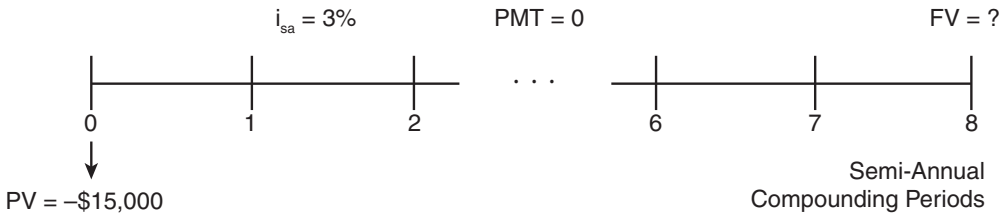
FV = ?

Now you need to calculate the future value, or the amount accumulated by the end of eight semi-annual compounding periods (four years):

$FV = PV \times (1 + i)^n$

$FV = \$15{,}000 \times (1 + 3\%)^8$

$FV = \$15{,}000 \times (1 + 0.03)^8$



Calculation

Press	Display	Comments
3 × 2 = I/YR	6	Enter nominal interest rate per year
2 ■ P/YR	2	Enter compounding frequency
15000 +/– PV	–15,000	Enter present value
4 × 2 = N	8	Enter number of compounding periods
0 PMT	0	No intervening payments
FV	19,001.551221	Computed future value

Thus, the investor will have accumulated a total of $19,001.55 by the end of the 8th semi-annual compounding period, i.e., the end of 4 years.

Illustration 13.5

Assume for the moment that the investor in this question had to withdraw these funds after only three years. How much would be available at the end of three years?

Solution:

To calculate this amount, you need only enter the variable that has changed N and re-calculate FV. All of the other financial keys will still have the correct amount stored in them from the previous calculation (you can verify this by pressing RCL and the corresponding financial key).

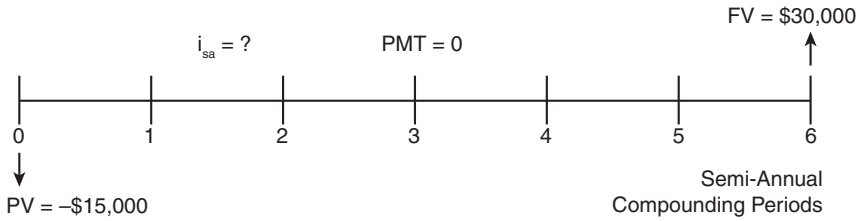
Calculation (continued)

Press	Display	Comments
	19,001.551221	Displayed from previous calculation
3 × 2 = N	6	Enter new number of compounding periods
FV	17,910.784448	Computed future value

The investor would have only accumulated $17,910.78 after three years.

Now assume that the investor will still have to withdraw the funds in 3 years but will need to have at least $30,000 accumulated by the end of this time. What interest rate must the investor earn to accumulate this amount?

This calculation is similar to the preceding example. The only variable that will change is the future value and the interest rate becomes the unknown amount that needs to be calculated. All the other financial keys should be the same as in the previous calculation.



Calculation (continued)

Press	Display	Comments
	17,910.784448	Displayed from previous calculation
30000 FV	30,000	Enter new future value
I/YR	24.49241	Computed interest rate (j_2)

Thus, the investor would need to receive a return of over 24.49% (j_2) to accumulate $30,000 in 3 years.

Illustration 13.6

Assume that you arrange an investment of $20,000 yielding interest at 5% per annum, compounded monthly. What is the future value of this investment after 15 months?

Solution:

$$FV = PV \times (1 + i)^n \quad \text{or} \quad FV = PV \times (1 + j_m/m)^n$$

where: PV = $20,000

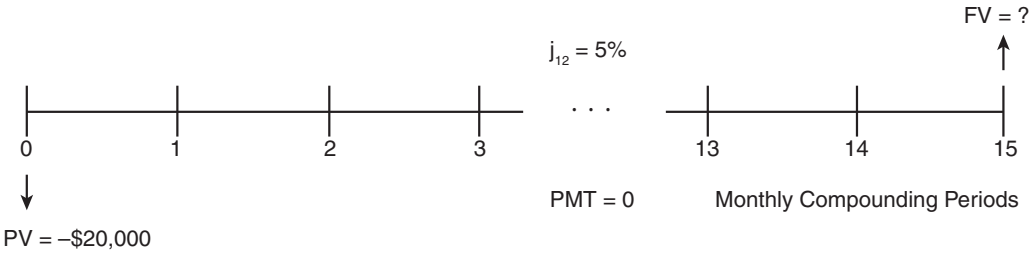
j_{12} = 5% (5% per annum, compounded monthly)

m = 12 (monthly compounding)

n = 15 months

FV = ?

The financial arrangement involved may be illustrated by a time diagram.



In the absence of information, it is assumed that there will be no payments made during the 15-month investment period; therefore, payments are zero. Note that in this illustration, "n" is expressed in months and the interest rate is compounded monthly.

Calculation

Press	Display	Comments
5 I/YR	5	Enter stated nominal rate
12 ■ P/YR	12	Enter stated compounding
15 N	15	Enter number of months
20000 +/– PV	–20,000	Enter amount of the initial investment
0 PMT	0	No payments
FV	21,287.124913	Computed future value

The future value of this investment after 15 months would be $21,287.12.

Calculation of Present Value

In the previous section, the calculator was used to solve for the future value of lump sum problems. Another common lump sum problem is calculating the present value of a cash flow received at some point in the future. For example, you may need to calculate how much to pay for an investment today given its expected

pay-off in the future. In this type of problem, the *time value of money* says that money received in the future is worth less than money received today; in calculating the present value, you are determining how much less it is worth, given the interest rate and length of time.

To calculate the present value of a lump sum, the formula given earlier is rearranged as follows:

$$PV = FV \times (1 + i)^{-n} \quad \text{or} \quad PV = FV \times (1 + j_m/m)^{-n}$$

However, this formula has been pre-programmed into the calculator, and as a result the only difference in calculating the present value of a lump sum is that you enter the future value and calculate the present value. The following illustration will demonstrate how to use the pre-programmed feature of the HP 10bII+ calculator to solve these types of problems.

Illustration 13.7

You are offered an investment that will produce $350,000 in 120 months. If you want to earn 9% per annum, compounded monthly, how much should you offer to pay for the investment today?

Solution:

$$PV = FV \times (1 + i)^{-n} \quad \text{or} \quad PV = FV \times (1 + j_m/m)^{-n}$$

where: FV = $350,000

j_{12} = 9% (9% per annum, compounded monthly)

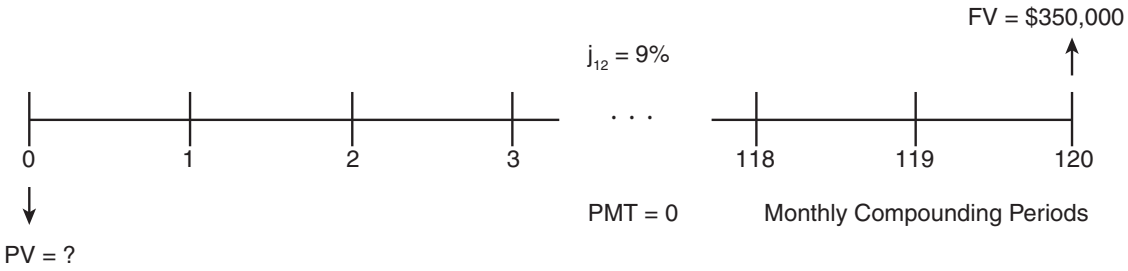
m = 12 (monthly compounding)

n = 120 months (10 × 12)

PV = ?

The solution requires you to calculate the present value based on the desired yield. In this case, the investment term is expressed in years (n) and the interest rate is compounded monthly.

The financial arrangement involved may be illustrated by a time diagram.



Calculation

Press	Display	Comments
9 I/YR	9	Enter stated nominal rate
12 ■ P/YR	12	Enter stated compounding frequency
350000 FV	350,000	Enter expected future value
120 N	120	Enter number of months
0 PMT	0	No payments
PV	–142,778.056744	Computed present value

If you want to earn a return of 9% per annum, compounded monthly, you should offer $142,778.06 for the investment today.

ANNUITIES: PAYMENTS

Up to this point we have been doing calculations involving only one-time cash flows. To do calculations involving recurring payments, we can use the PMT key on the calculator. To use the PMT key, payments must be in the form known as an annuity. An annuity is a stream of equal payments that are spread evenly over time. An example of an annuity is the stream of payments on a constant payment mortgage, which is the most common application of the PMT key. Another example of an annuity would be monthly deposits to a bank account to accumulate some amount in the future.

Illustration 13.8

An individual would like to put aside some money into a savings account to accumulate money to buy a boat. If this individual can put aside $200 at the end of every month, and the savings account earns interest at j_{12} = 6%, how much money will have accumulated in the savings account by the end of the 4th year?

Solution:

To calculate the amount in the savings account at the end of the fourth year, enter the information into the financial keys of the calculator. As before, enter information in all but one of the financial keys to calculate the final piece of information. The information given in the problem is as follows:

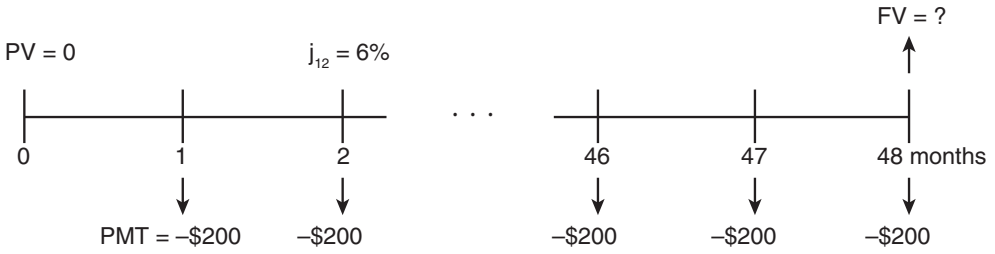
PV = 0

N = 48 compounding periods (4 × 12)

j_{12} = 6%

PMT = $200 (paid out, so they will be negative amounts)

FV = ? (cash received, so it will be a positive amount)



Calculation

Press	Display	Comments
6 I/YR	6	Enter nominal interest rate
12 ■ P/YR	12	Enter compounding frequency
48 N	48	Enter number of payments
0 PV	0	No money in the account at beginning
200 +/– PMT	–200	Enter amount of payment
FV	10,819.566444	Computed future value

By depositing $200 into a savings account at the end of each month for 48 months, the individual will accumulate $10,819.57 at the end of four years (48 payments).

sinking fund
a stream of cash flows where regular payments are set aside to accumulate funds for a specific purpose in the future

A stream of cash flows such as the one in the above illustration, where regular payments are being set aside to accumulate money for some specific purpose in the future are known as *sinking funds*. Sinking funds are often used by businesses to accumulate money to repay a bond, or to replace worn machinery or equipment.

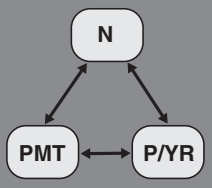
ALERT

Frequency Alert!

Notice that in the above calculation, the frequency of compounding of the interest rate and the frequency of the payments matched. When using the financial keys, and the PMT key in particular, it is vital that the I/YR, N, and PMT keys all use the same frequency. For example, if payments were made semi-annually, the interest rate would have to be entered in the calculator as a j_2 rate (I/YR is a j_2, ■ P/YR is 2), N would be the number of semi-annual payments, and PMT would be the amount of the semi-annual payments.

Frequency Rule of Thumb

One of the main issues students have when they first enter financial data into the calculator for a mortgage problem is that they forget that the frequency of I/YR, N, and PMT must match. The following should help students understand which frequency is the driving force in the question:

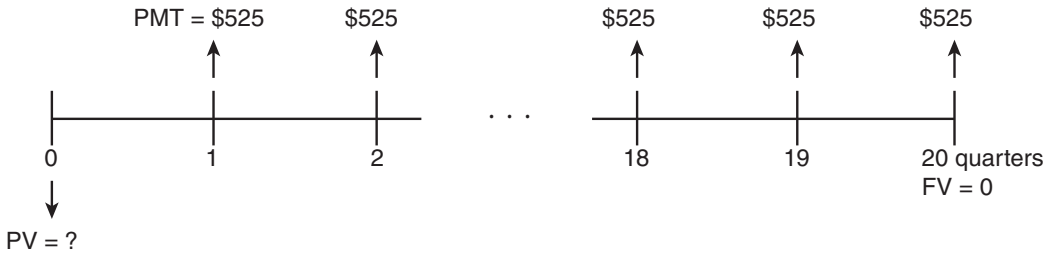


1. If there is a PMT frequency (e.g. monthly mortgage payment) stated in the financial problem, then this drives the frequency in the question. For example, if you know that there are monthly mortgage payments, the interest rate entered into the calculator must be expressed as a nominal rate per annum, compounded monthly, and any data you enter into N must be in months.
2. If there is no PMT frequency stated in the financial problem (e.g., interest accruing loan, which has no constant payments), then the compounding frequency of the interest rate given in the problem drives the question. For example, if the question stated there was an interest accruing loan with an interest rate of 10% per annum, compounded annually, you know that there are no payments, so, payment frequency cannot drive the question. Therefore, the compounding frequency of the interest rate is the "key" to frequency and any data you enter into N must be expressed annually.

Illustration 13.9

An individual wants to purchase an investment that will provide payments of $525 at the end of every quarter for the next five years. If the individual wants to earn an interest rate of 5% per annum, compounded quarterly, how much should the individual pay today for this investment?

Solution:



To find out what the individual should pay, enter the information about the investment and calculate the present value.

Calculation

Press	Display	Comments
5 I/YR	5	Enter nominal interest rate
4 ■ P/YR	4	Enter compounding frequency
5 × 4 = N	20	Enter number of payments
0 FV	0	No future value accumulated
525 PMT	525	Enter payment amount (cash received, positive)
PV	–9,239.64097	Computed present value (cash paid out, negative)

The individual should pay $9,239.64 for this investment to earn j_4 = 5% interest.

CALCULATING INTEREST ONLY PAYMENTS

As stated previously, when a borrower contracts to make regular payments of only interest to the lender, it is known as an interest only loan. During the life of the interest only loan, the borrower always owes the principal amount, but this amount never increases since the interest is paid when due by way of an interest only payment.

Illustration 13.10

A borrower has received a loan for $250,000 to start a mini-golf course. The loan has an interest rate of 7% per annum, compounded monthly, and requires interest only payments every month. How much are the interest only payments that the borrower makes every month if the duration of the loan is one year?

Solution:

Since you never pay down the principal balance on an interest only loan, the present value and the future value will be the same. In an interest only loan, you can set N to equal any number because there is no principal portion of the payments paying down the loan, and each payment will be the interest portion of the loan.

Calculation

Press	Display	Comments
7 I/YR	7	Enter nominal interest rate
12 ■ P/YR	12	Enter compounding frequency
250000 PV	250,000	Enter loan amount
250000 +/– FV	–250,000	Enter principal owing at end of loan
1 N	1	Set to any number
PMT	–1,458.333333	Compute interest only payment

The borrower will have to make monthly interest only payments of $1,458.33.

Alternative Solution:

Calculate the periodic interest rate per monthly compounding period, press % to convert this periodic rate to a decimal, and multiply by the interest only loan amount. This will calculate the monthly interest only payment.

Calculation

Press	Display	Comments
7 ÷ 12 =	0.583333	Convert the nominal rate to the periodic rate (monthly in this case)
%	0.00583333	Convert the periodic rate to a decimal
× 250000 =	1,458.333333	Multiply by interest only loan amount to calculate interest only payment

The borrower will have to make monthly interest only payments of $1,458.33.

Illustration 13.11

A borrower has received an interest only loan for $850,000, which will be used to help build a new medical office. The loan has an interest rate of 5.5% per annum, compounded quarterly, and requires interest only payments to be made quarterly. If the loan is for two years, how much are the interest only loan payments that the borrower makes every quarter?

Solution:

Since you never pay down the principal balance on an interest only loan, the present value and the future value will be the same. In an interest only loan, you can set N to equal any number because there is no principal portion of the payments paying down the loan, and each payment will be the interest portion of the loan.

Calculation

Press	Display	Comments
5.5 I/YR	5.5	Enter nominal interest rate
4 ■ P/YR	4	Enter compounding frequency
850000 PV	850,000	Enter loan amount
850000 +/– FV	–850,000	Enter principal owing at end of loan
1 N	1	Set to any number
PMT	–11,687.5	Compute interest only payment

The borrower will be required to make interest only payments of $11,687.50 every quarter.

Alternative Solution:

Calculate the periodic interest rate per quarterly compounding period, press % to convert this periodic rate to a decimal, and multiply by the interest only loan amount. This will calculate the quarterly interest only payment.

Calculation

Press	Display	Comments
5.5 ÷ 4 =	1.375	Convert the nominal rate to the periodic rate (quarterly in this case)
%	0.01375	Convert the periodic rate to a decimal
× 850000 =	11,687.5	Multiply by interest only loan amount to calculate interest only payment

The borrower will be required to make interest only payments of $11,687.50 every quarter.

CONCLUSION

Mortgage loans are the most common form of financing used in contemporary real estate transactions. Real estate licensees will benefit from recognizing the major sources of mortgage funds and understanding mortgage finance concepts, such as compound interest and the time value of money. Those who understand these concepts and the variety of mortgage repayment plans available will be better suited to helping their clients find financial solutions for their real estate purchases.