

## 4 TIME AND MONEY

### Understanding your personal finances: Using the time value of money to evaluate financial products

(This extension material accompanies the text on p.619 of your book.)

In this chapter we talked about the time value of money. Whilst this is crucial to business, an appreciation of the time value of money is also important for your personal finances. The concept of paying interest to compensate for using a sum of money in advance, or receiving interest for lending money, is fundamental to understanding the financial products which are considered near-essential to everyday life. Even as a student you are likely to have an overdraft facility, a credit card and perhaps a loan or a savings account. As a young professional person you will probably take out a car loan or mortgage and contribute to a pension plan. Here, we will explain how Chapter BM4 Time and Money is useful in understanding how some common financial products work.

#### Credit card bills and APR

If you have a look at the interest rate on your credit card bill, it is usually quoted monthly. Mine currently says 2.5%. This doesn't sound too terrible but bear in mind that this is for just one month. If the balance of your account is £100, it will be  $100 \times 1.025$  a month later,  $£100 \times 1.025 \times 1.025$  at the end of two months and so on. At the end of a year it will be  $£100 \times 1.025^{12} = 1.3449$ . So the *effective annual rate* of interest is 35% (see Chapter BM4, Section 1). In a year you will be paying back an extra one-third of your bill. In personal finance literature, the effective rate is often called the APR or *annual percentage rate*.

#### Taking out a loan

The table below shows figures that you might find a loan comparison site for personal loans (in this case we were looking for a £5,000 loan paid back over three years). Have a look and then we will explain what the various figures mean.

	APR £5000 over 3 years	Total repayable over term	Monthly repayment (£)	Risk- based pricing	Early repayment penalties	Homeowner
Loan 1	6.40%	£5,493.96	£152.61	Yes	Yes	No
Loan 2	6.90%	£5,532.48	£153.68	Yes	Yes	No

For the first loan, if you borrow £5000 now, you will have to pay back £152.61 at the end of each month for 36 months. The APR or *annual percentage rate* quoted is what we have called the *effective* rate of interest in BM4, Section 1. It is the percentage of interest the loan provider would receive by the end of a year if they reinvested every monthly repayment when they received it.

In terms of the series of payments we have talked about in BM4, Section 3, £5000 is the present value of a series of 36 end-month payments of £152.61, discounted at a monthly rate which corresponds to 6.4% a year effective rate. To find this monthly rate, say  $r$ , we reason as follows. A repayment of 1 now would be worth  $1 + r$  at the end of 1 month,  $(1 + r)^2$  at the end of two months and  $(1 + r)^{12}$  at the end of a year. For  $r$  to correspond to an effective rate of 6.4 it must be such that  $(1 + r)^{12} = 1.064$ .  $1 + r$  is therefore the '12<sup>th</sup> root' of 1.064 and a calculator gives  $1 + r = 1.005183001$ .

The monthly payment for the loan in question can be confirmed using Microsoft® Excel. Use the PMT function with Rate = 0.005183001, Nper = 36 and Pv = -5000 gives £152.61.

There are a lot of loan calculators on the internet (just search on 'loan calculator'). These can give you a feel for the effect of lengthening the term of the loan, changing the interest rate or changing the payment.

The interest rate you are asked to pay on a loan reflects how risky the lender considers lending to you is. If you have a bad credit rating you will have to pay a higher rate to compensate them for the risk that you will not repay. If the loan is secured in some way, say, for a car or a house, the rate of interest may be lower as the lender has some chance of retrieving their investment if you default. For instance, at time of writing, whilst most bank loans are perhaps 7% and above, mortgage rates are around 4–5% because the property is offered as security and the rate for a car loan is somewhere in between, currently 6% and above.

Some loans will incur set-up fees and these will affect the APR. If these are paid at the start they are effectively a reduction in the amount you are loaned. As your repayments remain the same, this will increase the APR.

## **ISAs and savings**

With luck you may find yourself in the pleasant position of having savings. In this case you will receive interest on your investment. Unfortunately, if you pay income tax, a percentage of this will be deducted in tax. In the UK, savings of up to so much a year invested in an Individual Savings Account or ISA are exempt from such tax. ISA products vary. Some offer a fixed interest rate for a specified period, some include interest rate changes from time to time and some 'track', or are related to, the Bank of England base rate. Slightly higher interest rates will be offered for ISAs where money can only be withdrawn after a notice period, or internet-only accounts or ISAs with a minimum investment.

### **Annuity rates – advice for your parents?**

An annuity is the ‘opposite’ of a loan. This time, *you* give an institution a sum of money and the institution pays you back in instalments. In calculating the amount of the annuity, the provider takes into account the time value of money. There are several types of annuity. For an annuity for a fixed number of years, ‘a fixed term’, the present value of regular income payments is the original sum of money. This might be useful to pay school fees for instance.

The most common type of annuity is probably the pension annuity. On retiring the person pays an insurance company a fixed amount in exchange for a series of payments (the pension) that will continue for the rest of their lives, so the exact term is not known. The insurance company makes calculations based on life expectancy and health, as well as future interest rates. This means that a younger person will receive less income per year than an older one as they are likely to live longer. Further, the type of annuity payment may differ. For instance, income may increase with inflation or remain level.

The table below shows the different annual incomes payable for an annuity purchase of £100,000 according to age and type of annuity. For instance, a person aged 55 would receive £4,569 per annum for the rest of their life. Notice how income increases according to age. The second row of the table shows income if payment for at least 5 years is guaranteed. It is slightly less than the first row because, if the recipient dies during the first 5 years, the provider must still pay out to their dependents. The third row allows for income to increase in line with inflation (RPI) and so shows lower income, whereas the fourth allows for a steady 3% a year increase. For the annuities in the final two rows, the recipient’s spouse will receive 50% of the income after the recipient’s death. As this may involve extra payments for the provider the income shown is lower than for the corresponding arrangements higher in the table,

	Age				
	55	60	65	70	75
Single life, level, no guarantee	£4,569	£5,071	£5,857	£6,805	£8,175
Single life, level, 5yr guarantee	£4,566	£5,064	£5,838	£6,765	£8,079
Single life, RPI, 5yr guarantee	£2,324	£2,780	£3,516	£4,433	£5,743
Single life, 3% escalation, 5yr guarantee	£2,888	£3,375	£4,073	£5,004	£6,327
Joint life 50%, level, no guarantee	£4,279	£4,704	£5,278	£6,064	£7,184
Joint life 50%, 3% escalation, no guarantee	£2,620	£3,013	£3,538	£4,327	£5,443