Chapter 3:

Designing a Computer Model of a Student Loan Programme

The design of a student loan programme needs to take account of a wide range of variables. The capital required to establish a loan fund and the annual operating costs will depend on the choices made between the alternatives outlined in the previous chapter. These choices also determine the attractiveness of the loan programme to students themselves, and therefore the number of students who will be willing to borrow, which in turn determines the costs to the government of providing guarantees or interest subsidies for student loans.

Because of the number of variables involved, it is difficult and time consuming for the planner to compare the effects of alternative choices or assumptions. For example, decisions about the role of interest charged to students will determine the cost of interest subsidies and the extent to which loan repayments will finance future lending. They will also influence the number of students who are willing to borrow, and the proportion of borrowers who default on loan repayments. All these variables are inter-related. So what the planner needs is a way of examining the implications of alternative choices, from the point of view of both the lender and the borrower.

The Purpose of a Computer Model

A computer model provides a powerful tool because it allows the planner to see, very quickly, the effects of alternative choices or assumptions on the financial flows of the loan programme, as determined by:

* the number and size of loans each year
* the level of repayments
* the rate of default
* the costs of administering the loans.

These financial flows can then be evaluated from the point of view of both lender and borrower. They will show:

for the lender: What will be the costs of the programme, and what proportion of future lending can be financed from loan repayments?

for the borrower: What will be the future repayment obligations and how severe or reasonable is such a burden of debt?

Most of the existing student loan programmes were developed without the aid of computers, so that any comparison of alternative choices or assumptions was a very time consuming business. The result is that decisions have often been taken by politicians or policy makers without a full understanding of their implications for future costs.

An example is the decision in the USA to extend eligibility for Guaranteed Student Loans, under the Middle Income Student Assistance Act (MISAA) of 1978, discussed in Chapter 2. This decision caused an enormous increase in the number of borrowers under the GSLP and a rapid escalation in the cost to the Federal Government of providing interest subsidies. The outcome of this decision, in terms of the extra costs to the government, was almost certainly underestimated at the time that MISAA was enacted.

There is always the danger that the effects of a major change in policy will be underestimated, and there is no technique or computer model that can entirely guard against this danger. Where a computer model may help is in showing, very quickly, the effects of alternative assumptions and the sensitivity of the financial flows of a loan programme to changes in key variables. Thus, it provides a framework in which decisions can be taken with a greater awareness of the implications of alternative choices.

Today, the increasing availability of micro-computers and

personal computers with specially designed computer software packages, means that a computer model can be developed that will enable the policy maker to compare, very quickly, the effects of alternative choices or assumptions regarding:

A. the average period of the loan, which will be dependent on the average length of study, and whether students can borrow for the whole period of study, or only for part of their course
B. the repayment period
C. the grace period during which borrowers are exempt from paying interest
D. the grace period during which borrowers are exempt from repaying capital
E. the rate of interest which the borrower must pay for a student loan, i.e. the *internal* rate of interest of the loan programme
F. the rate of interest which the lender must pay for funds to finance the loan programme, i.e. the *external* rate of interest (which may be measured in terms of the market rate of interest, if loans are provided by commercial banks, or the rate of interest charged by the Central Bank, if the loans are provided by a government agency)
G. the average size of each loan
H. the rate of inflation
I. the default rate, in terms of the proportion of borrowers who delay repayments or who cannot or do not repay their loans
J. the administrative costs of setting up the loan programme
K. the annual administrative cost of running the loan programme
L. the number (or proportion) of students who will be eligible for a loan

Decisions or assumptions about these variable will determine:

* the number of loans provided each year
* the amount of loan repayments
* the costs of interest subsidies
* the cost of postponing or writing off loans that are in default

* the net cash position of the loan programme, after paying such costs and providing new loans.

The calculations will show how viable a loan programme will be from the point of view of the lender. Similarly, from the point of view of the borrower, a computer model can show the effects of decisions about how much to borrow, and the effects of different repayment terms on the future burden of debt. To estimate the burden of debt, a borrower needs to see the implications of variations in:

* the amount borrowed each year
* the rate of interest
* the grace period
* the length of repayment
* assumptions about future job and earning prospects.

A Model to Assist Student Choice

One such model that has been developed in the USA is the *Student Loan Counselor*†, developed by the Education Testing Service at Princeton. This was designed to help financial aid administrators or advisors to guide and assist students in making decisions about whether, and how much, to borrow to finance their undergraduate or graduate study. The model is designed to run on a personal computer, in the office of a university or college financial aid advisor. The *Student Loan Counselor* consists of a diskette and a user's manual which explains the nature and purpose of the model, and gives instructions for its use (see box on p. 72).

The model is 'menu driven', which means that it provides

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†*The Student Loan Counselor* is a trademark of Educational Testing Service (ETS), Princeton, New Jersey, USA, and the model is the copyright of ETS. I am grateful for permission to quote from the user's manual and to reproduce illustrations of the use of the model.

Overview of the Student Loan Counselor

The Counselor allows you to:

* *review the terms and conditions of various student loan programs, including amounts that students may borrow, interest rates, maximum length of time that students are allowed to repay various loans, information about periods of grace and deferment, and whether financial need is a consideration in establishing eligibility for each program*
* *enter basic student background information, including the student's name, dependency status as an undergraduate, present educational level, date of graduation, plans to enter the armed forces, Peace Corps, VISTA, U.S. Public Health Service or other action program following graduation, and plans (if any) to enter a health professions field*
* *enter amounts that the student has borrowed or plans to borrow from as many as five major federal student loan programs and up to two school (or other) loan programs*
* *enter estimates of starting income and income growth for use by the system in projecting the student's income during the loan repayment period.*

Once the above information is entered into the system, at the touch of a button, the Student Loan Counselor provides:

* *estimates of the amounts that the student would have to repay for individual student loan programs and the student's consolidated loan repayment obligations (annual and monthly)*
* *an overview, for each student loan program, of interest rates, payment starting and ending dates, principal amounts borrowed, interest payments, and total payments*
* *estimates, based on starting income and inflation figures that you enter, of the student's income during each repayment year in relation to the student's loan repayment obligation for that year*
* *graphs of income projections and the percentages of the student's income required each year to retire his or her loan indebtedness.*

The Student Loan Counselor is easy to operate, because it is a menu-driven system.

messages and instructions for the user on the visual display screen of the personal computer. These instructions allow the student advisor to use different menus to perform different functions:

* Compare different loan programmes
* Enter into the computer information about the student's background, such as family income level, and educational and career plans, in order to establish eligibility for different loan programmes
* Enter information about the amount of money the student wishes to borrow
* Calculate future loan repayments
* Estimate future income, as determined by the student's choice of career, information about average starting salaries and assumptions about future inflation and income growth
* Estimate the burden of debt, in terms of the proportion of future income that will be needed to repay the student loan.

The use of the *Student Loan Counselor* can be illustrated by two hypothetical examples. In the first case, the financial aid administrator is advising a student, Mary Smith, who wants to finance her undergraduate study in the USA by means of a Guaranteed Student Loan (GSL). First, the adviser must decide whether the student is eligible for the GSLP and must explain to Mary Smith the terms of the loan program, which are summarised on the computer screen as shown in the box on page 74.

Having established that Mary Smith is eligible, and wishes to borrow $2,500 a year for four years, the adviser can use the model to calculate her future loan repayments, having first entered into the computer information about:

* the year in which she will graduate
* whether or not she intends to enter the armed services, Peace Corps, etc (which determines whether loan repayments can be deferred).

Guaranteed Student Loan (GSL) Program.

Interest Rate.....7, 8, 9%	Student must be Enrolled at least.....half time
Repayments Start...after you leave school	Citizenship.....U.S.
Loan Maximums (per year)	Origination Fee.....5% of
—Undergraduates..$2,500	principal
—Grad/Prof Students.....$5,000	Grace Period.....6 months
In Total	Deferment-Max. Time..††see
—Undergraduates . $12,500	note
—Grad/Prof Students.....† $25,000	Based on Need?.....yes, if income > $30,000

† including undergraduate GSL borrowings
†† 3 yrs. for armed forces, Peace Corps, VISTA, etc.
†† 2 yrs. for residency training

The next step is to estimate the burden of debt, in the light of Mary Smith's career plans. Her future job prospects, together with the future rate of inflation and rate of growth of incomes in the economy as a whole, will determine how much of her annual income will be needed for loan repayments. The computer model helps the student to make realistic assumptions. Built into the model is a body of data on average starting salaries in the USA in a wide range of occupations. The system also suggests alternative assumptions about future inflation and income growth. The student may be an optimist or a pessimist, which will influence her assumptions about her future career prospects. The model allows Mary Smith to estimate her future burden of debt on the basis of different assumptions about starting salary and about inflation and income growth.

Mary Smith, or her adviser, feeds these assumptions into the computer, which calculates future loan repayments as a proportion

of her income. The result can be shown on the computer screen, in terms of:

(a) a table showing annual and monthly income and loan repayments as a proportion of income (below).

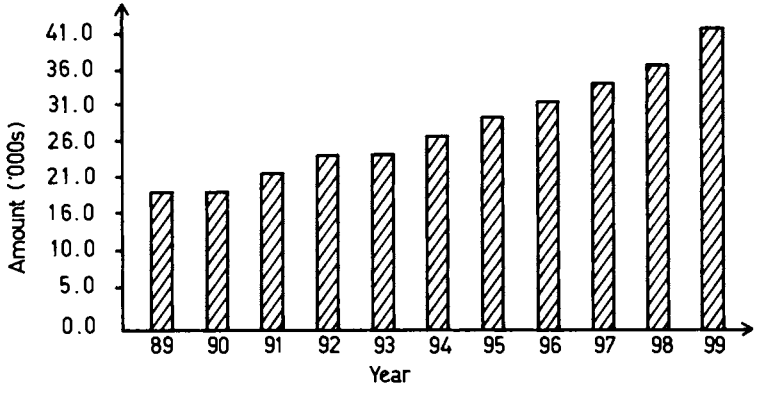
Loan Burden Analysis for: Mary Smith

Year	*Annual Income*	*Monthly Income*	*Repay/ Month*	*Payments as % of Income*
1989	*18900*	*1575*	*127*	*8.043*
1990	*20440*	*1703*	*127*	*7.437*
1991	*22106*	*1842*	*127*	*6.876*
1992	*23908*	*1992*	*127*	*6.358*
1993	*25856*	*2155*	*127*	*5.879*
1994	*27964*	*2330*	*127*	*5.436*
1995	*30243*	*2520*	*127*	*5.026*
1996	*32707*	*2726*	*127*	*4.648*
1997	*35373*	*2948*	*127*	*4.297*
1998	*38256*	*3188*	*127*	*3.973*
1999	*41374*	*3448*	*127*	*3.674*

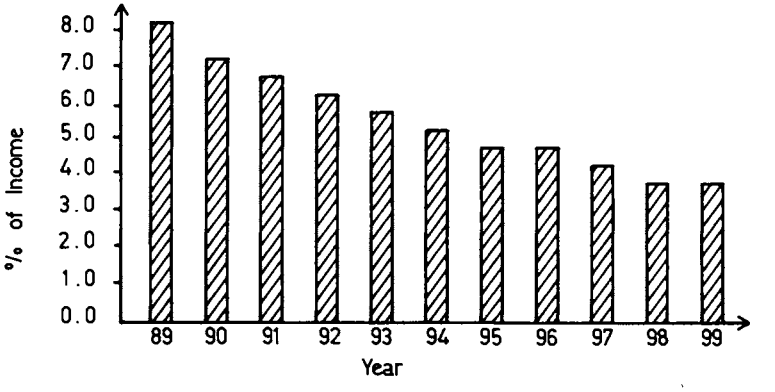
Starting Income = $18000 in 1988 Dollars.
Inflation = 5%. Income Growth Rate = 3.00%

(b) a graph showing estimated gross income profile and loan burden as a proportion of income (see p. 76).

In this example, Mary Smith plans to take a GSL and borrow $2,500 a year for four years of undergraduate study. She hopes to be earning $18,900 in 1989, when she first begins to repay the loan, and expects the future rate of inflation to be 5% and real income growth to be 3% a year. On the basis of these choices and assumptions, the computer model shows Mary Smith or her adviser that loan repayments will represent 8% of her income in 1989 and nearly 4% of her income in 1999, by which time her loan will be



Estimated Gross Income Profile for: Mary Smith



Loan Repayments as a Percentage of Income for: Mary Smith

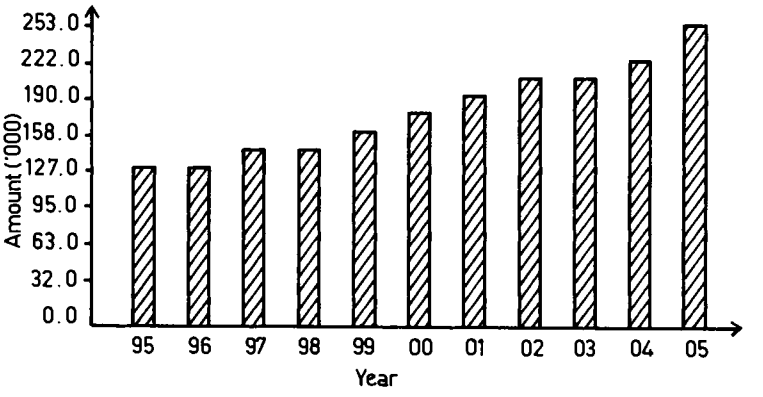
repaid in full. These assumptions may be too optimistic, but the model allows the student to see quickly the effects of a lower starting salary or higher rates of inflation.

The next example shows the choices of a graduate student, Martin Peterson, who plans to be a doctor, and who is therefore eligible for a Health Education Assistance Loan (HEAL). This allows a student to borrow much larger amounts than the GSLP, but charges the market rate of interest. Martin Peterson can use the model to help him decide whether this would be profitable, given the high income expections of American doctors.

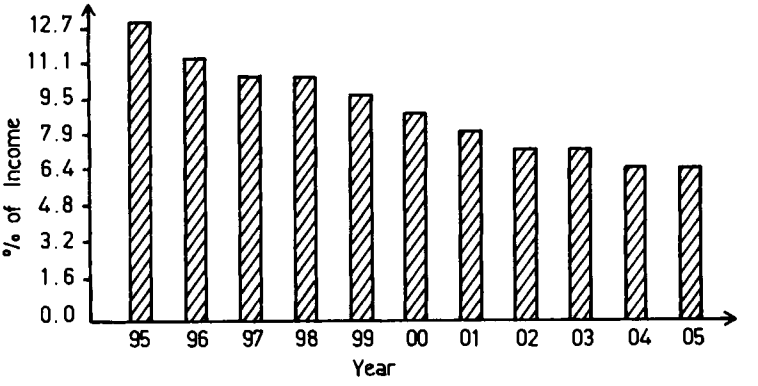
Martin Peterson estimates his starting salary, on the basis of current data on doctors' incomes, future inflation and income growth. These suggest that loan repayments for a HEAL loan will require 13% of his income in 1990, but only 6.4% by 2000 (see p. 78).

Are these assumptions realistic? The model cannot answer that question, although it does contain data on average starting salaries which serve as a guide. But the user's manual emphasises that "*The Student Loan Counselor* is intended to be used as an adjunct to the personal counselling process involving the financial aid administrator and the student borrower. It was *not* designed to replace the human interaction between counsellor and student that is so vital in assuring a clear understanding of the student's repayment obligations." In other words, the financial aid administrator must use personal experience to help the student choose realistic assumptions when using the model. The advantage of this model is that both student and adviser can then see, extremely quickly, the effects of alternative choices.

The *Student Loan Counselor* is, of course, specifically designed for use in the USA. The model incorporates data and information about the American student loan system and cannot be used, by itself, to analyse choices in a different country. However, the model does demonstrate, very powerfully, the potential uses of a computer model as a way of analysing the effects of alternative choices regarding the size of loan, interest rates and repayments terms, on the debt burden of individual student borrowers. Such a model could be developed for any other actual or hypothetical loan system, in order to:



Estimated Gross Income Profile for: Martin Peterson



Loan Repayments as a Percentage of Income for: Martin Peterson

* assist students to make decisions about borrowing
* help in the design of a loan programme by showing the effects of alternative types of loan from the point of view of the student borrower.

A Model to Assist Planning and Administration

A similar model could be developed to analyse such choices from the point of view of the lender. The remainder of this chapter provides an illustration of such a model†, which is designed to show the financial flows of a student loan programme on the basis of chosen or assumed values for the 12 variables identified and discussed earlier in this chapter (see page 70).

The model is not yet fully developed. It is based on a standard spread-sheet software package for a personal computer, and many further refinements could be included. For example, additional variables could be included, and it could be 'menu-driven', in the same way as *The Student Loan Counselor*.

At this stage, the model is intended simply for illustrative purposes, in order to show the potential uses of such a financial model as a way of assisting the planning and administration of a student loan programme by:

* analysing the effects of alternative choices or assumptions during the process of designing a loan programme
* providing a management tool during the process of administering the loan programme.

Assumptions of the Financial Model

The model uses the 12 variables (A-L) listed on page 70. These are the 'input variables' of the model, which are used to

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† The financial model has been developed with the help of John Webb and Sue Brownlow of Peat Marwick. However, the model has not been fully tested and no responsibility is accepted for its accuracy. It is here presented for illustrative purposes only.

calculate the financial flows of the student loan programme, on both an annual and cumulative basis.

For the purposes of this illustration these variables have the following values:

A. *Period of Loan* *(A = 3 years)*
Loans will be available for three years of study.

B. *Period of Repayment* *(B = 10 years)*
The loans should normally be repaid in ten years.

C. *Grace Period for Interest* *(C = 0 years)*
There will be no grace period for interest, i.e. interest will be charged during the period of study. This may not seem realistic in practice, but this assumption allows the policy maker to see, quite explicitly, the cost that is involved if this interest is foregone or deferred. Some loan programmes do charge interest during the study period (e.g. PLUS loans in the USA). Others allow borrowers to defer interest payments while they are studying, but the accumulated interest is added to the total debt on graduation (e.g. HEAL loans in the USA).

D. *Grace Period for Capital* *(D = 4 years)*
Borrowers need not repay capital during the three years of study or for one year after graduation.

E. *Internal Interest Rate* *(E = 8%)*
Borrowers pay 8% interest on their loans.

F. *External Interest Rate* *(F = 10%)*
The loan programme is financed through the Central Bank, which charges 10% interest. The loan programme therefore obtains funds at 10%, lends at 8% and bears the cost of a 2% interest subsidy.

G. *Average Size of Loan* *(G = $2,500)*
The average loan to students in year 1 is $2,500, and in subsequent years the average value of the loan increases with inflation.

H. *Rate of Inflation* *(H = 5%)*
The annual rate of inflation is assumed to be 5%.

I. *Default Rate* *(I = 20%)*
Each year 20% of borrowers are assumed to postpone or default on loan repayments.

J. *Administrative Start-Up Cost* *(J = $100,000)*
The initial cost of setting up the loan programme is assumed to be $100,000.

K. *Administrative Running Cost* *(K = 5%)*
The annual running costs are assumed to be 5% of the total value of loans awarded each year.

L. *Number Eligible to Borrow* *(L = 2,000)*
The loan programme will provide 2,000 student loans each year, but it is assumed that in the first two years, students will not take up the full number of loans, so that in year 1 of the system, the number of borrowers will be 1,000 and in year 2, it will be 1,500. By year 3, it will be 2,000.

These assumptions are summarised in the box below.

Student Loan System: Financial Model — Illustrative Version

Input Variables:

A. Period of Loan (Years):	*3*
B. Period of Replacement (Years):	*10*
C. Period of Grace on Interest (Years):	*0*
D. Period of Grace on Capital (Years):	*4*
E. Internal Interest Rate (%):	*8*
F. External Interest Rate (%):	*10*
G. Average Annual Loan size Year 1 (%):	*2,500*
H. Rate of Inflation (%):	*5*
I. Default Rate (% of graduates):	*20*
J. Administration start-up cost ($):	*100,000*
K. Administration running cost (% expenditure):	*5*
L. Number eligible for loan:	*2,000*

The Operation of the Model

On the basis of these input variables, which can be given any values to represent alternative choices or assumptions, the model uses a standard spread-sheet format to calculate the values of a number of dependent variables, for each year in the life of the student loan programme. An example showing the operation of the model is shown on pages 84–5. In this illustration, the calculations are shown for Year 1 to Year 20. The dependent variables, and the way in which they are determined, are as follows:

1. *Number of new borrowers this year*
   Determined by the input variable L.

2. *Number receiving loans*
   Shown separately for each year of operation, from starting year to current year. When the programme is fully operational,

   $$\sum_{n=1}^{n=a} (2) = (1) \times A$$

3. *Total current borrowers*
   The number of loans still outstanding, including borrowers in the grace period (3a), and those in repayment status (3b). Determined by (2) and by the length of repayment (B) and the grace period (D).

4. *Average loan size this year*
   Determined by average size of loan at the start of the programme (G), multiplied by the average rate of inflation per year (H).

5. *Total value lent this year*
   Determined by average size of loan (4) and by the number receiving loans [Σ (2)] each year.

6. *Cumulative total lent*
   The sum of (5) over the total life of the loan programme.

7. *Individual debt after grace period*
   The sum of (4) during the period of loan (A).

8. *Capital repayments this year*
   Determined by (7) and (3b) and by the period of repayment (B) and the default rate (I).

9. *Cumulative capital repayments*
   The sum of (8) over the total life of the programme.

10. *Net capital position this year*
    The difference between capital repayments (8) and the amount lent each year (5).

11. *Interest payable this year on funding*
    Determined by (10) and by the external interest rate (F).

12. *Cumulative interest paid*
    The sum of (11) over the total life of the programme.

13. *Interest receivable this year*
    Determined by (5) and by the internal interest rate (E) and by the default rate (I).

14. *Net cash position this year*
    The difference between the cash inflows (8 + 13) and the cash outflows (5 + 11) each year.

15. *Cumulative net cash position*
    The sum of (14) over the life of the programme.

16. *Administrative costs*
    Determined by the cost of setting up the programme (a fixed cost, J) and the annual running costs of the programme [(5) × 5%].

17. *Overall net cash position this year*
    The net cash position (14) minus administrative costs (16).

STUDENT LOAN SYSTEM: FINANCIAL MODEL — ILLUSTRATIVE VERSION

INPUT VARIABLES:

A.	Period of Loan (Years):	3
B.	Period of Repayment (Years):	10
C.	Period of Grace on Interest (Years):	0
D.	Period of Grace on Capital (Years):	4
E.	Internal Interest Rate (%):	8
F.	External Interest Rate (%):	10
G.	Average Annual Loan size Year 1 (%):	2500
H.	Rate of Inflation (%):	5
I.	Default Rate (% of graduates):	20
J.	Administration start-up cost ($):	100000
K.	Administration running cost (% expenditure):	5
L.	Number eligible for loan:	2000

1.	Number of New Borrowers This Year:		1000	1500	2000	2000	2000	2000	2000	2000
		FINANCIAL YEAR:	1	2	3	4	5	6	7	8
2.	Number receiving loans - starting year:	1	1000	1000	1000	0	0	0	0	0
		2		1500	1500	1500	0	0	0	0
		3			2000	2000	2000	0	0	0
		4				2000	2000	2000	0	0
		5					2000	2000	2000	0
		6						2000	2000	2000
		7							2000	2000
		8								2000
		9								
		10								
		11								
		12								
		13								
		14								
		15								
		16								
		17								
		18								
		19								
		20								
3.	Total current borrowers:		1000	2500	4500	6500	8500	10500	12500	14500
	of which:									
3a.	Total in period of grace:		1000	2500	4500	6500	7500	8000	8000	8000
3b.	Total in repayment status:		0	0	0	0	1000	2500	4500	6500
4.	Average Loan size This Year (K$):		2500	2625	2756	2894	3039	3191	3350	3518
5.	Total Value Lent This Year		2500000	6562500	12403125	15917344	18232594	19144223	20101435	21106506
	of which:									
5a.	Value New Loans This Year:		2500000	3937500	5512500	5788125	6077531	6381408	6700478	7035502
5b.	as % of Total:		100	60	44	36	33	33	33	33
6.	Cumulative total lent:		2500000	9062500	21465625	37382969	55615563	74759786	94881221	115967727
7.	Individual debt after grace period:		0	0	0	0	7881	8275	8689	9124
8.	Capital Repayments This Year:		0	0	0	0	630500	1623538	3013790	4473555
9.	Cumulative Capital Repayments:		0	0	0	0	630500	2254038	5267828	9741383
10.	Net Capital Position This Year:		-2500000	-6562500	-12403125	-15917344	-17602094	-17520886	-17087645	-16632951
11.	Interest Payable This Year on Funding:		250000	656250	1240313	1591734	1760209	1752089	1708764	1663295
12.	Interest Paid (Cumulative):		250000	906250	2146563	3738297	5498506	7250575	8959339	10622634
13.	Interest receivable this year:		160000	420000	793800	1018710	1166886	1225230	1286492	1350816
14.	Net Cash Position This Year:		-2660000	-6798750	-12849938	-16490368	-18186417	-18047524	-17509917	-16948430
15.	Net Cash Position (Cumulative):		-2660000	-9368750	-22238388	-38728756	-56824173	-74871697	-92481614	-109427044
16.	Administrative costs ($):		225000	328125	820156	795867	911630	957211	1005072	1055325
16a.	Set up costs:		100000	0	0	0	0	0	0	0
16b.	Running costs:		125000	328125	620156	795867	911630	957211	1005072	1055325
17.	Overall Net Cash Position This Year:		-2815000	-7126875	-13469794	-17286235	-19107047	-19004735	-18514989	-18003755
18.	Overall Net Cash Position (Cumulative):		-2815000	-9941875	-23411668	-40697904	-59804951	-78809686	-97324676	-115328431

2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
9	10	11	12	13	14	15	16	17	18	19	20
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0
2000	2000	0	0	0	0	0	0	0	0	0	0
2000	2000	2000	0	0	0	0	0	0	0	0	0
	2000	2000	2000	0	0	0	0	0	0	0	0
		2000	2000	2000	0	0	0	0	0	0	0
			2000	2000	2000	0	0	0	0	0	0
				2000	2000	2000	0	0	0	0	0
					2000	2000	2000	0	0	0	0
						2000	2000	2000	0	0	0
							2000	2000	2000	0	0
								2000	2000	2000	0
									2000	2000	2000
										2000	2000
											2000
18500	18500	20500	22500	24500	26500	27500	28000	28000	28000	28000	28000
8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000	8000
8500	10500	12500	14500	16500	18500	19500	20000	20000	20000	20000	20000
3694	3878	4072	4276	4490	4714	4950	5197	5457	5730	6017	6317
22161832	23269923	24433419	25655090	26937845	28284737	29698974	31183923	32743119	34380275	36099289	37904253
7387277	7756641	8144473	8551697	8979282	9428246	9899658	10394641	10914373	11460092	12033096	12634751
33	33	33	33	33	33	33	33	33	33	33	33
138129559	161399482	185832901	211487992	238425836	266710574	296409548	327593470	360336589	394716864	430816152	468720405
9580	10059	10562	11090	11644	12226	12838	13480	14154	14861	15604	16385
6006309	7615700	9305560	11079914	12942965	14899210	16322746	17486447	18380769	19278807	20242748	21254885
15747691	23363391	32668951	43748865	56691850	71591060	87913806	105400252	123781021	143039829	163282576	184537461
-16166523	-15654224	-15127869	-14575177	-13994080	-13385527	-13376228	-13697476	-14382350	-15101467	-15856541	-16649366
1615552	1565422	1512786	1457518	1399486	1338553	1337623	1369748	1438235	1510147	1585654	1664937
12238187	13803609	15316395	16773913	18173399	19511951	20849574	22219322	23657557	25167704	26753358	28418294
1418357	1489275	1563739	1641926	1724022	1810223	1900734	1995771	2095560	2200338	2310354	2425872
-16352716	-15730371	-15076906	-14390768	-13670324	-12913857	-12613116	-13071453	-13725026	-14411277	-15131840	-15888432
-125779762	-141510133	-156587040	-170977808	-184848132	-197561989	-210375105	-223446558	-237171583	-251582860	-266714700	-282603132
1108092	1163496	1221671	1282755	1346892	1414237	1484949	1559196	1637156	1719014	1804964	1895213
0	0	0	0	0	0	0	0	0	0	0	0
1108092	1163496	1221671	1282755	1346892	1414237	1484949	1559196	1637156	1719014	1804964	1895213
-17460610	-16883867	-16298577	-15673523	-15017216	-14328084	-14298085	-14630649	-15362181	-16130290	-16936805	-17783646
-132786240	-149660107	-165978685	-181652208	-196669424	-210997517	-225296602	-239926231	-255288412	-271418703	-288355508	-306139153

18. *Cumulative overall net cash position*
    The sum of (17) over the life of the programme.

The Results of the Model

The model can be used to show what proportion of new loans each year will eventually be financed by repayments of previous loans. Because of the assumptions built into this illustrative version of the model, i.e. the fact that the internal interest rate (E) is subsidised and the default rate is 20%, this hypothetical loan programme will never become fully self-financing. By the time the loan programme is fully operational, the capital repayments each year (8) will represent 56% of the total amount lent each year (5), and the cash inflows each year (8 + 13) will represent 60% of the cash outflows each year (5 + 11). When allowance is also made for the annual cost of administering the loan programme (16b), then the model shows that the annual receipts from loan repayments (8 + 13) represent more than half (57%) of the annual expenditure of the loan programme.

The policy maker may decide that this would represent a significant saving of public funds, compared with a programme based entirely on scholarships or grants. However, the policy maker may decide to change some of the assumptions by changing the values of the input variables. The model will then show the effects of these alternative assumptions on the financial flows of the programme.

For example, the assumptions on interest rates could be modified, so that borrowers would have a grace period for interest, corresponding to the grace period for capital repayments. This would reduce the annual receipts of the programme and increase the cost of the interest subsidy. Alternative assumptions about the rate of default or the rate of inflation would also change the cash position of the programme.

Additional variables could be incorporated into the model, which would also affect the results. This version does not include any 'loan forgiveness clauses', which are a feature of several loan programmes. Other factors could also be included. It must be emphasised that this illustrative version of a financial model represents nothing more then the 'bare bones' upon which a more detailed and elaborate model could be constructed.

Conclusion: A Framework for the Analysis of Choices

The advantage of the computer models outlined in this chapter are that they provide a framework for analysing the effects of alternative choices in the design of a student loan programme. The use of a computer is not, of course, absolutely necessary. In fact, most of the existing loan programmes were designed without the aid of a computer.

The essential requirement for the design of a loan programme is not a computer but a systematic comparison of alternatives. A computer model simply provides a means to that end. Even without such a model, the planner should compare the effects of alternative interest rates or repayment periods, or the effect of alternative assumptions about the rate of default, in designing a student loan programme.

Such comparisons show that the final outcome of a student loan programme will depend on many factors. The outcome will depend partly on policy decisions such as:

* How much should students be subsidised?
* What is an acceptable burden of debt?

It will also depend on the attitudes of students, or their parents, towards borrowing which in turn will depend on:

* the private rate of return to higher education, and student perceptions of these returns
* general attitudes to credit in society.

Finally, it will depend on conditions in the country, for example:

* economic conditions, such as the rate of inflation
* the efficiency of banks or other institutions providing student loans, which will influence the rate of default and the administrative costs of the loan programme.

None of these can be predicted with certainty. International experience of student loan programmes, examined in more detail in the final section of this book, shows that there are considerable variations between countries in the input variables that influence

or determine the outcomes of a student loan programme. It also shows that planners should be aware of a number of trade-offs. For example, a low rate of interest on student loans will increase their attractiveness to students, which may increase their political acceptability, but diminish the savings that will result from the introduction of loans. Similarly, a very flexible system of loans which incorporates loan forgiveness clauses or other incentives, and variable repayment terms for different groups of borrowers, may achieve efficiency or equity objectives, but only at the cost of administrative complexity, higher administrative costs, and less saving of public funds. The choice between these alternatives therefore depends crucially on the policy objectives of the student loan programme.

Information about **The Student Loan Counselor** *can be obtained from:*

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If you would like further information about the computer model discussed in this chapter, please write to:

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