INTEREST RATES:

FACTS AND FALLACIES

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THE AGRICULTURAL ECONOMICS RESEARCH UNIT

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The computer programmes used to calculate effective interest rates and loan instalments were provided by P. R. Oliver, Kellogg Farm Management Unit, Lincoln College.

SUMMARY

The purpose of this paper is:

1. to discuss the methods of calculating interest rates that are commonly used in New Zealand;
2. to present case examples showing the difference between quoted and effective interest rates for a number of major lending institutions; and
3. to generate discussion as to the need for effective interest rate disclosure legislation in New Zealand.

In only one of the case examples presented is the interest rate quoted on an effective basis. In all other cases, except where no interest rate is quoted at all, the quoted rates are lower than the effective rates. In one case the quoted rate is less than half the effective rate. If the effective rates were reduced to the quoted rates then for some of the larger loans borrowers would pay several thousand dollars less in interest over the term of the loan.

The advent of programmable calculators and desk top computers has greatly simplified the calculating of effective interest rates. This should facilitate both the implementation and enforcement of interest rate disclosure legislation. The major factor at present preventing the enactment of interest rate disclosure legislation appears to be the opposition of the financial institutions. It would seem that many of these institutions have a vested interest in maintaining the status quo.

1. INTRODUCTION

Paying interest is an integral part of daily living; most people at some time in their lives have to pay interest on house or farm mortgages, hire purchase agreements, and bank overdrafts. This often means that decisions must be made as to the most suitable source of loan money. Given the considerable variation in the types of loan available these decisions are not always easy, but assuming that the term of the loan is satisfactory and that the repayments can be met from income, then the decision is usually made on the basis of the interest rate charged.

Unfortunately, these decisions are often made on the basis of information that is at best poorly understood and, at worst, misleading. This problem arises because there are many different methods of calculating interest rates. Some people are aware that a *flat rate* of interest of (say) 15 per cent for a hire purchase agreement, is not the same as the 15 per cent that a bank might charge on a house or farm mortgage, but few are aware of the difference between nominal and effective rates, or the implications of annual instead of monthly rests of principal.

The purpose of this discussion paper is to present the more important methods of interest rate calculation together with some case examples. An associated objective is to encourage discussion as to whether legislation requiring disclosure of effective interest rates would reduce the level of confusion and misinformation that exists at present.

The examples that are used in this paper, and the lending organisations involved, have been chosen solely on the grounds of convenience, in that the data were readily available to the author. All the examples are either real case examples or else

they are taken from promotional material provided by the lending institutions themselves. Because the data were not all collected at the same point in time it would be unfair to use these data to make statements such as "organisation A provides cheaper money than organisation B". This is because interest rates change with time and any quoted figures can rapidly become outdated. In addition, any such comparisons would need to take account of other criteria such as the variation in security requirements and the purpose for which the loan money is to be used. However, the figures can be taken as indicative examples of the methods of calculating interest used by these lending organisations. They also indicate the extent to which the quoted figures need to be altered to reach a common basis of comparison between all lending organisations.

It is emphasised that the objectives of this paper relate to the difference between quoted and effective interest rates. Any discussion as to whether specific interest rates are too high or too low is beyond the scope of this paper.

2. FINANCE TERMINOLOGY

The terminology of finance is confusing. This is because the original definitions used in texts on the mathematics of finance have often been subsequently misused when applied to consumer finance. In this paper the terminology used, except where expressly stated otherwise, is that of financial mathematics.

2.1 Simple and Compound Interest

Simple interest is charged in one lump sum when a loan is repaid. For example, consider a loan of $1,000 that is to be repaid after two years with an interest payment at that time of $160. The $160 is the simple interest and the rate of simple interest is 16 per cent for the two years. Alternatively, you might lend a friend $500 for six months at a simple interest rate of 10 per cent for the period. The friend would then be required to pay back $550 at the end of the six months. Note that the simple interest rate usually relates to the term of the loan and is not usually expressed on a per annum basis. If it is expressed on a per annum basis, then it is still only paid at the end of the loan term and is calculated using the formula:

$$\text{Simple Interest} = (\text{Principal}) \times (\text{Time in Years}) \times (\text{Annual simple rate of interest})$$

In practice, simple interest is only used for short term loans, usually of less than one year and even then only in a limited number of situations.

Compound interest, in contrast to simple interest, is charged at regular intervals throughout the term of a loan. In some situations it is paid at the time it is charged and in other situations it

is added to the principal, in which case the borrower must, in the next period, pay interest on interest. For example, consider a loan of $1,000 for two years at an annual compound interest rate of 8 per cent. If the borrower pays $80 at the end of year one and another $80 at the end of year two then he is paying 8 per cent compound interest per annum. Alternatively, if the first years interest of $80 is charged but not paid then $80 will be added on to the principal and at the end of year two the borrower will owe:

1.	Original principal	$1,000.00
2.	8 per cent interest on $1,000 for year 1	80.00
3.	8 per cent interest on $1,080 for year 2	86.40
	TOTAL	$1,166.40

In this second case the borrower pays a total of $166.40 interest instead of $160.00 but in both cases the compound interest rate is 8 per cent per annum. The only difference is that in the first case it is 8 per cent compound interest per annum paid annually and in the second case 8 per cent compound interest per annum paid biennially. The additional dollars paid compensate for the delay in payment.

2.2 Nominal and Effective Rates of Interest

Although compound interest is usually quoted on an annual basis, borrowers are often required to make their payments more frequently than this. For example, many institutional leaders require monthly payments but some require payments ever four weeks and others require quarterly payments. Solicitors often require payment twice yearly.

In situations where payments are required more often than once a year there are two different methods for converting the interest rate per payment period onto an annual basis for quotation purposes. One method gives the *nominal* annual interest rate, the other the *effective* annual rate.

The essential difference between the two methods is that *effective* interest takes into account when during the year the interest is paid, whereas the *nominal* rate does not. This difference is best illustrated by examples.

(i) Consider an organisation that charges $60 interest twice yearly on a loan of $1,000. The *true* interest rate per period, which is also referred to as the *periodic*, *compound* or *actuarial* rate, is therefore 6 per cent per six months. The *nominal* annual rate, obtained by multiplying the true rate by the number of interest accrual periods per year, is 12 per cent. However, this loan is clearly not equivalent to paying 12 per cent interest once a year (i.e. $120 at the end of the year) on account of the difference in timing. In other words the nominal annual rate (the word annual is often omitted) does not take account of the compounding concept of paying interest on interest. Looked at another way, the nominal interest rate does not take account of the fact that the first $60 of interest had to be paid after six months and could not be left in the bank or invested in shares etc., itself earning interest for the next six months. Accordingly, the $60 interest per six months is equivalent to effective annual interest of:

$60	+	$60	+	6 per cent of $60	=	$123.60
(for 1st 6 months)		(2nd 6 months)		(compounding effect of paying interest on interest in second 6 months)		(effective interest per annum)

i.e. the effective annual rate = 12.36 per cent

(ii) Consider another example of a person who takes out a loan of $1,000 at 3 per cent quarterly interest compounded. Since there are four interest accrual periods in a year the nominal interest rate will be 3 per cent x 4 = 12 per cent. Now assume this person intends to invest the borrowed money and to pay back the principal plus accumulated interest on the loan at the end of one year. How much will he repay?

Initial Loan	=	$1,000.00
Interest for 1st 3 months	=	30.00
Sum outstanding after 3 months	=	1,030.00
Interest for 2nd 3 months ($1030 x .03)	=	30.90
Sum outstanding after 6 months	=	1,060.90
Interest for 3rd 3 months (1060.90 x .03)	=	31.83
Sum outstanding after 9 months	=	1,092.73
Interest for 4th 3 months (1092.73 x .03)	=	32.78
Sum outstanding after 1 year	=	$1,125.51

Obviously $1,000 of this sum is principal, leaving $125.51 as interest. Hence, the effective rate of interest is 12.55 per cent. Unless the borrower has earned at least 12.55 per cent on his investment then he will have made a loss overall.

Other examples of the difference between nominal and effective interest rates are as follows:

True Rate (per cent)	Nominal Annual Rate (per cent)	Effective Annual Rate (per cent)
12 per annum	12	12.00
6 half yearly	12	12.36
3 quarterly	12	12.55
1 monthly	12	12.68
.03288 daily	12	12.75
24 per annum	24	24.00
12 half yearly	24	25.44
6 quarterly	24	26.25
2 monthly	24	26.82
.06576 daily	24	27.12

2.3 Amortisation and Rests of Principal

Amortisation of a loan involves the regular repayments of principal throughout the term of the loan. Normally this involves equal instalments made up of varying amounts of interest and principal. For example, in the early part of the loan most of the repayment will be interest and only a little will be principal. As the principal is gradually paid off the interest component declines and the principal repayments increase accordingly. If the amortisation is complete, then the loan is completely paid off by the end of the loan. Such loans are commonly referred to as *instalment, reducing* or *table* mortages. Alternatively, a loan may be *partially amortised,* with the remaining principal paid off at the end as a lump sum or *balloon* payment.

Another variant method of amortisation is *straight line amortisation* whereby a constant amount of principal is paid each period. This means that the total repayment of interest and

principal required each period declines throughout the period of the loan.

Yet another variant is the so-called *slow start* loan where little or no principal is repaid in the early years and then as the borrowers financial position improves both the principal and the total repayments increase.

When interest rates are calculated on an effective basis then interest is only charged on the amount of principal that is outstanding. However, many lending organisations, in particular finance companies dealing with hire purchase agreements and personal loans, charge interest throughout the whole term of the loan on the original sum borrowed. This means, for example, that in the last year of a five year loan the finance company will have been repaid most of the money they lent and will have reinvested this money elsewhere, but the original borrower is still paying interest on the total sum. Interest calculated on this basis is called *flat rate* interest. (Note that flat rate interest refers to instalment loans, not flat loans).

Another method of charging interest is to grant *rests of principal* at regular intervals throughout the term of the loan, but with the length of time between these rests exceeding the payment intervals. For example, a lender may require payments of interest and principal to be made on a monthly basis but only grant rests of principal every six months. This would mean that as the months went by the borrower would be paying interest on increasing amounts of repaid principal. Then at the end of month six, the repaid principal is "rested" and no more interest on it is paid. Then the cycle repeats itself for months seven to twelve and so on. Another way of saying the same thing is that the oustanding principal is decreased every month by the total instalment, but then at the *end* of six months interest is charged on the sum outstanding at the *start* of the period.

It should be apparent that the effect of granting rests of principal less frequently than the loan instalment period is to raise the effective interest rate. Such a procedure can be considered as an intermediate stage between flat interest and effective interest.

3. CASE EXAMPLES

3.1 Post Office Second Mortgages

The Post Office appears to be the only major lending institution that quotes its interest rates on an effective basis. It therefore provides a standard against which other institutions can be compared.

The Post Office lends money for second mortgages on houses and sections. These loans are currently (1981) limited to $15,000 for a term of ten years. Payments of interest and principal are required on a monthly basis and the Post Office advertises the interest rate as being a "true" rate of 12 per cent. Using the terminology presented earlier in this paper the true rate is actually 0.949 per cent per month and this compounds up to give an effective rate of 12.00 per cent, but accepting that the Post Office are attempting to describe their loans in layman's language it would be pedantic to argue about the slight misuse of terminology.

Consider the example of a $15,000 loan for ten years. The monthly repayments are $209.91. In the first month the interest payment will be $15,000 x .00949 = $142.35 and the balance of $67.56 is principal. In the second month the interest repayment is reduced slightly to $141.71 on account of the principal outstanding having been reduced by $67.56 to $14,932.44. This means that the amount of principal paid off in the second month increases to $68.20 ($209.91 - $141.71). This procedure will continue until the 120th payment at the end of 10 years at which stage all the principal will have been repaid.

3.2 The Rural Bank

The Rural Bank lends money to existing farmers for farm development and to suitably qualified prospective farmers for

farm purchase. Lending rates vary depending on the purpose of the loan, but the case example is a farm purchase loan of $100,000 for 25 years at a quoted interest rate of 9 per cent. The Rural Bank requires such a loan to be repaid by quarterly payments of $2,530.10.

The approach taken by the Rural Bank in calculating the repayments is to consider the term of the loan as being made up of fifty periods each of six months with an interest rate of $4\frac{1}{2}$ per cent per period. They then divide the six monthly amounts by two to get the quarterly repayments.

There are two points to note. The first is that rests of principal are only granted every six months and hence in the second and fourth quarters of every year the farmers pays interest on principal that has already been repaid. The second effect is that the $4\frac{1}{2}$ per cent per six months has been multiplied up to give a nominal annual rate instead of compounded to give an effective rate.

The combined effect of these two factors is that the quoted rate of 9 per cent is in fact an effective rate of 9.35 per cent. This means that over the 25 years of the loan the farmer will pay a total of $153,010 in interest instead of $146,366 interest if the repayments had been calculated using an effective interest rate of 9.0 per cent. The quarterly repayments at an effective annual rate of 9 per cent would have been $2,463.66, a reduction of $66.44 per quarter (or $265.76 per year) on the amount actually paid.

3.3 The Housing Corporation

The Housing Corporation lends money on first mortgage to persons purchasing their first home. The maximum loan and also

the interest rate can vary depending on the type of house purchased and the personal circumstances of the borrowers, but the case study example is a loan of $19,000 for 30 years at a quoted rate of interest of 8.5 per cent per annum.

The Housing Corporation requires all borrowers to make a contribution to the "Corporations General Reserve Fund" of 2 per cent of the loan. This amount is added to the amount that has to be repaid. In this case the borrowers received $19,000 but were required to pay interest and principal as if the loan had been for $19,380. The borrowers received no additional advantage from the $380 payment (for example, it did not provide mortgage insurance cover). The monthly repayments on the loan were $149.59.

The approach taken by the Housing Corporation in calculating interest is similar to the Rural Bank except that the six-monthly sums are divided into monthly rather than quarterly payments. In addition, the General Reserve Fund contribution raises the effective rate even further. The combined effect of all these factors is that this Housing Corporation loan with a quoted interest rate of 8.5 per cent per annum has an effective annual interest rate of 9.12 per cent. Without the Reserve Fund contribution, the effective interest rate would have been 8.90 per cent.

If the Housing Corporation had charged at an effective rate of 8.5 per cent, then the monthly instalments of interest and principal would have been $141.88 instead of the $149.59 actually charged. The difference of $7.71 per month adds up to $92.52 per year and $2,775.60 over the 30 years of the loan.

3.4 The Bank of New Zealand

The Bank of New Zealand lends money to commercial organisations and private individuals for a wide variety of purposes. The

term and interest rate depend on the purpose of the loan and the source of the money. For example, money borrowed from the BNZ Trading Bank will be at a different rate of interest than money borrowed from BNZ Finance or the BNZ Savings Bank.

The case example here is a housing loan from the BNZ Savings Bank for $25,000 repayable by equal instalments over 15 years at a quoted interest rate of 11.5 per cent. The monthly instalments for this loan are $294.67.

In calculating the required instalments the BNZ grants six-monthly rests of principal, but requires that payments be made on a monthly basis. They obtain a six-monthly interest rate of 5.75 per cent by dividing the quoted annual rate by two. The combined effect of these factors is that the quoted rate of 11.5 per cent per annum is in fact an effective rate of 12.31 per cent. If the BNZ charged an effective rate of 11.5 per cent then the monthly repayments would be $11.59 less at $283.08. This difference amounts to $139.08 per year and $2,086.20 over the 15 year period of the loan.

It might seem that the advantage associated with quoting on some basis other than an effective rate always lies with the financial institution but this is not necessarily so. For example, the BNZ is also a borrower in that it receives deposits of various types. For example, a term deposit of $10,000 for six months at a quoted rate of 12 per cent per annum is in fact a true rate of six per cent per six months. Hence, the effective interest paid by the Bank on this loan is slightly greater than 12 per cent. (In fact it is 12.36 per cent). However, it should be noted that the BNZ, like most financial institutions, tends to pay interest to its depositors at longer intervals than it uses when charging

interest to borrowers. In addition, the long interval between rests of principal works exclusively in favour of the lending institutions. On balance, therefore, the financial institutions gain considerably more than they lose by quoting on some basis other than the effective rate.

3.5 The Canterbury Savings Bank

The Canterbury Savings Bank is the largest lender in Canterbury of funds for first mortgages on houses. These loans are amortised on a straight line basis with quarterly payments over 25 years. Each payment comprises one per cent of the initial principal and interest on the outstanding principal.

The case example is a loan for $25,000 at a quoted annual rate of 13 per cent. The Canterbury Savings Bank actually charges the borrower 3.25 per cent per quarter. Hence, in the first quarter the required payment is:

Principal (1 per cent of $25,000)	$ 250.00
Interest (3.25 per cent of $25,000)	812.50
	$1,062.50

In the second quarter the payment is:

Principal (1 per cent of $25,000)	$ 250.00
Interest (3.25 per cent of $24,750)	804.38
	$1,054.38

In the third quarter the payment is:

Principal (1 per cent of $25,000)	$ 250.00
Interest (3.25 per cent of $24,500)	796.25
	$1,046.25

This continues until the last quarter of year 25 the payment is:

Principal (1 per cent of $25,000)	$ 250.00
Interest (3.25 per cent of $250)	8.12
	$ 258.12

It will be noted that unlike most of the earlier case examples the interval between the rests of principal is the same as the interval between payments. However, the 13 per cent quoted interest rate has been obtained by multiplying the true rate of 3.25 per cent per quarter by four, instead of compounding it to give the effective interest rate. The effective interest rate is 13.65 per cent.

It is interesting to note that the total interest paid over the 25 years is considerably less than if the loan had been amortised with equal instalments made up of varying amounts of principal and interest. With straight line amortisation at 13.65 per cent effective interest rate the total interest is only $41,031 compared to $59,709 under the other method. The difference is $18,678. It is therefore tempting to suggest that this straight line method is the better one, but this viewpoint does not take account of when the interest is repaid. Especially in times of high inflation, it is the payments in the first one to three years that normally cause the "pain" and with straight line amortisation these early payments are greater. For example, the quarterly repayments for an equal instalment loan at 13.65 per cent effective interest would be $847.09 as compared to $1,062.50 in the first quarter of the CSB loan. It is not until the last quarter of year seven that the CSB quarterly payments drop below $847.

3.6 The Public Service Investment Society

The Public Service Investment Society lends money to its members for a variety of purposes including second mortgages on houses and personal loans. Two case examples are presented here, both being second mortgages on houses.

The first example is a loan of $6,000 for a term of five years taken out towards the end of 1980. The quoted interest

rate is 13 per cent, with payments of $129.00 every four weeks. The loan contract states "that interest will be added every six months from the date the loan was paid out, calculated on the balance at the beginning of each period". As mentioned previously, this is the same as granting rests of principal every six months. Although not stated, the quoted rate of 13.0 per cent is the nominal annual rate obtained by multiplying the six monthly rate of 6.5 per cent by two.

The effective interest rate on this loan is 15.01 per cent as compared to the quoted rate of 13.0 per cent. If the PSIS had charged an effective rate of 13 per cent then the four weekly payments would have been $123.97, a reduction of $5.03. This reduction amounts to $65.39 per year and $327.95 over the five year term of the loan.

The second example is also a second mortgage for $6,000, but this loan was taken out in May 1981 by which time the PSIS had raised their interest rates and were quoting a rate of 15 per cent. The term of this loan is three years and the payments every four weeks are $197.00. The effective interest rate on this loan is 18.24 per cent.

It is interesting to note that the difference between the quoted and effective interest rates is greater for the second case example than the first despite the fact that the PSIS method of quotation is unchanged. There are two reasons for the increased difference.

(i) As nominal interest rates increase the difference between nominal and effective rates also increases. (Refer back to page 7 for an illustration of this point).

(ii) The effect of granting rests of principal only every six months is greater for the short term loan. Although not immediately obvious it is this second point which is the more important of the two.

3.7 Insurance Company House Mortgage

The case study example is a $15,000 second mortgage on a home. The quoted rate is 15 per cent and the company requires the loan to be repaid over 20 years. The quarterly repayments are $593.85.

The true interest rate on this loan is 3.75 per cent per quarter and this is equivalent to a nominal annual rate of 15.0 per cent. The effective annual rate is 15.87 per cent.

If the insurance company had charged an effective rate of 15.0 per cent then the quarterly payments would have been $568.11, a reduction of $25.74. This reduction amounts to $102.96 per year and $2,059.20 over the 20 year term of the loan.

It may be unwise to generalise from this one example to all insurance companies. Although this insurance company grants rests of principal on a quarterly basis it would seem that some other companies may only grant rests of principal on an annual basis. Where this practice eixsts there will be an increased difference between the quoted and effective rates.

3.8 Finance Company Personal Loan

The case study example is a finance company wholly owned by one of the trading banks. It advertises personal loans at a quoted interest rate of 15 per cent. In fact this interest is calculated on a flat rate basis.

The monthly repayments on a $3,000 loan for five years are $93.04. This monthly repayment also covers payment of $190 in documentation and associated charges, (e.g. caveat, security documents, consumer credit insurance). In effect the borrowers account is debited with $3,190 although he actually only receives $3,000 and the monthly payments of $93.04 are used to pay off this total amount of $3,190.

The effective interest rate on the $3,000 loan is 31.63 per cent. If the quoted rate of 15 per cent had also been the effective rate then the monthly payments would have been $69.89 instead of $93.04. Over the five year term of the loan the borrower would have paid back $4,193.40 in principal and interest instead of the $5,582.40 required by the finance company. The interest component would have been $1,193.40 instead of $2,582.40, a difference of $1,389.

3.9 Finance Company Home Improvement Loan

The case example is taken from promotional material distributed by one of the larger New Zealand finance companies whose lending activities include consumer finance (e.g. cars and television), farm machinery, personal loans and large scale commercial lending. The example presented here is a home improvement loan. No quoted interest rate is given in the promotional material but the quoted "indicative monthly repayments" for a $5,000 loan for five years are $145.83. The effective interest rate on this loan is 27.68 per cent.

3.10 Finance Company Farm Machinery Loan

This example relates to the same finance company as the

home improvement loan. It is taken from a paper presented to a farm finance seminar by a manager of the company, and applies to items such as tractors and combine harvesters.

The indicative monthly repayments on a loan of $10,000 for five years were $276.10. The interest rate was not initially provided but in answer to questions as to the "true rate" the manager stated it as being 22 per cent "actuarially assessed". In fact the true interest rate (also called the actuarial rate) for this loan is 1.832 per cent per month, the nominal annual rate is 22 per cent and the effective annual rate is 24.32 per cent. Although the nominal rate of 22 per cent may indeed have been calculated by a company actuary, it is not the actuarial rate.

3.11 Bank and Stock Firm Overdrafts

No specific example is presented, owing to the complexity of presenting the varying daily cash flows. However, now that all of these institutions have computerised their account systems it is normal to charge interest on a daily basis. Hence, a quoted rate of (say) "18 per cent per annum charged daily" is likely to mean a true interest rate of 18 ÷ 365 = 0.049315 per cent per day. This gives an effective rate of 19.72 per cent per annum.

It is common banking practice in many overseas countries to assume that a year has only 360 days. Hence a quoted rate of (say) 18 per cent charged daily, is often in reality a true rate of 18 ÷ 360 = 0.05 per cent per day. This gives an effective rate of 20.01 per cent per annum. It is not clear whether any New Zealand banks or stock firms follow the practice of a 360 day year. Although some branch managers have denied the practice exists, these same managers have in ignorance claimed that their institution always quotes "true" interest rates.

3.12 Summary

The differences between quoted and effective interest rates are summarised in the following table:

Organisation	Purpose of Loan	Quoted Interest Rate (Per cent per annum)	Effective Interest Rate (Per cent per annum)
Post Office	House Second Mortgage	12.0	12.00
Rural Bank	Farm Purchase	9.0	9.35
Housing Corporation	House Mortgage	8.5	9.12
Bank of New Zealand	House Mortgage	11.5	12.31
Canterbury Savings Bank	House Mortgage	13.0	13.65
Public Service Investment Society	House Second Mortgage (i)	13.0	15.01
	House Second Mortgage (ii)	15.0	18.24
Insurance Company	House Second Mortgage	15.0	15.87
Finance Company	Farm Machinery Purchase	22.0	24.32
Finance Company	Home Improvement Loan	-	27.68
Finance Company	Personal Loan	15.0	31.63

4. CREDIT LEGISLATION

In contrast to some other western nations such as the United States of America, New Zealand has no current legislation requiring disclosure of the effective interest rate charged on loan and other credit transactions. The Hire Purchase Act of 1971 does have a section requiring that all hire purchase agreements state the rate of interest calculated on the basis of the principal outstanding but this section of the act has never been made operative. Although in theory this could be done at any time by Order in Council it would seem most unlikely after this period of time. In addition, the Hire Purchase Act 1971 does not clearly state whether it is the nominal or effective annual rate that must be disclosed.

A bill entitled "Credit Contracts Bill" was introduced to Parliament in 1980. The explanatory note accompanying the bill stated that the purpose of the bill was, amongst other things, to "ensure that the cost of credit is disclosed on a uniform basis in order to prevent deception and encourage competition" and "to prevent misleading credit advertisements". The provisions of the bill did not meet the general approval of the financial institutions and at present the bill is under further study. In the meantime, the long term future of the bill is uncertain.

If passed into law, this bill would require all credit institutions to disclose the "finance rate". This is defined as the nominal annual interest rate for credit contracts where the nominal annual interest rate is 15 per cent or less, and the effective annual interest rate in other situations (i.e. where the nominal annual rate exceeds 15 per cent). In addition, "a finance rate that is not the correct rate shall be deemed to be correct if the difference between the rate and the correct rate is not more than 1".

5. DISCUSSION

So far in this paper there has been no mention of the methods and formulae that are required to convert quoted interest rates into effective rates. This has been purposeful in that the formulae are not particularly easy to apply, especially for long term instalment loans that have short intervals between repayments. Indeed, given a stream of monthly payments calculated on a non effective basis, the only method of obtaining the effective rate is to calculate the internal rate of return on a trial and error basis, or else use a programmable calculator or micro computer that has been programmed for this purpose.

These problems mean that it is seldom feasible for a prospective borrower to make his own adjustments to convert a quoted interest rate to an effective basis. The borrower is therefore reliant on the lending organisation for this information. In the absence of this information the borrower can only guess. He may, if he is in luck, obtain from the lender the basis on which interest is calculated and make his own "rough and ready" adjustments, and there are formulae which can be used to give approximate answers, but even these formulae are too complex to be readily remembered. (Readers can refer to the Appendix for details of these and other interest rate formulae.)

It is therefore apparent that if effective interest rates are to be readily available to prospective borrowers, then the onus to provide the information must lie with the lending institutions. If legislation enforcing such disclosure is to be enacted, then this legislation needs to satisfy the three criteria of being useful, practical and enforceable.

5.1 Would Interest Rate Disclosure Legislation be Useful?

The initial reaction of most people to this question is likely to be "yes". In the same way that consumers are protected from the sale of produce in containers incorrectly labelled as to quantity, so should borrowers be protected as to misleading advertising as to interest rates. However, the following counter arguments are sometimes put forward.

(i) Disclosure of effective interest rates will only increase the amount of confusion.

It is sometimes argued that consumers might baulk at signing hire purchase agreements quoting effective interest rates of 25 per cent and more, yet these agreements would be identical in substance to agreements that they have previously signed without a second thought. However, once all interest rates were presented on the same uniform basis it would not take long for consumers to understand the concepts of effective interest rate calculations, in particular the idea that interest is only charged on principal that is outstanding. If some resistance to hire purchase type agreements continued over a long period then this could only be regarded as evidence that people considered these rates, when disclosed, to be too high. Surely any change in public attitudes which resulted from the presentation of additional factual information could only be regarded as a positive result.

(ii) Borrowers have neither the need nor desire to know the interest rate they are paying. They are only interested in whether they can afford the repayments.

Borrowers are undoubtedly very interested in the size of the weekly or monthly payments, but this does not mean that they

don't want to also know the interest rates. Obviously the financial institutions are aware that interest rates are important. Otherwise they would not bother to quote them so conspicuously in promotional material. Nor would they object to quoting them on an effective basis.

(iii) Effective interest rates take into account when the interest is paid, i.e., they make allowance for time preference. But this is too complex a concept for most borrowers to appreciate.

It is true that some borrowers see no difference between paying $10 per week or $520 at the end of the year. However, other borrowers do see the difference. In any case this argument misses the central point. Without effective interest rate disclosure legislation it is possible to have two different organisations offering loans for the same amount and the same term and even quoting the same interest rate but requiring quite different monthly payments. Surely that is unsatisfactory!

(iv) Some institutions require repayments on a monthly basis instead of quarterly or six monthly so as to assist borrowers with poor savings habits. This increases the effective interest rate but does not help the financial institutions because of the higher administration costs. Forced disclosure of effective interest rates will penalise institutions for trying to help their clients.

This argument is really an extension of the previous one and the same answer applies. However, the additional point needs to be made that computerisation and automatic payments have reduced administration costs to the level where an efficient organisation will be gaining a net benefit from the earlier receipt of the money.

5.2 Is the Concept of Interest Rate Disclosure Legislation Practical?

There is really only one issue here and that is whether or not the financial institutions can be reasonably expected to be in a position to provide effective interest rates for every contract. However, there are several parts to this question.

(i) Is effective interest rate information at present available at Head Office level?

The answer to this question probably varies between companies. However, in professionally run companies these rates will be the initial input into the calculations made to compute the size of the loan repayments. Flat rate interest quotations (and similar) are for public consumption only. Nevertheless, there probably is considerable variation between companies in the level of available expertise and in some cases further training may be necessary. For example, the Canterbury Savings Bank is at present (June 1981) advertising one year personal loans of $1,000 with monthly repayments of $91.66. The advertising material states that the flat interest rate is 10 per cent and the "true interest rate" is 18.46 per cent. In fact the effective interest rate is 19.51 per cent and their quoted figure appears to have been obtained by using a formula which only gives an approximation. (Refer to the appendix for details of this formula). This quotation to two places of decimals would seem to indicate a lack of knowledge of the limitations of this formula. Similarly, several years ago one New Zealand stock firm programmed their computer with an incorrect formula and consequently undercharged their clients for many months before the error was detected.

These examples serve as a reminder that the financial institutions are indeed quite fallible and their level of expertise

is not always high. Nevertheless, these problems should be easy to remedy. For example at Lincoln College approximately 100 students graduate each year with B. Com. (Ag.) degrees and as part of their training they are taught the mathematics of finance. Presumably commerce graduates of other universities are taught the same skills. It then becomes the responsibility of each institution to ensure they employ competent staff who have this knowledge.

(ii) Would every staff member who deals with the public need a knowledge of the mathematics of finance?

The answer is definitely "no". Repayment conditions and interest rates are almost invariably determined at Head Office level and the job of the branch manager or salesperson is to select for his client the most suitable of several alternatives. In the same way that at present each alternative plan supplied by Head Office has the repayment requirements stated in dollars and cents, so would the effective interest rate also be stated. In fact, this procedure should reduce the level of skill required by "front line" employees of financial institutions. Experience shows that many of them are at present quite unaware that there is more than one method of calculating interest rates and they are therefore quite incapable of explaining the existing policy of their own institution! With a uniform system of disclosure such explanations would not be necessary.

(iii) Would solicitors lending their clients money need any additional knowledge?

As professionals, solicitors could reasonably be expected to understand the mathematics of finance. However, if not all

solicitors are familiar with these concepts, it would be easy for the Law Society to circulate its members with tables stating the weekly, monthly, quarterly, six monthly and yearly payments required for each interest rate, in the same way that the financial institutions would provide their staff with similar tables.

(iv) What is an acceptable level of accuracy?

Until recently it was difficult to accurately calculate effective interest rates from a given stream of payments, but this situation has been completely changed with the advent of programmable calculators and micro computers. There is no reason why calculations cannot be made with precision using desk top machines. Accordingly the allowable errors in the 1980 draft legislation are surprisingly large. It is difficult to see why rounding off to the nearest 0.5 per cent (e.g. 11.3 per cent rounded to 11.5 per cent, 11.2 per cent rounded to 11.0 per cent) would not provide sufficient flexibility. As desk top computers and programmable calculators become increasingly common and cheaper, it should even be possible, should doubts arise, for salespeople to check any such calculations using pre-supplied programmes.

5.3 Would Interest Rate Disclosure Legislation be Enforceable?

There are two aspects to this question.

(i) Would legislation be costly to enforce?

Enforcement of law always involves a cost but in this instance the cost would be very low. Loan contracts are invariably in writing and a copy is held by the borrower. This is the only evidence needed. The ease with which information was obtained

for the case studies in this paper confirms this point. Indeed enforcement would be so easy it is doubtful if many cases would end up in court; the institutions would have no alternative but to follow the law.

(ii) Would there be loopholes allowing circumvention of the law?

It is quite possible there would be loopholes and it is not unlikely that subsequent amendments would be required to close them. One potential loophole is that some institutions might further increase their documentation and other charges such as compulsory credit insurance, contributions to loan redemption funds, etc. It is apparent that these charges already vary greatly from institution to institution and provide a convenient method of increasing the quoted interest rate. The simplest way of overcoming this problem would seem to be that all interest rates should be quoted as a percentage of the net sum lent to the borrower. This would have the effect of incorporating such charges into the quoted interest rates.

Another potential loophole is the use of interest rate review clauses to consistently raise effective interest rates above the quoted interest rate. In a dynamic economy there are very good reasons which necessitate these review clauses but scrutiny may be necessary to prevent some institutions from consistently quoting a low interest rate then reviewing it upwards after a few months.

5.4 Summary

The purpose of quoting all interest rates on the one basis is so that borrowers can compare the cost of money obtained from different sources. At present it is possible for two loans to be identical in respect to the size of the loan, the term and the quoted interest rate but to require different monthly repayments. It is also possible to have two loans for the same amount and the same term, but the loan with the *higher* monthly payments has the *lower* quoted interest rate.

It is possible to propound a number of plausible arguments as to why effective interest rate disclosure legislation should not be enacted. However, none of these arguments stand up well to careful scrutiny. It is all too easy to view supposed problems as reasons for non-implementation when in reality they may be nothing more than excuses. It is clear that many institutions, in particular those lending at high effective interest rates, have a vested interest in maintaining the status quo. The fact that one major New Zealand institution does quote interest rates on an effective basis indicates that the concept is practical.

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APPENDIX

INTEREST RATE FORMULAE

1. Compounding Formula

Given:

(a) the true interest rate per period expressed as a decimal = i

(b) the number of periods = n

(c) initial principal = P

then:

$$S_n = P(1 + i)^n$$

where S_n is the compounded value at the end of n periods.

2. Converting True Interest Rates to Nominal Annual Interest Rates

Given:

(a) the true interest per period expressed as a decimal = i

(b) the number of interest periods per year = m

then:

$$I_n = i \times m$$

where I_n = the nominal annual interest rate.

3. Converting True Interest Rates to Effective Annual Interest Rates

Given:

(a) the true interest per period expressed as a decimal = i

(b) the number of interest periods per year = m

then:

$$I_E = (1 + i)^m - 1$$

where I_E = the effective annual interest rate.

4. Calculating Effective Annual Interest Given the Initial Principal and Required Repayments

Given:

(a) the initial principal = $P

(b) the total number of payments = n

(c) the required repayments = $R

then the true interest rate, i, is the value of i such that:

$$P = \frac{R\{(1+i)^n - 1\}}{\{i(1+i)^n\}}$$

This value of i may be obtained manually by a trial and error procedure. Alternatively it may be obtained with the aid of a computer or programmable calculator. The true interest rate, i, is then converted to an effective annual rate using the previously mentioned formula:

$$I_E = (1+i)^m - 1$$

5. Calculating the Flat Interest Rate per Annum given the Initial Principal, the Number of Payments, and the Value of Each Payment

Given:

(a) the principal = P

(b) the total number of payments = t

(c) the number of payments per year = m

(d) the value of each repayment = R

then:

$$f = \frac{(R.t - P)m}{P.t}$$

where f = the annual flat interest rate expressed as a decimal.

6. Converting Flat Interest Rates to Effective Interest Rates

This formula is an approximation and cannot be relied upon to give precise answers.

Given:

(a) the flat annual interest rate = f

(b) the total number of repayments = t

then:

$$I_E = \frac{2.f.t}{t + 1}$$

where I_E = the effective interest rate.

7. Calculating the Required Payments Per Period Given the Effective Interest Rate

Given:

(a) the effective interest rate = I_E

(b) the number of repayments per year = m

(c) the total number of repayments = n

(d) the principal = P

then:

$$i = (1 + I_E)^{1/m} - 1$$

where i = the true interest rate per period.

This value for i may then be entered into the formula:

$$R = \frac{P \{ i(1 + i)^n \}}{\{ (1 + i)^n - 1 \}}$$

where R = the value of each instalment.

This formula and the previous formula for calculating flat interest rates can be used together to provide an approximate effective annual interest rate given the initial principal, the number of payments and the value of each payment.

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