NORGES HANDELSHØYSKOLE

Bergen, 10 Aug 2006

# Income-linked loan contracts in a Norwegian perspective

*Case: Norwegian State Education Loan Fund (NSELF)*

**Einar Bakke**

**Adviser: Agnar Sandmo**

A Thesis for the MSc Financial Economics

NORGES HANDELSHØYSKOLE

# Abstract

This thesis approaches the Norwegian State Education Loan Funds repayment scheme for student loans. I light of a more digitized Norway it is reasonable to assess more sophisticated approaches to student loan repayment.

Income-linked loan schemes basically let graduates repay their student loans as fraction of their income rather then as function of their principal debt. Meaning you that you repay your loan as a percentage of your income, and thus let your payments follow your income growth. This has rather attractive feature of giving low-income earners better liquidity in the first phase of their career. Hence reducing the risk of large student loans for the borrower and reducing the chance of default for the lender.

The focus of this thesis will be on the repayment scheme. All other aspects of student loans will only be presented if appropriate.

I will begin this thesis with an introduction of income-linked loans as well as a presentation of the current history of such repayment schemes in other countries. Thereafter I will introduction the current theory and discuss a possible Norwegian application of such a scheme. I will further analyze how such a repayment scheme would have turned out if it had been employ by the Norwegian State Education Loan Fund in the seventies. Finally I will suggest a pragmatic solution to individualizing such fractions of income in a way that follows an individual's income growth.

***Acknowledgements***

I would like to express my gratitude toward my advisor Agnar Sandmo.

I would also like to thank Per Östberg and my father Kristen Bakke for valuable comments and advise in the writing process. I am also most obliged to Siviløkonomene, TEKNA and the Norwegian State Education Loan Fund, who have provided me with data which is the bases for my research.

# Table of Content

# 1. An Introduction to Income-Linked Loans

The idea of income-linked loans for financing human capital originates from Milton Friedman in an article dating back to 1945[1]. Friedman explores in *Capitalism and Freedom* the idea of financing education thru equity like instruments. The basic idea sprung from the fact that there is a problem when financing education in that the lender has no collateral. In the same way as an investor would buy equity to invest in a new venture, he could also invest in an equity like instrument to develop human capital.

Imagine that a student does not have any funds available to finance a college education. He is offered two loan options. The first is a mortgage type loan where he upon graduation would pay an equal amount, consisting of interest payment and payment on the principal, for a given number of years. The second contract is a contract in which he receives funds by committing to pay a fraction of his future income for a given period. In essence paying a dividend on his earnings to the investor. Which of the two options the student would choose depends upon many factors, and the covenants of the contract.

Norway has since the Norwegian State Education Loan Fund (hereby referred to as NSELF) was established in 1946 offered a loan of the first type. Until 1972 the financial aid given by NSELF was based on discretion[2], but from 1972 and onward financial aid has been available to any Norwegian student irrespective of social background. In this thesis I will try to explore the second type of contract and its different versions. As such my research question for this thesis is: "What if NSELF had instead offered an income-linked contract, what would have been the consequences?"

Lets first explore different types of loan contracts and their characteristics.

---

[1] According to Palacios (2004) I have only consulted Capitalism and Freedom (Friedman, 1962). For those interested I have included his reference in my reference list.

[2] Students were offered loan base on their parent's inability to finance their children's education.

## 1.1 Loan types

### 1.1.1 Mortgage Type Loans

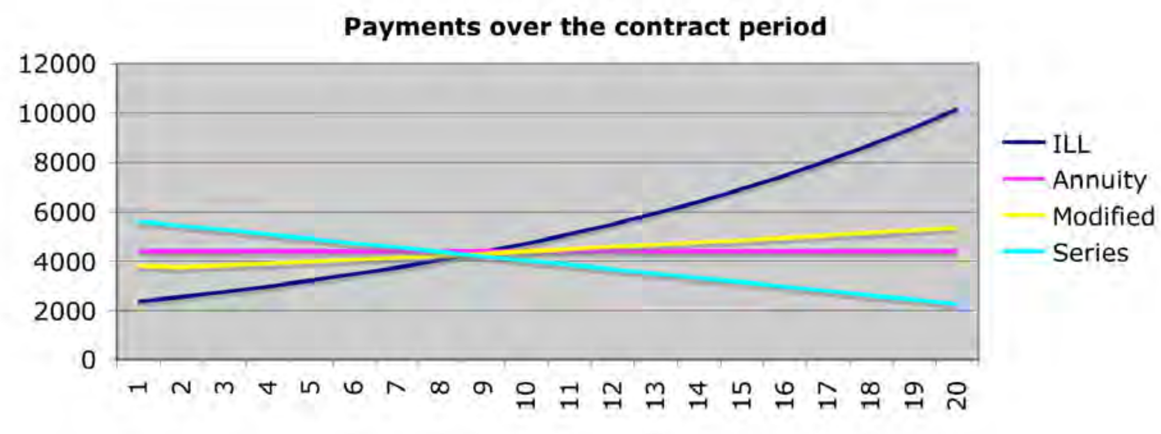
An annuity contract is the type of loan most people are familiar with. This is the traditional loan in which you borrow and repay according to a repayment plan that is related to the size of the loan. It can come in one of three varieties. First is a straight annuity, which is the loan most people are familiar with. With a straight annuity the payments stay the same over time, only adjusted by a change in the market interest rate if the loan has a floating interest rate. Payments are the same size and are in effect the sum of interest accrued for each period and an increasing payment on principal over the repayment period. The second type is a series loan. This type of loan has equally sized payments on the principal each period in addition to the accrued interest for the period. This results in decreasing size of the payments over the payment period. The third type is a modified annuity. This is a loan in which the payments grow in size. Sweden uses this type of repayment schedule on their student loan to adjust the repayment plan in such a way that the payments are in equal size in real terms, meaning the students payments increase in nominal terms, but would have the same purchase power for every year of repayment.

To sum up there are three ways to structure a mortgage loan. The first is a nominally flat repayment plan, the second a declining repayment plan and finally a repayment plan where the payments grow by some factor, for instance inflation like in Sweden.

### 1.1.2 Income-Linked Loans

The main feature of an income-linked loan is that payment are linked to a fraction of the borrower's future income and not the principal received by the borrower. In essence these contract have the same properties as equity, with the only difference being that they last for a limited time and that there is an absence of ownership. The absence of ownership worth pointing out since the investor only owns a right to a fraction of an individual earnings and not the right to direct the individual's actions. If this condition does not exist these contracts would in essence be indentured servitude.

Income-Linked Loans can be divided into two main categories: Income Contingent Loans (ICL) and Human Capital Contracts (HCC). ICLs are essentially loans in which the borrower repays a fraction of their earnings until the principal and accrued interest is repaid. Imagine that you borrow one hundred thousand and repay it with 5 percent of your annual earnings until the loan is repaid. Every year you would pay your 5 percent. If the payment is less than the accrued interest your principal will increase, and visa versa. Now, the length of the contract will wary with the size of your earnings. The debt can either be arranged as an individual debt or as a group debt as Yale did with the Tuition Postponement Option in the seventies. HCCs on the other hand work slightly different from an ICL. You repay the same 5 percent but over a set contract length, say 20 years. This way high-income graduates will repay more than low-income graduates if they are charged the same rate. If one was able to charge the fraction of income that would result in the graduate repaying the principle and accrued interest in exactly within the length of the contract the two variations would yield the same result. Lets call this rate the Correct Contract Rate (CCR). Later in my analysis I will calculate the CCR and time it would take different cohorts of graduates to repay their Income Contingent Loans at different policy rates[3].




Now, what would the reasons be for such contracts to be attractive? Repayment will be of the same size relative to the graduate's income for the whole repayment period. This would reduce the risk of repayments restricting the borrower income and certainly reduce the likelihood of default. Consider an annuity where the payment size stays constant[4] for the repayment period. In effect this means that the payments constitute a larger fraction of the graduate income in the start of his career when money is thigh and visa versa. After

---

[3] A policy rate it a static rate set in the contract by the lender. This is as oppose to a dynamic rate working within agreed upon bounds to adjust for inflation or market interest rates.

[4] Given a constant interest rate.

graduating college most student face many financial challenges. The will need to obtain a place to live, means of transportation and possibly start a family.

Other relevant benefit would be how this feature would assist entrepreneur when considering a new venture, a theme that lately has got a lot of attention in the media and with policymakers. Such a repayment schedule would enable both student fresh out of school and those with experience to embark on new ventures as the only loan that cannot sell their assets to repay[5]. The fact that they will only have to pay a small fraction of their already small income will relieve at least some of the issues that may deter them from taking the risks of starting a new venture.

#### *1.1.2.1 An illustrative example*

In Norway the doctrine has after World War II been that there should be relatively small differences in income. This is the result of a redistributive tax system and emergence of what is known as a "Scandinavian" welfare state. It is not the subject of this thesis to discuss neither this doctrine nor the way the Norwegian government chooses to finance higher education, but I believe that it is appropriate to acknowledge that Norway has been ranked as the world's best country to live in by the United Nations (UN 2005) for many years in a row now so the doctrine seems to work fairly well. I will therefore only discuss the repayment of the student loan given, as is the policy today, and not consider alternatives as such.

Now this result in, as I will later discuss, less economic benefit for those who pursue higher education. I will limit my self to two short examples.

First I would like to consider Kari. She enjoys working with people and considers one of two career choices. Either to become a licensed practical nurse[6] which is a diploma she would obtain as an alternative in high school[7] or to obtain a high school diploma and subsequently go for three years to nursing school. The first alternative giving her a three years head start with regards to earnings, and the second a sizeable debt. On the following page you will find

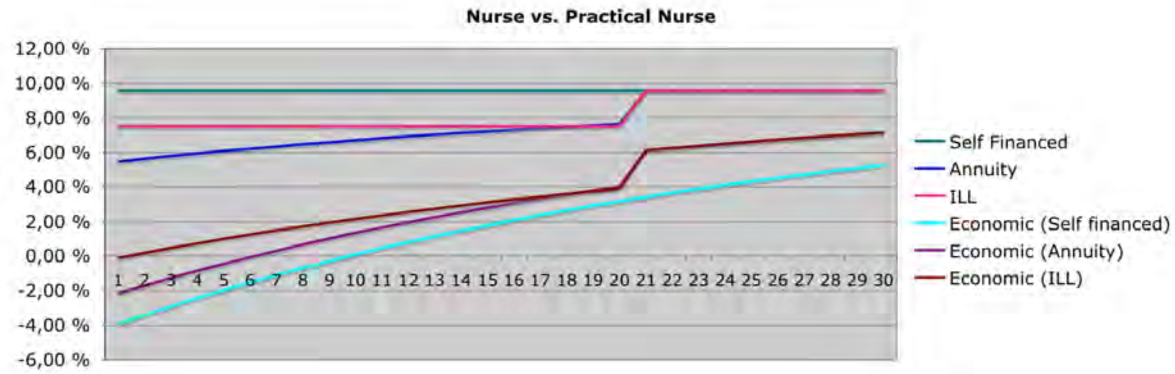
---

[5] I am referring to the fact that there is no way to sell your education in order repay your loan, as you could with say a house.

[6] "hjelpepleier"

[7] This would not give her full quantifications to apply for nursing school

a diagram representing relative differences between the two alternatives from starting with the year of graduation from college. I show both the nominal difference and the economic difference. The first nominal difference is the difference in disposable income after tax and loan payments. The economic difference shows the same difference but also correcting for a write-off for the alternative cost of lost income[8]. I have also included the difference if the degree is self-financed, which only corrects for the loss in income and no benefits. I would like to point out that both professions are with few exceptions publicly employed in Norway resulting in a fairly equal income growth[9].




It become quite clear that the current system does not imply that a rational person would pursue a degree in nursing when there is such an income disadvantage[10]. Even though an income-linked loan only would result in slight difference in disposable income it seems clear that it would alleviate some of the inequity in the first part of the career. The kinks in the curves indicate the loan obligation ending.

If we take a second look at a presumably more lucrative career choice employed in the private sector and a related blue-collar career what would be the result? I will present a similar diagram for a civil engineering student and a construction worker[11]. Here I have used an income growth of 8 percent for both the civil engineer and for the construction worker. I

---

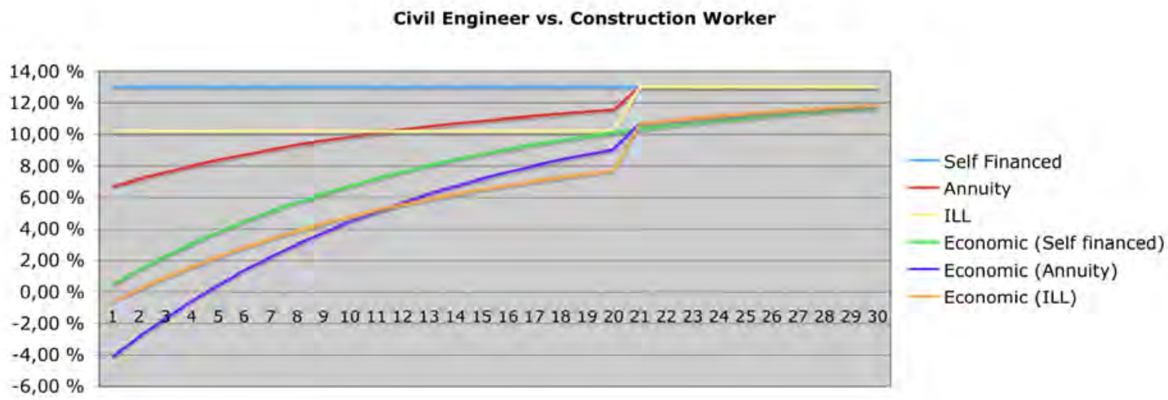
[8] I have used the difference in disposable income of the practical nurse and the total financial aid received as an annuity over 30 years. The wages used are averages presented in a recent article in the daily news paper Dagbladet (http://www.dagbladet.no/dinside/2006/03/16/460879.html)

[9] I have used 4 percent for both.

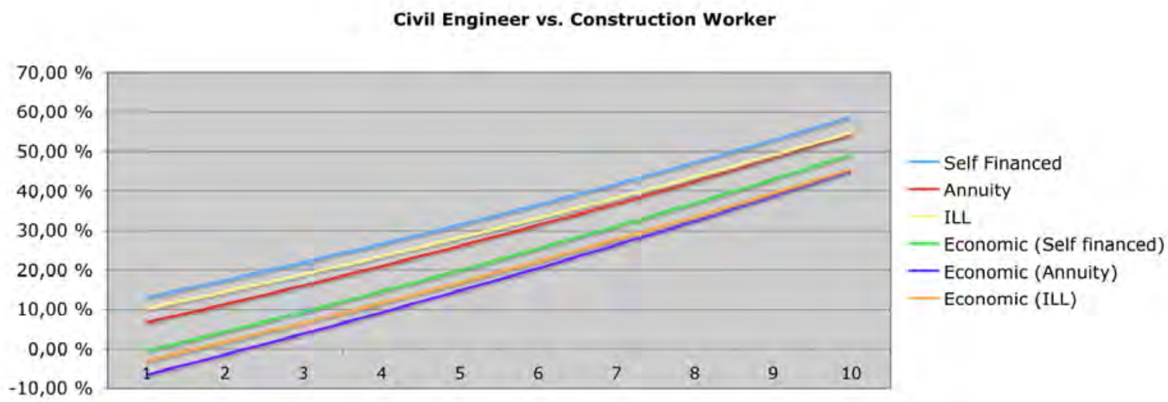
[10] Even though most nurses are aware that it is not a lucrative career to pursue and therefore hardly would sit down to estimate this difference. That said there seem to be no problem with recruitment of nursing students (www.samordnaopptak.no, see “poenggrenser”)

[11] Incomes used for the engineer is from my research data and the other is from the Dagbladet article mentioned in the footnote on the previous page.

would like to point out that the income growth for the construction worker is very volatile, but strong union in Norway often result in high result depending on the business cycle. Using the same growth rate also gives a better illustration. A lower income growth would obviously result in an advantage to the
civil engineer.




As we see that on average an annuity style repayment plan would result in the worst result. The fact that civil engineering is a lucrative career results in this being a career that actually would be worth self-financing. With an income growth of 4 percent for construction worker the story is much brighter for the engineer[12]. I will only show the first ten years to illustrate.




Hægeland and Møen (2000) discuss the fact that there seems to be some higher degrees that actually have a relative disadvantage to just having a high school diploma. They refer to a study by Moen and Semmingsen (1996) with the table below.

[12] I would like to remark that the estimate of 312 800 NOK annually for a construction worker seems rather conservative compared to my own expectations and experience of those I know in the business. According to Statistics Norway the average in 2005 was 335 000 annually. This would not

| Ranking | Degree | Relative Lifetime Income |
|---|---|---|
| 1 | MSc Business/Economics | 1,42 |
| 2 | Law | 1,33 |
| 3 | Medical Doctor | 1,30 |
| 4 | MSc Enginerring | 1,23 |
| 5 | MSc Science | 1,12 |
| 6 | BSc Engineering | 1,11 |
| 7 | BSc Business | 1,09 |
| 17 | High School | 1,00 |
| 18 | MSc Education (Lektor) | 0,99 |
| 20 | MA (Cand.philol) | 0,94 |
| 21 | BA (Cand.mag, HF) | 0,93 |
| 22 | BSc (Lærerhøyskole) | 0,89 |
| 23 | Nursing | 0,87 |

Source: Moen og Semmingsen (1996) tablel 4.3. Net discountrate 2 percent

Hægeland and Moen argue that the reason for these differences may be due to there being a greater return on talent is certain occupation. Mean that a talented Lawyer has a greater income potential compared to a less talented collage colleague. This may not be the same for say nurses, as they do not get paid according to their prowess being public employees.

The point of these illustrations is, as I will get back to that there are relatively fewer children from blue-collar backgrounds pursuing longer degrees in Norway (Fekjær, 2000). Fekjær (2000) argues that these children don't realize the value of education, but could it be that they realize how little economic value many of their career choices have? That they realize that their parents are rather well of compared to their responsibilities and education? "The juice ain't worth the squeeze", as the modern proverb goes. I am not going to argue for or against these arguments, but this would certainly be an interesting question for further research.

### *1.1.2.2 Summing up the introduction to Income-Linked Loan*

To sum up income-linked loan have two main forms. Both work through a percentage of the borrower's future income, but the difference is in how the contract terminates. Income Contingent Loans terminate when the principal and accrued interest is paid, while a Human Capital Contract[13] lasts for a set period.

If we have a constant interest rate (or alternatively a zero real interest rate) combined with constant income growth over the contract period an income-linked contract would be

[13] Some times referred to as a graduate tax, though this implies that it is for life and imposed by the government.

equivalent to a modified annuity in which the growth rate is equal to the income growth rate. This is the link between the two main contract-forms discuss in this thesis. Of course such a condition would never hold in real life, as no one would be able knows someone's average income growth ex ante.

I will discuss these contracts in more detail and relate them to Norwegian conditions later in this text, but lets first review the history and experience of different experiment with income-linked contract so far.

## 1.2 History

In this section I will briefly explain the origin of the idea of Income-Linked Loans and discuss different implementations of such contracts. The main objective of this section is to, through examples, explained different variations of these contracts, how they were implemented, and the lessons learned. It is not indented to be exhaustive discussion with regards to the examples given, but rather an introduction as such to these contracts through examples[14].

### 1.2.1 Milton Friedman and the origin of an idea

According to Palacios (2004, 41) Milton Friedman introduced the idea of committing a fraction of ones future income in exchange for financing education in a footnote in *Income from Independent Professional Practice* (Friedman and Kuznets, 1945)[15]. In its simplest form an investor would "buy" a fraction of a students future income. Friedman wrote:

> The device adopted to meet the corresponding problem for other risky investments [not related to education] is equity investment plus limited liability on the part of the shareholders. The counterpart would be to "buy" a share in an individual's earning prospects. (Friedman, 1962, 103)

From this spun ideas, which in this text are referred to as Income-Linked Loans that now are divided into Income Contingent Loans (ICL) and Human Capital Contracts (HCC). Friedman forwarded the idea with reference to vocational and professional school as oppose to general education for citizenship. He argues that this type of training has no neighborhood

---

[14] Palacios (2004), Barr (2005, 2001, 1989) and Johnstone (xxx) all have thorough discussions of previous implementations until their volumes were written.

[15] I have not been able to obtain this text, and have only consulted Friedmans volume *Capitalism and Freedom*

effects[16] like those that can be attributed to general education. This he claims in effect makes an investment in human capital analogous to that of investment in real capital such as machinery or buildings. The individual will receive a higher return on his services then what he otherwise would be able to. He also correctly points out that major cost of vocational and professional schooling is forgone income in the period of training, interest lost by postponing the earning period and the expenses related to acquiring the education. Compared to the erection of a building the investor would have a similar loss of interest in during construction. Both investments would be carried through if the investor believes the extra return is worth the cost.

Friedman also argue that if capital was equally available to invest in human capital and real capital the rate of return would be roughly the same in the two fields, and that an underinvestment in human capital would reflect an imperfection in the capital market. He explains this by the fact that an investment in real assets would give the investor an opportunity to realize part of his investment in the event of default. Hence, referring to the fact that investors would be able to obtain collateral for their investment in real asset, while this would not be possible in the case of human capital. As he points out:

> In a non-slave state, the human being embodying the investment cannot be bought and sold. Even if he could, the security would not be comparable. The productivity of the physical capital does not in general depend on the cooperativeness of the original borrower. The productivity of the human capital quite obviously does. (Friedman. 1962, 102)

Now in light of this fact he argues that a the type of fixed payment loan used for the financing of for instance the erection of a building would be an inappropriate form of financing for development of human capital. Event though the average expected return would be high. There would be great variation between individuals and therefore much risk involved. In addition there is the risk of death or physical incapacity.

Lets compare Friedman's proposition to a startup firm. An investor faces many of the same issues when backing a startup company developing for instance new technology. Until the company obtains a patent the investor faces the risk of never recovering his investment. He would also need cooperation from those developing the company's product or technology. In

[16] Forklaring på neighborhood effects og referanse

the event of irreconcilable disagreement between the employee of the company the company may "die" as there is no one to complete the development of the product or technology into some entity that can be sold, for instance some sort of Intellectual Property Right. If the researchers walk out on the project they take the knowledge with them. In the beginning of a company's life it also experiences tight budgets and what is commonly known as the J-curve[17]. Venture Capitalists backing startup firms usually offer funds in return for equity in the company. The financiers do not further the financial stress on the company, and therefore increase the company's chance of survival and their own excess returns.

This analogy serves two purposes. First it explains the similar properties of financing startups and human capital and therefore increases the amount of available theory that can be applied. Second this similarity should indicate that the structure of this financing human capital should be similar to that of new venture as well. It is important though to remember that there is one significant difference between the two. Venture Capitalist have the opportunity to control and direct their investment. They tend to want a significant share of the company's equity in order to have some control of how the funds are spent and the strategy of the company. This type of control is not possible with regards to human capital, as slavery most likely (and hopefully) never will become an option. Another significant difference is the perspective of the investors. Most graduate have an average of 35 year of productive life[18]. A company can in theory last forever. Venture Capitalist tend to exit companies within 5-10 year. These differences indicate an instrument that is similar though not identical to equity.

Friedman points out that the reason that such contracts do not exist must be due to the high administration cost of obtaining correct income statements, since there is no limitation on an individual's mobility. This point probably was more relevant in the sixties that it is today. In the case of Norway information on tax returns would easily be available to anyone that would issue such a contract. The collection methods will be discussed below in the examples below.

---

[17] This is a curve that describes the net income of a firm over its lifespan. This curve has the sharp of the letter J, or the hockey stick, as it is some times also referred to as. The point being that a firm usually has negative income in the first period of its life.

[18] OECD (2005) average

Another interesting point that might be relevant to Norway is that because of marked imperfection there is an underinvestment in human capital. This may justify government intervention (Friedman, 1962, 104), but how should this be done? He argues that if the government subsidizes to the point that anyone meeting minimum quality standards could get training, there would tend to be an over investment in human capital. In Norway vocational training is available under these conditions. Anyone that meets minimum grade requirements can obtain some sort of vocational training, and Norwegian colleges do not charge their students tuition. Hence, vocational training is subsidized to the point where anyone seeking vocational training can obtain it. This I have already treated above.

Friedman's idea set of the imagination of many economists and policymaker. Several experiments with Income Contingent Repayment Schemes were initiated. These experiments where structured as loans, which is now conventionally called Income Contingent Loans (ICL). Palacios (2004, 43) speculates that this was due to the fact that Friedman referred those "buying" a share of an individual's earning prospects as "lenders", rather then investors.

### 1.2.2 The Yale University Tuition Postponement Option

In 1971 Yale University initiated something they called the Tuition Postponement Option. This was a program that let the students pay their tuition by committing a fraction of their future earnings. It was devised as an alternative to students that found their financing options shrinking due to government cuts in the amount of loans and grants offered. The program was designed to last until 1976, but students that joined the university prior to 1976 were allowed to continue the program until graduation (Palacios, 2004, 124).

**Description of the program**[19]

The Yale program had two distinct features separating it from other programs at the time. First, the payments were income contingent. Second, the borrowers were grouped in to cohorts that were mutually responsible for their group's collective debt. This was in order to create a mutual responsibility among classmates to repay their obligation.

[19] This is a summary of the description in Palacios (2004)

The first feature stated that the student would pay 0,4% of their annual income for each 1000 dollars. These payments would as described earlier be used to pay the accrued interest and a payment on the principal[20]. Payments lower than the accrued interest would instead increase the principal. The interest on the loan would be variable and reflect Yale's own cost of capital.

The second feature, the more controversial one, grouped the students into cohorts. The reason it turned out to be controversial was that students defaulting on their loan effectively pushed their loan onto the other cohort members. This in turn would make the remaining cohort members more likely to default. The grouping of loans also redistributed loan from low-income earner to high-income earners. These cohorts where created randomly, and so there is no reason to believe that there are any significant differences between them. The redistribution was not unlimited as an individual obligation was limited to 150 percent of their debt plus accrued interest. This was also offered as a "buy out" option to students who did not wish to continue the program. Another important feature was that that the obligation would last no more than 35 years, but it was expected that most cohorts would finish much before that.

**Problems and lessons learned from Yale's repayment plan**

According to Palacios (2004) the two main problems related to the Yale Tuition Postponement Option were related to each other. High default rates spawned negative public opinion, which again did not help the default rates. Yale's default rate was as high as 15 percent, which of course was way above the expectation. The absence of effective group pressure on those who did not pay meant that there was nothing to gain from honoring the contract. In addition there was a change in the law in 1986 that removed the tax deductibility of the loan, effectively making the loan even more unattractive.

[20] These could be negative payment in the beginning of the repayment period.

**The lessons learn from Yale's experiment:**

1. **The time frame** of 35 years repayment created a feeling of "perpetual obligation".

2. **A lack of understanding of the time value of money** since the graduate had to repay many time the value nominal value of their tuition.

3. **The redistributive nature of the loan** as we have already discuss.

4. **The collection agency** in that Yale is not a bank, but rather a university and hence its expertise is not to collect debt.

The timeframe in effect correspond to length of the graduate's productive life. That combined with high default rates meant that most of the students would have to pay this "extra tax" until they retired. This generated negative feelings and incentives to default on the loan. Palacios (2004, 127) argues that shorter periods of time have a disadvantage, since the profits of education come during the whole period of someone productive life. He therefore argues that repaying in a shorter period creates a "higher-then-needed financial burden", and that it makes more financial sense to let the repayment period be equal that of productive life. I would like to argue two points. First, in theory a repayment period equal to that of productive life might make financial sense, but this will effect let the principal grow depending on the market rate applied substantially beyond its initial nominal value. With an expected income growth and interest rate of 8 percent and 8,5 percent respectfully found in my analysis this would in effect result in the principal more than doubling and actual repayment on principal does not occur until the last 5 years of the 35 year repayment period[21]. This would in effect most likely result in massive default rates unless the contract rate was set higher than necessary. A longer contract rate I argue would constitute more risk for the investor hence a higher cost of capital, which amplify results in the unwanted effect just described. Also a pragmatic approach to the rate applied is to charge according to a shorter term, thus leaving slack[22]. The second point I would like to make is that the property that makes Income-Linked Loans interesting is that they let the payments grow with the borrowers earnings. Would it not be reasonable to believe that income would grow more in

[21] These projections are made with the Correct Contract Rate and static income growth and interest rate.

[22] This would only apply to income contingent loans.

the beginning of a graduate's career, and that growth would decline as the borrower approached retirement? The data in my analysis is indicates this, but there are too few observations to conclude from them. This also fits with a Mincerian Human Capital Earning Function (Mincer, 1974) that I will get back to.

The second lesson from the Yale experiment was the psychological effect of paying many times the value of the nominal value of the tuition. Palacios (2004, 124) argues that there are many ways to reduce this effect, but points out that this is just a psychological factor and that using a below market interest rate would need someone to cover the low risk-adjusted rate. He goes on to point out that the most sensible solution is to educate the borrower and removing the effect altogether.

The third lesson earned the Yale experiment its growing public perception of inequity. The fact that those who honored their contract ended up as losers seems unreasonable and in conjunction with the fact that most of the borrowers did not understand the time value of money this probably generated even greater feelings of inequity.

The fourth lesson was that Yale showed that they lacked competency to collect the payments. Yale is an academic institution and should have left this work to a financial institution.

### 1.2.3 Australia's Higher-Education Contribution Scheme[23]

In 1989 the Australian government radically changed its education policy on higher education. They implemented an Income Contingent Repayment Scheme (ICRS) with the taxation office, as it's collecting agency. In order to see how this policy change came about we need to review Australia's financial situation at the time.

The government primarily operates Australia's higher-education sector and decides fees, which all students are subject to. Prior to 1974 those fees represented 25% of the total costs, the rest was subsidized the government. In 1974 all fees on higher education where abolished, and the burden of educational cost were carried by the government.

[23] This is a summary of Palacios (2004, 131)

According to Palacios (2004) three factors made the Australian government rethink its position:

1. Increasing demand for higher education

2. Increasingly negative public view of state-financed higher education

3. A tide of liberalization that questioned the regional government spending in several areas, including education.

The first factor was tied to the increasing number of students graduating high school. This would presumably in time increase the number of student entering tertiary education. This pose an increase in the budget need for higher education. This pressure threatened the current system unsustainable.

The second factor was due to the view that financing of higher education through tax revenue was extremely regressive. The critics argued that because an only a fraction of the population attended the tertiary education, and those that did often also enjoyed higher incomes thereafter. Hence, public financing of higher education received resources from everyone, including the majority that did not enjoy the benefits of higher education. The argument was that everyone invested in those that would enjoy higher average income upon entering the job market.

The third factor is closely linked to the previous factor as Australia faced the problem of reintroducing fees without erecting financial barriers for disadvantaged students. The two main reasons that there is an inefficient capital market for financing education is the lack of collateral and high collection costs as mentioned earlier. In the absence of such a market they considered an Income Contingent Loan type contract. This option was considered as it provided a viable alternative that would enable introducing fees without affecting the low-income students negatively.

Although there had been published theoretical work on the idea this was the first time it had been applied on a countrywide scale. It was suggested that the Australian taxation office would collect the loan. The Wran committee[24] that suggested the scheme faced considerable

[24]I have been unable to obtain this rapport and as such this is reference forwarded from my other references such as Barr and Palacios.

resistance as there was raised questions of whether it would work or not, and if it would actually help those it was intended to help (Wran, 1988). In addition the tax office opposed their involvement, as they did not see it as their responsibility to collect debts. A third issue that was argued was that this scheme did not resolve the government immediate financing needs.

The first to points where resistance to novelty. The third issue was solved through offering a discount to those that were able to make upfront payments (see Wran 1988; Edwards, Howard and Miller, 2002)[25].

When the Higher Education Contribution Scheme was implemented there was to important question that need to be answered.

1. How much should be charged as a fee?

2. Should there be different fee for different educational programs?

The first question is really concerning how large the neighborhood effects or positive externalities are. That is how much of the benefits of education for instance a doctor is enjoyed by his “neighborhood” versus the doctor himself. Everyone benefits from having access to a doctor, but the doctor also enjoys a higher income and most likely social status in his community. It this neighborhood effect is undervalued it would result in too much of the cost of education to fall on the student and hence an underinvestment in would be the result. Neighborhood effects are difficult to quantify, and covering 100 percent would cover more than this effect.

The second question related to whether a medical and accounting student should face the same fees. According Bruce Chapman (1997) the average cost of training a medical student is about five times that of non-clinical program such as accounting or law.

The way these issues were solved by a search for simplicity. One fee was to be charged at approximately 20-25 percent of the average cost of a full time student. The number was

---

[25] I have been unable to obtain this volume and as such this is reference forwarded from my other references such as Barr and Palacios.

according to Palacios determined arbitrary, and was based on the fees charged prior to the 1974 reform.

There are two additional factors that need to be determined. First you would need to decide how to handle the interest rate. They choose to set the real interest rate to zero, which in effect would only adjust the principle by the rate of inflation. This was to avoid a debt accumulation similar to that of the Yale experiment. This meant that those that repaid slowly received a subsidy compared to those that repaid fast. This was implied implicitly as those that repaid slower benefited from the zero real interest for a longer period.

Secondly they need to decide on the repayment schedule. As we discuss earlier a stronger expected income growth warrants a lower contract rate, but that does not necessarily gain the effect wanted by policymaker and investors. This would imply that those with higher incomes could pay a smaller fraction of their income in order to repay their debt. In the case of Australia they choose to use a progressive rate that increased with your taxable income. If your income were below a certain level the rate would be zero. This way it would not place a burden on low-income earners. The payments would also last for as long as the graduate had an income or a remaining balance. To create an incentive to pay fees upon enrollment the students were offered a 25 percent discount if the fees were paid upfront. As will be discuss later this actually would be warranted, as the discount would essentially be the value of the option value of the Income Contingent Loan[26].

**Lessons learned from the Australian Higher Education Contribution Scheme**

Palacios list two important lesson of why the system appear to be a success:

1. An efficient collection system
2. It showed that the immediate need for funds could be overcome.

Using the Australian Tax Office as the collection agency proved very efficient, reliable and cost-effective. Collection of payments that are income-linked is very expensive for private institutions. This is most evident with the Yale experiment. The collection of student loans

[26] Human Capital Options discuss below.

through the income tax system seems both efficient and maximizes the main argument for pursuing these schemes.

Edwards, Howard and Miller (2002)[27] describes the Higher Education Contribution Scheme as a painless method of (re)introducing tuition charges in higher education.

The second lesson is essentially related to Palacios (2003) working paper an idea that he also presents in his book *Investing in Human Capital* of creating an option on an individuals income over a certain period. He argues that the discount given to students that pay the fee upfront could be seen at the size of the premium on such a contract. The theory of Human Capital Options (HCO) will be discussed below.

### 1.2.4 Sweden[28]

Sweden initiated an Income Contingent Loan scheme in 1989, but adopted a very different model from the Australian scheme. Sweden is very similar to Norway in that the state covers university tuition, as well as social structure, and is therefore especially interesting when analyzing Income-Linked Loans. The Swedish scheme consisted of a grant and a loan. The loan was to be repaid in the form of an ICL contract by a flat rate of 4 percent of the graduate's annual income. The principal was to carry an interest rate set annually by the government, which should be "equivalent to the cost of capital for the government during the last three years". Essentially the interest rate applied is the rate given by the Bank of Sweden adjusted for the income tax advantage of debt[29]. The scheme has no definite contract period, which can be interpreted as being equivalent to the HECS scheme. Palacios (2004) claims that the Swedish implementation is "usually considered successful", but considering that the scheme was terminated in 2001, in favor of a modified annuity[30], this can hardly be the case.

---

[27] I have not been able to obtain a copy of this volume and as such this is a reference given by Palacios (2004)

[28] This is based on the information provided on http://www.csn.se

[29] That adjustment is equivalent to a 30 percent tax discount according to http://www.csn.se

[30] As mentioned earlier this annuity grows by the target inflation rate of 2 percent.

The scheme was terminated due to much criticism. The main points forwarded in the Swedish parliament were these six points[31]: (1) Many students took on debt that it would be unrealistic to repay. Mainly due to a lack of understanding of how these contracts work. (2) Debt speculation – the graduates lacked incentives so that they would limit how much debt they accumulated each semester. In effect borrowing more than they needed. (3) The system was difficult to apprehend for most student and no alternative contracts were offered. (4) The scheme did not encourage the student to finish their education on time. The scheme lacked incentives as such. (5) Accrued interest tends to build over time, as we discuss earlier with longer periods of repayment. The critics claim that this meant the average student would not be able to pay off the loan within a reasonable timeframe. (6) The financial aid provided had a structure that offered unreasonably different terms for students to complete their education.

This resulted in termination in 2001, returning to a mortgage type arrangement with rather strict terms. CSN[32] now imposes shorter repayment schedules, but offers a "safety rule"[33], which graduate with low income could apply to be considered for. This rule states that those accepted will limit their payments to 5 percent of their annual income. If the debt is not repaid at age 50 the graduate is subject to a 7 percent rate.

It seems quite clear that the lack of differentiation of rates given in the Higher Education Contribution Scheme seems to have lower the student's attitude towards their student loan. They seem to have regarded it as an additional tax and therefore would enjoy student life for as long as possible.

### 1.2.5 Other examples

In addition to the examples mentioned above I am going to quickly mention a few other countries and private initiatives that have initiated Income-Linked Loans schemes.

New Zealand introduced its Income Contingent Loan program in 1991. Although similar to the Australian scheme, this is probably the program that most closely resembles a marked-based loan. A few of the significant differences to the Higher Education Contribution

[31] Motion 1999/2000:Ub10 (http://www.riksdagen.se)

[32] The Swedish National Board of Student Aid

[33] "Trygghetsregeln" (http;//www.csn.se)

Scheme were; the intention of the program was to improve the universities response to demand from students[34]. This program also applied the market rate on the principal. This was heavily criticized, which resulted the government reducing the interest rate to zero while the students were in school.

Chile implemented an Income Contingent Loan scheme to finance students in 1994. The loan carries a 2 percent real interest rate and lets the graduate pay the lesser of a fixed payment and 5 percent of his annual income. The contract length is 12 or 15 years depending on the remaining balance in year twelve of repayment. The loan is available depending on the student's background. According to Palacios (2004,141) this program is considered successful.

Ghana also implemented an Income Contingent Loan program in 1989. This is worth mentioning due to its interesting collection and repayment scheme. The program was intended to cover living expenses, which makes it equivalent to the educational system of the Scandinavian countries. Collection of repayment is made through the social security system. It does not constitute of an additional tax, but the student loan payments takes precedence over the accumulation of retirement funds. Most graduates accumulate maximum retirement benefits before retirement age, but continue making payments until retirement. The system had been question for its lacking capacity to generate additional revenue for the state. There is also an interest rate subsidy on the loan, which results in the graduates only paying back a fraction of the original amount given to them.

Some private initiatives worth mentioning are MyRichUncle.com and Robertson Education Empowerment Foundation.

MyRichUncle.com is probably the most renown of the two. They started their work on the investment in human capital in 1999. They are mention in most news articles and other literature on the subject, like Robert Shiller's volume *The New Financial Order*[35]. When trying to find information on them it seems that they have turned to a fixed payment repayment schedule, with an option of deferring payments. Every reference I have pursued

---

[34] The universities were allowed to vary the amount charge to each student.

[35] Shiller (2003)

has been unsuccessful with regards to Income-Linked Loan schemes and this leads me to believe that they have either put their offer of contracts on hold or terminated this scheme.

The Robertson Education Empowerment Foundation[36] began its Educational Investment program in the fall of 2002 at the University of California, San Diego campus, with an initial investment of 3 million dollars. It is intended to grow over time to enable future generation of students attending University of California system to benefit from it. To be eligible you need to be a US citizen, attend University of California full time and maintain a 3.0 grade point average. The contracts have variable rates beginning at 0,20 percent of gross income for every thousand invested for undergraduates and 0,10 percent for graduates for a period of 15 and 10 years accordingly. The rates are set according to an evaluation of potential and past merits. There is also a buyout option after three years of consecutive payments.

[36] http://www.aboutreef.org

# 2. Current theory on Income-Linked Loans and their variables

In this section I will try to illuminate theoretical aspect of Income-Linked Loans. I will start with a discussion of market failures related to education, moving on to a presentation of the more technical aspects of the these contracts.

## 2.1 Market failure in the financing of education

According to economic theory competitive markets fail for four reasons: market power, incomplete information, externalities and public goods[37]. Of these reasons those most likely to appear in the financing of education is the problem of incomplete information and externalities. I will start of with a discussion of how this affects the borrower, and then move onto the lenders. The sum of this discussion is that a government guarantee and subsidy is need in order for these two problems resolve.

### 2.1.1 Risks and uncertainty facing the borrower

Investing in human capital is risky for the individual. He faces many risks and a high degree of uncertainty in borrowing in order to obtain a degree. It is instructive to adopt Barr's (2001, 175) comparison to lending toward buying a house. Now lets consider five point of comparison:

1. **Unknown benefits:** When buying a house the borrower presumably knows what he is buying. He has lived in one his whole life and a buildings engineer can easily verify the condition of the house. This is not the case with higher education. He does not personally have any experience with higher education, and there might not be anyone in his family with a higher degree. The benefits may not seem clear to the student.
2. **Uncertain value:** The house is unlikely to fall down. When the house is bought the own will not need to by another one. A student on the other hand could be unable to complete the degree. It might also be necessary to pursue further education.

[37] Pindyck and Rubinfeld (2001)

3. **Need for reinvestment:** The value of a home will generally increase. A college degree on the other hand will loose its value over time. It may for instance be rendered obsolete by new technology.
4. **Illiquid investment:** If the homeowner's income falls or it for some reason becomes burdensome to make the payments on the mortgage, the owner can always sell the house. A college degree on the other hand is impossible to sell, as it would entail slavery.
5. **Cannot be collateralized:** When borrowing to buy a house, it can serve as collateral. That way if the borrower defaults on the loan the lender can recover most of the debt. This on the other hand is not possible with a student loan as the value is the future proceeds of that individual. This risk will therefore have to be reflected in the interest rate applied to the loan.

Faced with these uncertainties the risk averse[38] student is less likely to invest in education. That essentially means that if an individual is from a family or neighborhood where no one has a higher degree that individual would have to be willing to take, to him, unknown risks in order to obtain a degree instead of receiving a steady income like everyone else he knows. Palacios (2004, 25) shows that there is very likely that a degree will result in a higher income in the U.S.A. compared to those without a high school diploma. This is likely to be similar on average for Norway all though it would be reasonable to expect the variance would be smaller and the distance between the average incomes to be smaller. I have not been able to obtain any statistic to support this argument, as it has not reported by Statistics Norway[39] nor been to my knowledge published any research related to this question. That said students in Norway only face the loss of earnings while obtaining a degree and the cost of interest on their living expenses.

### 2.1.2 Lenders risks and uncertainty

Governments represent presently most lenders; this means that they often are controlled by policy and public opinion rather then business sense. The possibility of private investors in education will be limited by the how great the following problems are perceived. For the

[38] Pindyck and Rubinfeld (2001) define it as: prefering a certain income to a risky income with the same expected value.

[39] I did suggest it to them and it will most likly be made, although not in time for me to recent in thesis.

purpose of this thesis these point are as I mentioned earlier not relevant, as the topic of this thesis is not the higher education policy of Norway only the repayment scheme applied. Lets continue with the comparison of buying a house. First consider the asymmetric information facing the lender:

**Asymmetric information** When providing a financing for someone to purchase a house the lender knows very well what they are helping finance. This is due to real estate being relatively easy to value. Education on the other hand it quite difficult to value. The lender is missing loads of information necessary to value the investment. Even the student does not know all the information necessary, merely his own intentions. This is very likely to result in the well-known problem of *adverse selection*[40] particularly in the absence of a (government) guarantee. Because the lenders do not know each individuals intentions and abilities they are likely to charge a rate above what the best students will consider fair. This will result in these students finding other sources of financing. This again results in the lenders over time adjusting their rate up to their new expected rate. This will result in additional of group seeking other source of financing. The cycle will repeat it self until only the worst students remain. Another problem is *moral hazard*. This is the risk faced by lenders that individuals choose not to honor their contract. We see clear examples of this in the Yale experiment. Students choose to default, and because of the group structure of the loan this results in even more student choosing not to repay their loans. If the house owner chooses not to make a payment on the loan the investor knows where to find him.

**Difficulty in collecting payment**: A bank can feel fairly confident that a house will remain at its current address. Graduates on the other hand tend to move around. The fact that they do is actually to their mutual benefit as it creates better opportunities for the graduate to increase his earnings. It does however make it more difficult for the investor to track his earnings and collect payments.

**Uncertain value, illiquid investments, and the absence collateral:** These concerns are equivalent to those of the borrower. They all warrant higher rates as the investor faces a greater risk and more uncertainty.

---

[40] Akerlof (1970) paper on market for lemons

### 2.1.3 Externalities

An externality is the result of effect of transaction between to parties which are nota transaction indirectly affects others (positive or negative) without being reflected directly in the marked price. In the case of a higher education this would be represented by a positive externality. I have already mentioned these effects as neighborhood effects. When a student trains to become a doctor this will not only benefit himself, but also his community. The availability of his services will affect his community positively as it is a benefit to have access to a doctor in case of illness. This is a social cost of training the doctor, and should be born by society. These social benefits should result in society paying the accompanied social cost. Thus the individual should pay the private cost. For Norway this, as I have indicated earlier, can in economic terms be relatively small.

## 2.2 Income-Linked Loans

So far I have avoided the technical aspect of these contracts. They have been explained in less technical terms as I have tried to avoid mathematical formulas. In this section I will introduce these aspects of Income-Linked Loans. So far I have mentioned two types of contracts; (1) Income Contingent Loans, which charges a rate on gross income until the principal plus accrued interest is repaid and (2) Human Capital Contracts, which charges a rate on gross income for the duration of it's contract period. In addition to these two contracts I will introduce Palacios' (2004) Human Capital Option. My analysis will not treat these options per se, but as this is an important contribution I will present them here. Human Capital Options are essentially a tool that can yield the same result as the Correct Contract Rate[41] on either an Income Contingent Loan or a Human Capital Contract as a whole. The Correct Contract Rates of different cohort are estimate in my analysis.

Lets summarize the discussion of Income-Linked Loans (ILL) so far. An Income-Linked Loan is a contract that lends funds to an individual with a commitment from that individual to repay his debt through as a fraction of his future income for a period of time. In our case this is financing of higher education. This could just as easy apply to other loans Shiller (2003) argues, but these applications will not be discussed in this text.

[41] The rate at which the loan is exactly repaid within it's repayment length.

These contracts can be divided into to main groups: Income Contingent Loans – which runs until the loan is repaid, and Human Capital Contracts – which runs for a set period of time. Both will have a specified percentage or rate attached to them. If we had perfect information about the individual's future income and the marked rate we could estimate a Correct Contract Rate for such contracts and charge this for each individual. Even though it is not possible to obtain such information, the Correct Contract Rate of an individual would render the two contract types identical. Most of the literature does not discuss the topic of the contract rate. Most of the discussions around Income Contingent Loans only reflect on the repayment period, and in the case of Australia they applied a progressive rate, so that high-income earners had a higher rate than low-income earners. Palacios (2004) is the first to touch upon this subject, but his point of view is the opposite of what I initially considered for this thesis[42]. He decides the rate and then estimates the present value of an individual's income to price the amount the lender is able to offer that individual for a certain period of time. That is he applies a typical equity research valuation approach to his idea of HCC.

My initial approach was from the opposite direction. I wanted to research what a Correct Contract Rate would be historically, and what effect such a rate would have. The Scandinavian tradition of financial aid dates back more than thirty years. It has generally been provided as a mortgage type loan, with the exception of Sweden from 1989 to 2001. Financial aid is provided non discriminatory to any student who applies for it. All students receive the same amount of financial aid[43]. The Correct Contract Rates will be estimated for each class of Norwegian engineer and business graduates from the seventies until present.

As I will be handling historic data I do not need a model for future income in my analysis, and the data I have had access to did not provide an opportunity to estimate coefficient for such a model.

[42] I only discovered Palacios and most of the literature toward the end of writing this thesis.

[43] Every student in Norway is eligible for student loans, but grant are only award to student that work earn less than a set amount annually or has a substantial fortune. These requirements are currently at 113 027 NOK and 223 600 NOK accordingly.

### 2.2.1 Basic valuation

One of the fundamental concepts in finance is the time value of money. This describes the fact that holding $20 bill to day is better than the promise of one tomorrow. This is the rationale for charging interest[44]. This implies that we have to calculate the alternative cost of lending money. In an income-linked loan contract there are five basic variables: the principal (the amount borrowed), the income, the contract rate (the percentage of the income paid to the lender), the interest rate on the principal and the income growth rate. Now for anyone that has a little knowledge of equity valuation this should seem rather familiar. Lets just relate this to one of the most well known formula in valuation, the Gordon growth formula[45].

$$P_0 = \frac{Div_0}{k-g} = \frac{d \times E_0}{k-g}$$

Which states that the present value ($P_0$) of a business entity is the dividend ($Div_0$) divided by the cost of capital (k) minus the growth in the dividend or earnings (g). In other words the percentage (d) of the income ($E_0$) paid per period to the lender (owner of the share) divided by the relevant interest rate minus the income growth. Now this is essentially Palacios (2004) model. He uses the Mincer (1974) Human Capital Earnings Function[46] to estimate the present value of income, and explicitly includes administration costs, default costs and unemployment. His approach is that an investor would estimate the present value of the borrowers future income and offer price on that contract based on the percentage charged.

### 2.2.2 Estimating The Correct Contract Rate

My approach is contrary to Palacios. I look at the financing need to complete the degree. From this I estimate what rate needs to be charged. The difference in orientation is probably due to the fact that I am used to the Scandinavian tradition where financial aid only covers living expenses and not tuition, which is covered by the government. Hence the amount needed is less, and no upper limit on funds need as such is likely to be reached.

---

44 For a more detailed discussion of the time value of money and discounted cash flows consult any finance text. Principles of Corporate Finance by Brealey Myers & Allen (2005) is an excellent example.

45 See Gordon & Shapiro (1956)

46 I am not presenting this theory, as it is rather technical and will not be used in my analysis. It is worth mentioning that Mincer's framework seems highly accepted, as I have found it in most of the relevant literature. Thus it seems to be appropriate to apply it to these type of contracts.

If we then rearrange the Gordon growth formula with regards to the percentage of income paid out we get

$$P_0 = d \times \frac{E_0}{k-g} \qquad \Rightarrow \qquad d = \frac{P_0}{\frac{E_0}{k-g}} = \frac{P_0}{PV(E)}$$

Hence the correct percentage of the earnings (dividend payout ratio) needs to be the fraction the price of the security is of the present value of the earnings. Translated in to income-linked loan contract terms. This means that the Correct Contract Rate is the fraction the initial principal debt ($D_0$) make out of the present value of that individual's future income[47].

$$CCR = \frac{D_0}{PV(y)}$$

Now since the point of this contract is to repay it, within a limited timeframe, we will need to discount the projected cash flow for the contract period. The way this is done is to discount each year's income by the compounded interest rate previously incurred from the initial point at which the principal was paid out. Using this method on ex post data you are able to calculate the Correct Contract Rate (CCR) for Income-Linked Loans[48].

$$CCR = \frac{D_0}{\frac{y_0}{r-\gamma}\left[1-\left(\frac{1+\gamma}{1+r}\right)^T\right]} \qquad \text{or in time series notation} \qquad CCR_{t,T} = \frac{D_{0,t}}{\sum_{i=0}^{T-1} \frac{y_{t+i}}{\prod_{j=1}^{i+1}\left(1+r_{t+j}\right)}}$$

Here $\gamma$ denotes the income growth rate. The second model uses t to denote the initial year and T to denote the length of the contract in both.

[47] This is the percentage of the student's future income that would result in no profit or loss to the investor.

[48] For derivation of this formula using a difference equation approach see Appendix A

### 2.2.3 Human Capital Options[49]

An option contract works like an insurance contract, where someone pays another to carry his risk. If the event does not occur the insurer makes a profit from the contract, otherwise the insurer will need to pay out according to the terms of the contract. Options are essentially insurance policies on the price and volume of a product.

Option contracts come in two forms puts and calls. Puts are guarantees to achieve a certain minimum price, while calls guarantees a certain maximum price. That is to say if the price at the time the contract matures is above the agreed put strike (agreed minimum) price or below the call strike (agreed maximum) price you will not need the insurance, as you are better of not using either of the contracts. Hence the issuer earns his premium, the price you paid for the insurance or option.

Palacios (2004, ch. 7) introduced Human Capital Options[50] (HCO) as a way to reduce the risks of income-linked loan contracts. Human Capital Options are insurance on the present value of someone's income over the contract period. The combination of either a flexible loan[51] and a HCO put[52], or a HCC and a HCO call[53] would be the equivalent of an Income Contingent Loan or a Human Capital Contract with overpayment insurance.

The borrower would decide to pay a certain percentage of his income for the contract period, and buy a put on the same percentage of the expected present value his income for the period in question. This would mean that if his income became higher than he expected for the period he would repay the loan quicker than expected. In the event that he exaggerated his expected income (that is paid a smaller percentage than needed) the put would cover the difference at maturity.

---

[49] This section is not meant as a full discussion of Human Capital Options or option theory in general. It is only intended to illuminate the existence of the idea and its significance. As I will not use this theory in my analysis I only present the general idea here. For a thorough discussion se Palacios (2004)

[50] Palacios uses Black-Scholes option pricing, see Palacios (2004, Appendix B) and Black Scholes (1973)

[51] A loan where the borrower chooses how to handle both principal and accrued interest until the loan matures.

[52] A put is a minimum income insurance contract.

[53] A call is an insurance against overpaying on the Human Capital Contract in case of great success.

The Human Capital Contract combined with a HCO call work the opposite way. If he earns more than expected he would be able to reclaim the excess earnings through the call option. This is protection against what Barr (2001, 218) calls the Mick Jagger problem[54]. Mick Jagger was an accounting student at LSE prior to his fame and fortune. Now it is reasonable to say that his wealth is not related to his education. Neither would paying a fraction of his income for say 15 years be fair relative to what skills he acquired with the loan. Given that he had sign a Human Capital Option he would avoid overpaying on his obligation.

It is also important to point out that the same investors or financial institutions need not offer both contracts. Hence a student could get a HCC from one bank and the HCO from another. Another point that should be made is that this kind of protection much easier to obtain by capping the terms of the contract. Say that the contract rate is calculated on the average of the student of the class with all students in the 90$^{th}$ percentile counted at the income of the 90$^{th}$ percentile. This could also be done with the lower bound so that the rate did not become unreasonably high for the best performers[55].

### 2.2.4 Securitization of Income-Linked Loan Contracts

One of the main differences between a traditional equity instrument and an income-linked loan contract is the investors right to exercise ownership. This is indeed what distinguishes ILL contracts from indentured servitude[56]. It is easy to see that investors holding only a few ILL contracts would be inclined to exercise pressure on the students he finances if he believes that them not perform as he expected. By pooling students together the individual student will gain a higher degree of anonymity.

Markowitz (1952) showed that a portfolio of assets with a correlation of less than one, the risk adjusted return will be higher. From an investors point of view this is an attractive feature of an investment.

---

[54] Mick Jagger is the lead singer of the Rolling Stones.

[55] This applies mostly to Human Capital Contract, as Income Contingent Loans only would result in slightly speedier termination.

[56] An indentured servant is a laborer under contract to work for a specified amount of time for another person or a company/corporation. See http://en.wikipedia.org/wiki/Indentured_servitude

These two arguments argue the case of pooling ILL contracts together in order to securitize them. This will allow investors to choose their exposure and the student anonymity.

Regardless of who originate such a human capital security, government or private institution, it is evident that it would be a source of additional capital given that the return is attractive. Chile attempted to sell such securities to the private sector, but according to Palacios (2004, 141) faced fierce opposition from students who clearly acted on a psychological reaction related to the fear and association to indentured servitude.

Even though the idea of selling off student loans as securities resulted in negative public opinion in Chile the idea is intriguing. Imagine that these securities as for instance “engineer bonds”, “economist bond” or “medicine bonds”, these bonds would return a percentage of the average graduate’s income within its profession relative to experience level. If we disregard any tax effects this would essentially mean that a business could invest in its own human capital. A consulting firm for instance, could through a portfolio of Human Capital Contracts own the right to a percentage of their human capital. The firm could buy a contract for each position they offered. This way the firm would be able to hedge their salary expenses somewhat, but most importantly they would own and carry their employees education expenses. In those educational systems where the tuition is cover either partly or completely by the student this would make even more sense. It would give the firm an option of leasing or “buying” their employed human capital[57].

# 3. The case of Norway

Currently approximately three out of four Norwegian students receive financial aid from the Norwegian State Education Loan Fund (NSELF, 2005)[58]. It is therefore safe to say that NSELF is the primary source of funding for students in Norway. Because most of the academic institutions are fully financed by the Norwegian government students only need to finance their living expenses during their studies[59].

[57] Human capital in this instance refers only to education. Which is a very narrow definition.

[58] According to their annual rapport (http://www.lanekassen.no/upload/Arsrapport/2005/Årsmelding_2005.pdf)

[59] With the exception of a few schools. The Norwegian School of Management (BI) being one the largest. Students are offered additional loans to pay these tuition fees.

In this chapter I will go through the history of NSELF, the present loan and grant scheme and its features and trends among college applicants. I will discuss the present situation in Norway regarding the income distribution relative to education, as well as the income tax system. Finally I will discuss ways Norway could consider revising their repayment scheme.

## 3.1 The history of the Norwegian State Education Loan Fund[60]

The Norwegian State Education Loan Fund (NSELF) was established in 1947 with the intention of removing the inequity with regards to who would have access to higher education. The goal was to give everyone the same opportunity to obtain a higher education regardless of social background (Røseth, 2003). Until 1972 NSELF was discriminatory with regards to social background and the students family's ability to fund the student[61]. Røseth (2003) has categorized NSELF's financial aid schemes into five phases.

| Phase | Supply of Educated Labor | Governments ability to provide financial aid | Sources of funding | Subsidies | Support Selection Criteria | Organization |
|---|---|---|---|---|---|---|
| (1930) | Excess | Weak | Personal | Low | Tight[62]/Reward | Private/Decentralized |
| 1. 1947 – 57 | Increasing | Increasing | Personal/ Government (increasingly) | Increasing | Tight/Reward/ Regulation | Private/Decentralized/ Government |
| 2. 1957 – 67 | Shortage | Growing | Personal/ Government | Strong | Need/Redistribution | Government/Centralized |
| 3. 1970'ties | Shortage/ Equilibrium | Strong | Government | Strong | Universal | Government/Centralized |
| 4. 1980 – 95 | Excess | Reduced | Personal/ Government | Decreasing | Tight/Incentive | Increasingly private/ Decentralized |
| 5. 1995 - 03 | Shortage | Growing | Government | Increasing | Universal/Incentive | Government/ Centralized |

Røseth's (2003) Classification of the different phases of NSELF.

In the pre-war years there was according to Røseth little or no public support for a government supported financial aid fund. The universities and university colleges had their

[60] For a through discussion of NSELF's history see Røseth (xxxx)

[61] According to Ingvild Våge at NSELF.

[62] Røseth uses the term tight in referance to a thigher policy than based on need.

own funds, which tried to aid student. Since there seem to be no demand for educated labor it made little sense to spend tax revenue on higher education.

After World War II there was a consensus that there should exists a government fund to aid student from low-income families the same opportunity. This in combination with an increasing need for educated labor resulted in the establishment of NSELF in 1947. Initially it supported those with little or no opportunity of financial support from their family. As the need for educated labor, follow by the government's increasing ability to finance the aid the support selection criteria widened. During the seventies all students were eligible for financial aid through NSELF. This resulted in an over production of candidates and an excess supply of educated labor, which, during the eighties resulted in reduced support for financial aid and NSELF.

## 3.2 The present financial aid situation

NSELF currently provides all students eligible[63] financial aid for the ten-month academic year. While in school there accrues no interest on the loan. The students are allowed to borrow approximately 80 000 NOK annually or 8 000 NOK for each month of support. The financial aid is paid monthly into the student's checking account[64]. When the student successfully completes his exams each semester 40 percent or less of the loan is converted into a grant[65], subject to income and net wealth covenants of NSELF. Students are not allow to earn more than[66] 113 000 NOK in a calendar year or have a net wealth exceeding 223 600 NOK while receiving financial aid[67].

After graduation there is a six months grace period until the student will start his payments on the loan, which is a mortgage type loan with fixed payments at a rate close to the market rate. The interest rate is discussed in more detail in the analysis below. The interest will also

[63] Any Norwegian citizen accepted into a approved school has the right to a total of eight years of financial aid.

[64] The rationale for this is to save the government interest.

[65] Effectively written off.

[66] In 2006

[67] Exceeding the covenants will result in a reduced grant, and will be checked against tax returns.

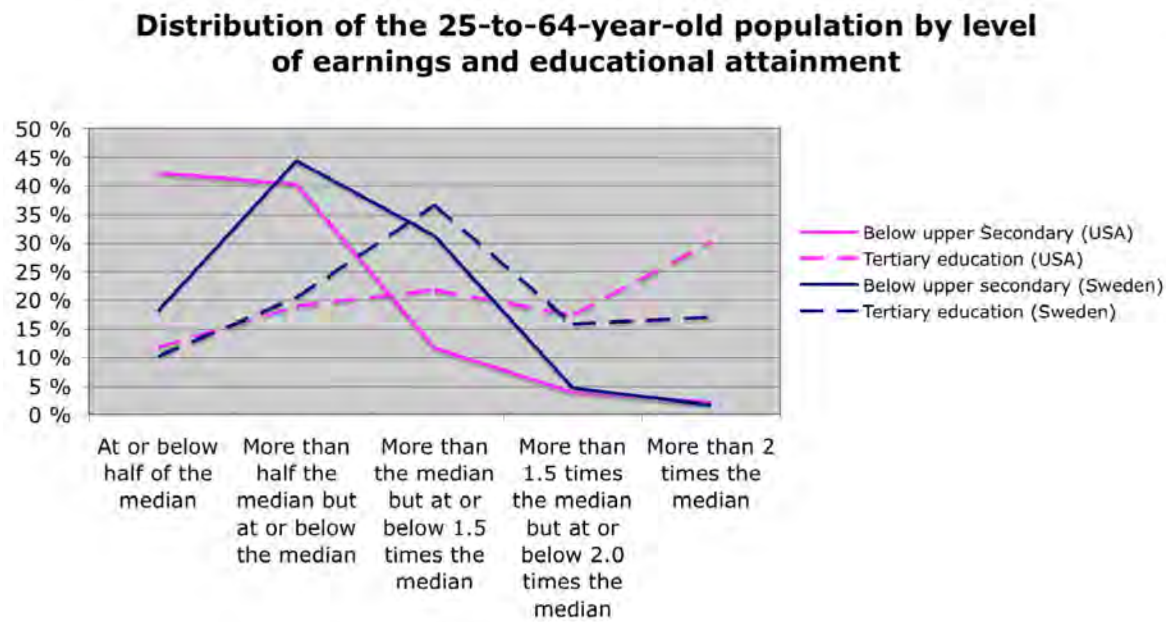
not accrued in case of unemployment, and it is possible to apply for a freeze off the interest rate and delayed payment, with certain rules limiting the use of such applications.

The maximum repayment schedule, which according to NSELF most students use due to the favorable terms of the loan, is 20 years.

The main purpose of the scheme is still to provide everyone with the opportunity of obtaining a higher education independent of social background.

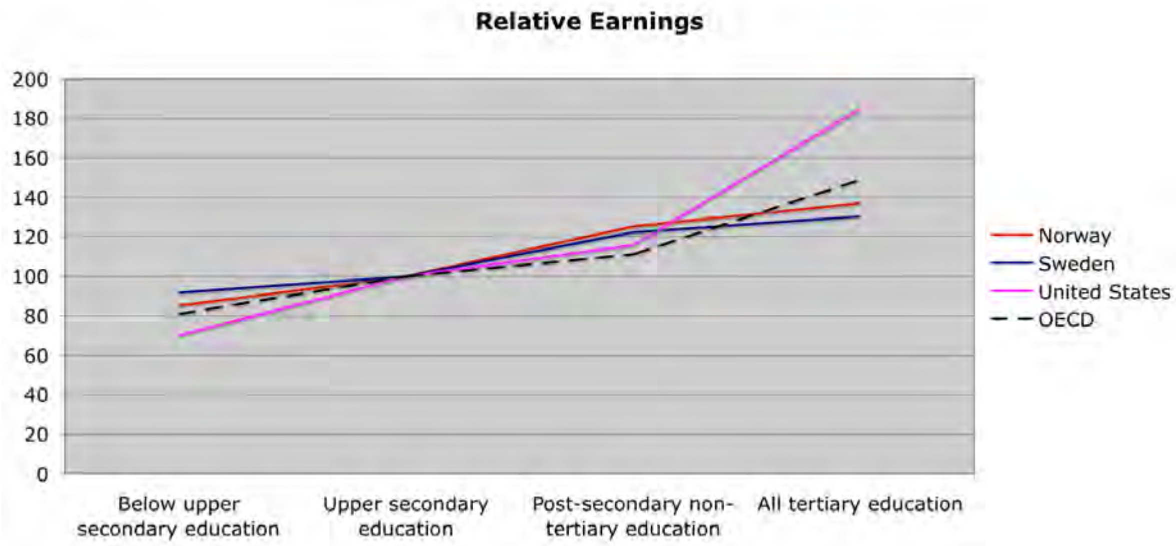
## 3.3 Income Distribution

Being a heavily unionized social democratic welfare state the Norwegian difference in income relative to education level is less than for many other countries (OECD, 2005). Unfortunately there exists no distribution to show this directly, but as the Scandinavian countries are fairly similar in their social structure and salaries I will compare Sweden to the U.S.A.




Source: OECD (2005) table A9.4c

The blue lines constitute the distributions for Sweden while the purple lines are the distributions for the U.S.A. We Clearly see the difference in the distribution of income. In the Swedish case the income of the to groups center around the median, while for the US case it clearly shows the majority of each group at their respective far ends of scale. This should indicate that there is a greater economic benefit attached to obtaining a higher degree in the US compared to Sweden, and presumably Norway. The next diagram shows the relative earnings between each education level for Norway, Sweden, The U.S.A. and the average of the OECD.




Source: OECD (2005) table A9.1a[68]

As we can see from the diagram Norway and Sweden is rather close. It is also apparent that there is an advantage of obtaining a higher education, but the payoff seems more significant for the US compared to the Scandinavian countries.

## 3.4 The Norwegian Tax System[69]

Norway has are two direct taxes; an income tax and a wealth tax. These taxes are generally paid as a percentage of income, and are paid both to the state and the local municipality. In addition there is a social security premium to finance public hospitals, medical treatment and various social benefits. Income taxes are progressive and follows this schedule[70]

[68] Note that the ISCED categories for these four levels are (0/1/2), (Upper secondary = 100), (3/4), (5+). Statistics Norway uses the following classification 'grunnskole' (0/1/2), 'videregående' (3/4), 'universitet og høyskole' (5+)

[69] see http://www.skatteetaten.no

| Taxable Income | Tax | Percentage |
|---|---|---|
| < 29 600 NOK[71] | Social Security Premium | 7,8 % |
| < 31 800 – 61 100 NOK[72] | Income tax (state & local) | 28 % |
| < 394 000 NOK | High Income Tax Level 1 | 9 % |
| < 750 000 NOK | High Income Tax Level 2 | 12 % |

Source: http://www.skatteetaten.no

Depending on how Income-Linked Loan (ILL) contracts are treated with regards to taxation and the type of tax system would be an important factor. Imagine that the ILL contract applies to gross income, not just taxable income. The percentage paid on the ILL contract could be regarded as a valid expense due to the income being a result of the education obtained. Hence a tax deduction[73] should be warranted. This would imply that at the same ILL rate two students, one being a low-income earner the other a high-income earner, would effectively pay different rates because of tax benefits.


| | 5 % ILL Rate | 10 % ILL Rate |
|---|---|---|
| Minimum net ILL rate | -0,96 % | 2,64 % |
| Maximum net ILL rate | 3,60 % | 7,20 % |

[70] This it just a simple representation of what an average employee would face. The tax system has a lot of exceptions and deduction rule that would be beyond the intention of this simple representation.

[71] A 7,8 percent is paid on the total income if above 29 600 NOK

[72] The minimum tax deduction is 34 percent of income with these lower and upper limits.

[73] In Norway 28 percent of interest paid is deductible from taxes paid. I have therefore deducted 28 percent of the ILL paid. Hence ignoring the distinction between interest and principal.

This diagram shows the effective ILL rate relative to income level at a 5 percent ILL rate if the ILL rate is tax deductible. It is interesting to note that in both cases of 5 and 10[74] percent the minimum ILL rate is around 180 000 NOK.

Another way of dealing with the tax issue is to apply a net interest rate on the principal. This is the solution used in Sweden. This also makes the rates more transparent, and does not penalize the high-income earner.

An important question is what effect an ILL rate would have as it could be seen as an additional tax. I would argue that since the typical rate for a 20-year contract would be in the vicinity of 1,5 to 4 percent this would hardly deter anyone from earning or working, more. The progressive tax system already in place is like to be to dominant for those concerned and there dominate such a decision.

Norway is a highly digitized country, and so are the tax services. After the turn of the millennium Norwegians have enjoyed this to the extent that their tax returns are filled in automatically and sent to them for verification by the local tax assessment office. In 2003 1,1 million Norwegians delivered their tax return electronically, 191 000 of them via a text message on their mobile phone[75]. The point is at this level of digitization it should be easy to transfer the collection of loan payments to the Norwegian tax authorities

## 3.5 Why should Norway change their system?

The main question still remains unanswered. Is there a need to revise the current system? NSELF offers everyone the opportunity to get a higher education. The term on the loans offered seem reasonable and three out of four students make use of these loans to finance their education. While these facts are all true there is evidence that children of highly educated and high-income families seem to borrow more that students of low-income families with little education. Students pursuing the same degree seem to acquire equivalent amounts of debt, but there is evidence that student from high-income and highly educated

[74] Not shown in a diagram, as the shape is similar.

[75] http://www.skatteetaten.no/Templates/Pressemelding.aspx?id=8458&epslanguage=NO

families pursue higher degrees that take longer to obtain. They also study abroad, borrowing towards their tuition, and seem more confident they will earn more because of their education (Fekjær, 2000). Fekjær (2000) argues that this is because children from higher social backgrounds seem to make most use of NSELF's services; NSELF seems to benefit those from well of families first and foremost. This she claims might be due an attitude among children from families with parents with no higher education that "education is not worth borrowing for". If we look at the income distribution relative to education discuss above, it is easy to see why children from a lower social background might have this attitude. The fact that obtaining a degree results in a substantial loss of income in the schooling period and in addition accumulates a sizable debt, makes little sense if the expected payoff is rather small. A change in student financing that corrected this view would benefit not only the potential student, but also society at large. Norway is a high cost country with regards to manual labor, except from highly educated labor (OECD, 2005). Given that this trend continues the most likely products produced in Norway in the future will be knowledge and technology. This will require more of high school graduate to pursue a higher degree, preferable in fields that generate knowledge and technology.

A repayment scheme that is based on a percentage of income would be, if the rate is subject to the education is funded, be able to convey income information much better than the run of the mill news article. This would be a valuable tool when choosing education and career, as every student in Norway receives the same support. This would also help adjust what programs to expand and reduce and if the student chooses rationally this could potentially make the supply and demand in the labor market adjust accordingly. Of course this would be subject to availability of imported labor and other factors, which is beyond the scope of this thesis to discuss.

Considering a repayment scheme that would follow a graduate's income and make education economically beneficial regardless of income would certainly encourage more students to pursue a higher education. A financing scheme, which partly helps remove the cost of lost income in the schooling period, might also give more incentives to those from lower social backgrounds. One of the main feature of a ILL repayment schemes is that payments are lower in the beginning of the graduate career, this combined with the fact that most graduate have a need to take on larges mortgage in order to buy a house or car would suggest that these type of scheme would further encourage high school graduate to pursue higher education as the cost would seem low compared to the potential benefit.

# 4. Methods and data used to test theory

The main objective of this thesis is to analyze the Norwegian State Education Loan Fund (NSELF) financial aid from 1972 until present with regards to alternative repayment schemes from the traditional mortgage type repayment plan it has adopted since its start in 1947. The reason that I don't analyze data previous to 1972 is that twofold; first – NSELF had discretionary financial aid before 1972; Second – pre seventies income statistics often had a different focus, and the income distributions and education level (and requirements) were very different from present day Norway. The main focus will be on income-linked loans. In this section I will explain:

- The data used
- Traditional financial mathematics involved
- The model used to calculate the Correct Contract Rate (CCR)
- A suggestion on how to make a loan contract that has Human Capital Contract features, but keeps the loan as an individual contract.

## 4.1 Data used

When searching for suitable data for this analysis I need income data by year of graduation. In addition to income data I need data on the financial support given to each class. It is obvious that this limits how diverse the selection of professions could be, as the availability income data is rather limited with regards to graduation year. The financial support data[76] and NSELF interest rate is available at on the NSELF website[77]. It also makes most sense to use nominal data as the inflation and the real interest rate both affect income growth.

Because we are looking at a portfolio of loan contracts; the most interesting statistical value is the average annual income for each class, but in order analyze the factors of income-linked contract it is useful to have the as many cohorts as possible. In the data that I have used the upper and lower quartiles and the 90 percentile are also given. These four values for each individual class of graduates make the basis for my analysis and gives a fair picture of the ex post outcome.

[76] "kostnadsnorm"

Being a welfare state about 40 percent[78] of the work force work for the government. Government employees are paid through a pay grade system. An employees pay grade is decided by many factors, of which education level is one such factor. Hence, the length of your education is a deciding (though not the only) factor in which range of pay grades an employee will fall under. Your education level of course limits which positions you can hold, but in many instance this can be overcome by extensive relevant experience[79].

When collecting income statistics I tried many sources, but income by year of graduation seemed to be rather hard to find. Statistics Norway had the data, but as I have limited time and funds I could not buy the statistic from them. I therefore contacted many of the trade unions. To my surprise there was very few of the trade unions that had sufficient income statistics, especially for the professions that are employed by the government. The two sources[80] that I have used which are described below had complete annual statistics dating back to at least the early seventies.

### 4.1.1 Norwegian State Education Loan Fund (NSELF)

An important variable in the analysis to investigate is the amount of financial aid that NSELF has been dispersing each year over the period analyzed. The financial aid is divided into a grant portion and a loan portion. In addition there has been some variations in the terms for the grant portion. Currently the financial aid is given as a loan. On successful completion of the education that the financial aid is meant to support the grant portion of the financial aid is written off by NSELF, hence given as a grant.

It is important point out that in Norway there is no tuition for college and university education, though there is a symbolic fee[81] per semester to the local Student Welfare Organization. Hence the financial support only covers living cost and course material. There

---

[77] http://www.lanekassen.no

[78] According to http://www.ssb.no. This number is irrespective of education.

[79] This statement is obviously not a valid statement for positions such as physicians, etc.

[80] I would like to thank Arnhild Sønsteby at Siviløkonomene and Øyvind Haldorsen at TEKNA for their help and for providing me with the data that make the foundation for this analysis.

[81] Currently approx. 400 NOK (15 USD)

is no differentiation in the size of the financial aid between different school and educational program, but students attending private institutions will be granted additional loans to cover their tuition[82]. The grant portion of the financial support is a “living away from home” grant and is intended to cover the expense for housing during the 10 month the academic year. I have only focus on the loan portion of the financial aid, as this is the part of the financial support that is actually borrowed with the system current in place. One could argue that the relevant economic variable is the full financial aid, but that will not change the result of this analysis as it would only be a linear scaling; hence Twice the debt, twice the rate. This is easy to see why in the simple model presented below.

#### *4.1.1.1 The NSELF interest rate*


The other interesting economic variable is what interest rate would be relevant to use on the principal as well as a discount rate for the present value of cash flows such as income. All other economic variables, such as income data and the financial aid are given for the academic year, which is from September until September each year. I have used a geometric average of the NSELF rates for each academic year, as this is the relevant period for this analysis. In order to analyze the data with a uniform and perfectly inflation adjusted annual financial aid I used the consumer price index for Norway[83].

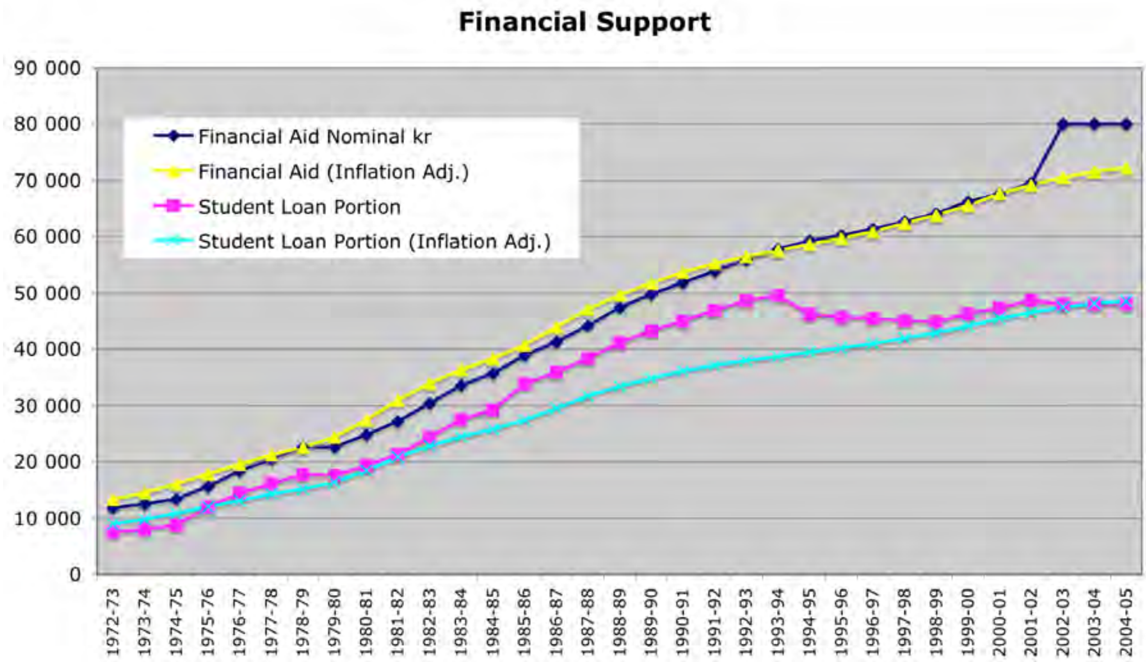
---

[82] It is important to note that the most prestigious academic institutions in Norway are public institutions. The beginning salaries are on average higher for The Norwegian School of Economics and Business Administration, compared to the private counterpart (http://paraplyen.nhh.no/cgi-bin/paraplyen/imaker?id=14884)

[83] CPI-JAE

There has been changing monetary regimes and a wide range of interest rate schemes offered by NSELF. I have consequently used the rate that reflects the floating or short-term options in the following analysis. In order to estimate a long-term interest I calculated the geometric mean of the NSELF interest rates that each class faced over a 10, 15, 20 and 25 year period and estimated the arithmetic mean of these estimations. This yielded an expected long-term interest rate of 8,5% that I have used as in the stylistic projections in this thesis.

I also checked the development of financial support in Norway for the period in question. Checked against an inflation adjustment using the NSELF inflation rate and using the academic year 1975-1976 as the base year[84] as this was the first year that offered uniform financial support for all students[85].




An observation worth remarking is that the percentage of the financial aid given, as a loan, seems to have increased more than the inflation in the eighties and was corrected early nineties. I discuss this earlier with regards to the history of the Norwegian State Education Loan Fund. That said the financial support seems to have followed inflation closely.

84 The three first academic years are discounted by the appropriate inflation.

85 The first three years (1972-1975) of the data I used had a differentiated support depending on place of study (geographically). I used the highest category which included Oslo, Bergen and Trondheim (the cities that had Universities at the time and educated Economists and Engineers) I would like to thank Wenche Merli and Ingrid Våge at NSELF for providing me with this information.

### 4.1.2 Income data

In order to make a sensible analysis  the income data would need to be linked to the year of graduation. Of course there might be students that are delayed a year or two, as well as students that accelerate their education. In order to find sources of income data I tried Statistics Norway and checked the Official Norwegian Reports (NOU) made available in conjunction with the annual salary negotiations, as well as the professional trade unions. It turned out that the government agencies mainly work in terms of the average either for a profession or a position. The trade unions on the other hand divided into to different categories. Either they had excellent and complete statistics dating back to at least the seventies, or they only had statistics dating back about five years. The first category often had the greater portion of their members being privately employed, while the second category either had the major portion of their members either being publicly employed or self employed[86].

The data that I have used are given in annual rapports from Siviløkonomene (The Norwegian Association of Master of Science in Business) and TEKNA (The Norwegian Society of Chartered Technical and Scientific Professionals).  These two organizations have collected income data from its members and reported the mean, upper and lower quartiles, median and 90 percentile for each year of income for each graduating class. The TEKNA data had a large response rate from both public and private employees, while the Siviløkonomene data had a rather small response rate from the public sector. The main observation is that there seems to be a fairly consistent that the long term average income growth is 8 percent for employees in the private sector and 6 percent for government employees. These findings will be discussed below. In the following section I will try to explain problems and observations from the data I found to be the most usable.

[86] A example would be Norges Juristforbund (The Norwegian Association of Lawyers).

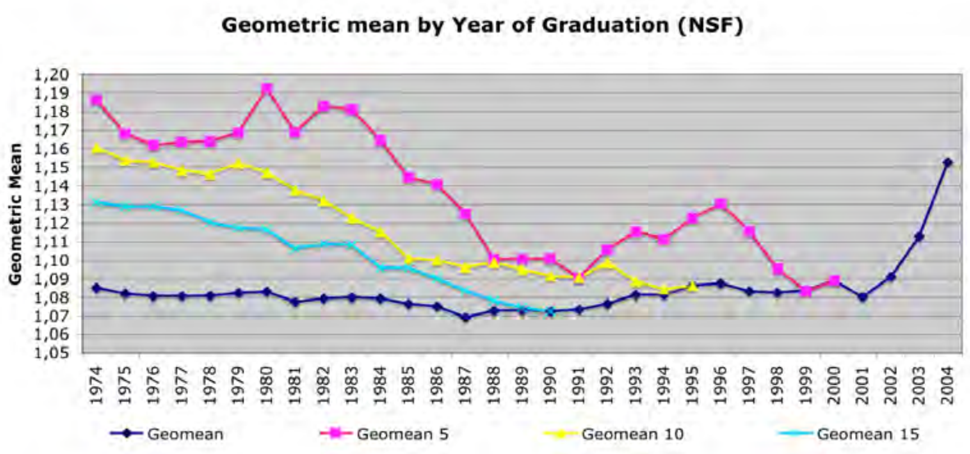
### *4.1.2.1 Siviløkonomene (NSF)*

The NSF data did not distinguish between the public and private sector up until 1983, and even the post 1983 data often had incomplete data for the public sector[87]. But because I need the average income for each graduating class and the data pre 1984 pool private and public employees I calculated the weighted average of the public and private average for each class each year to have a uniform average throughout the sample period.

For the quartiles and 90 percentile I used the private values as these represented about 90 percent of the respondents[88]. Pre 1983 the 90 percentile is not given. These values are therefore omitted in any part of this analysis.

**Preliminary analysis for Siviløkonomene data**

In order to make some reasonable assumption in the projections in my analysis I have calculated the geometric averages for the first 5, 10 and 15 years after graduation for each class as well as for all data available for each class.




As we see from the figure above the annual income growth seems to converge towards 8 percent annually. We also see that the last four observations for the blue line have a rising trend. This could be due to either the fact that they consist of less than five observations or that there has been a boom the recently, giving employee larger bonuses or opportunities to ask for a raise.

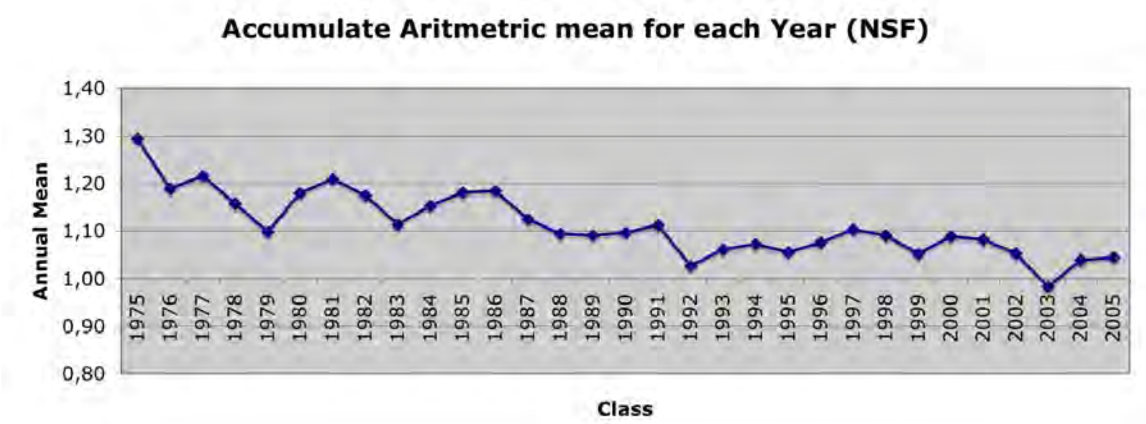
87 The statistics from years pre 2000 had rather low respondent rates from the public sector. In particular 1989 and 1990 are these are non existent.

88 According to Arnhild Sønsteby at Siviløkonomene (NSF) about 10% of the members are publicly employed.

It does however indicate that there may be reason to assume a higher income growth in the first half of a graduate's career in the first period of the data. In the table below you will find the arithmetic averages for each of the curves above. These averages seem to support the assumption that there is a stronger income growth in the first classes in the data.

| **Average income growth for Business Majors (NSF)** | **All** | **1974-1984** | **1985 - 2005** |
|---|---|---|---|
| Average income growth first 5 Years after Graduation | 14 % | 17 % | 11 % |
| Average income growth first 10 Years after Graduation | 12 % | 14 % | 9 % |
| Average income growth first 15 Years after Graduation | 10 % | 12 % | 8 % |
| **Average income after Graduation On available data** | **8 %** | | |

The diagram below represents the arithmetic average of all the classes each calendar year. It seems to indicate that there has been a trend of moderation in the income growth each year, especially from the mid eighties onwards.



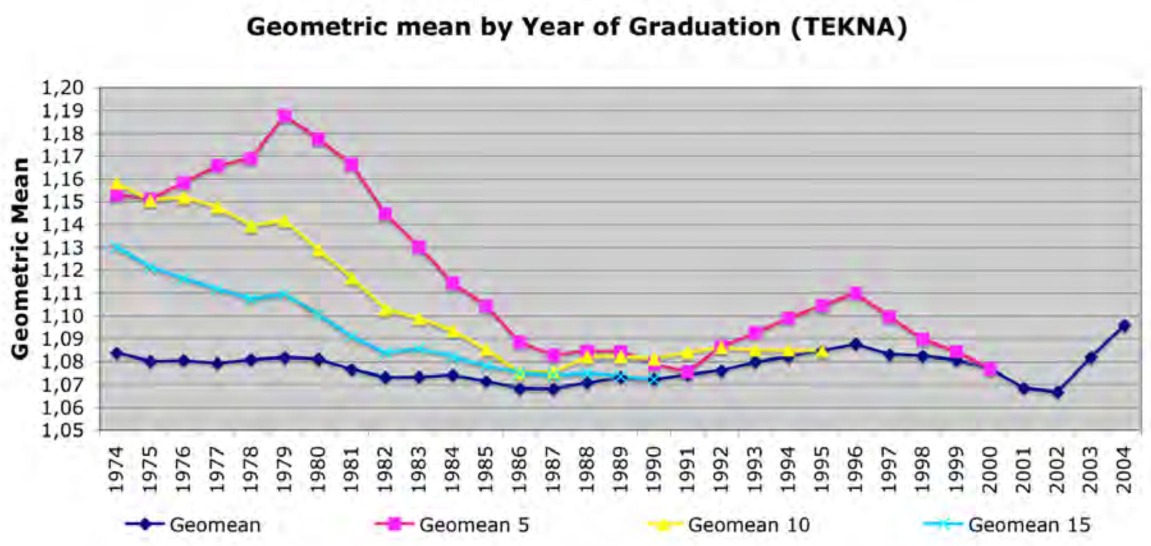

## *4.1.2.2 TEKNA*

The TEKNA data has a strong respondent base and has been collected and reported income statistics very consistently from 1946 until present[89]. I would also recommend this data as a source in the future due to its consistency. I used the data from 1974 until present. For this period there is no data for government employee in the1977 and 1986 data does not state the 90 percentile. I solved this issue by averaging the data from the previous and following year. The value for graduates (first year of employment) was estimated by deflating the value of the following year value by the average of growth in the other values (classes of graduate) for those calendar years.

89 A big thanks to Øyvind Haldorsen at TEKNA for providing me with this material.

**Preliminary analysis for TEKNA data**

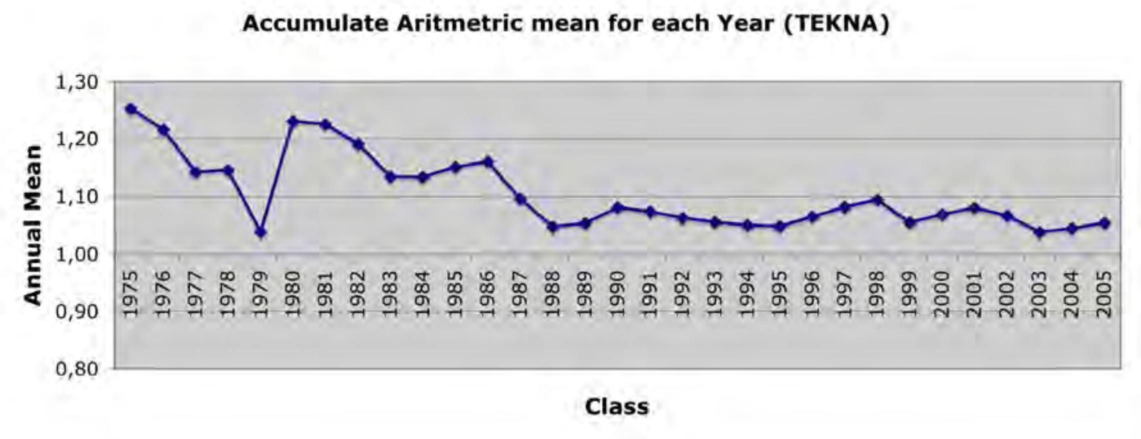
In order to make some reasonable assumptions in the projection analysis I have, in the same way as for NSF, calculated the geometric averages for the first 5, 10 and 15 years after graduation for each class (year of graduation) as well as for all the data available for each class. Since TEKNA has made the distinction between government and privately employed members I have analyzed both data sets individually. I will first look at the members employed in the private sector.




As we see from the diagram above the annual income growth seems to converge towards an 8 percent annual growth. This is consistent with the findings in the analysis for NSF. We also see that the last four observations for the blue line have a rising trend, but this trend is weaker than for NSF.

It does however indicate that there may be as much reason to assume a higher income growth in the first half of a graduate's career during the first decade of the data set. This is consistent with high inflation of this period. In the table below you will find the arithmetic averages for each of the curves above. These averages seem to support the assumption that there is a stronger income growth early in the career for the first decade, but slightly less than in the NSF case. It seems that pre the mid eighties this was more the case than in recent years, which seem to be quite consistent with 8 percent.

| Average income growth for Technology Majors (TEKNA) | All | 1974 – 2005 | 1985 - 2005 |
|---|---|---|---|
| Average income growth first 5 Years after Graduation | 12 % | 16 % | 9 % |
| Average income growth first 10 Years after Graduation | 11 % | 13 % | 8 % |
| Average income growth first 15 Years after Graduation | 9 % | 10 % | 7 % |
| **Average income after Graduation On available data** | **8 %** | | |



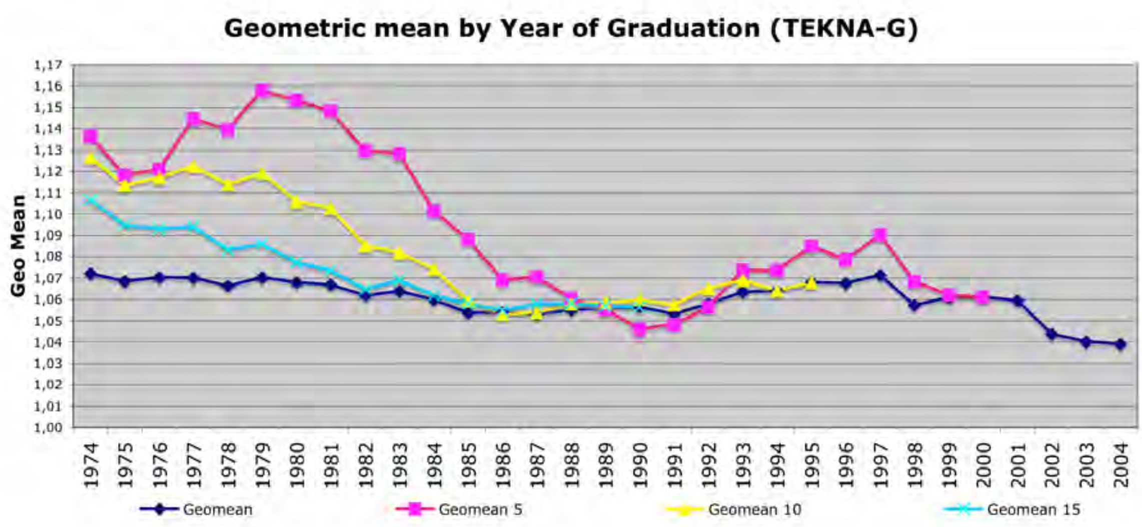

Again we see that there is a trend of more moderation in income growth from the mid eighties. I will get back to this later in the analysis of the correct contract rates.

### *4.1.2.3 TEKNA-G (public sector)*

Lets take a look at the analysis for government employees. These data are on average based on samples of on average more than forty observations per cohort, and therefore should give a general idea of the pubic sector. As wages for employees in the Norwegian government agencies are bases on pay grades (lønnstrinn), which again is derived from amongst many factors the length of your education[90], it is reasonable to assume that these data are fairly equivalent to anyone with a master's level degree. I checked the sample data that I got from the Norges Juristforbund[91] (Norwegian Lawyers Society) for government-employed lawyers and it seems fairly consistent.

[90] As mention earliar your education often sets the premise for the level your pay grade can reach.

[91] Thanks to Karen Oppegaard Haavik at Norges Juristforbund for providing these income data.

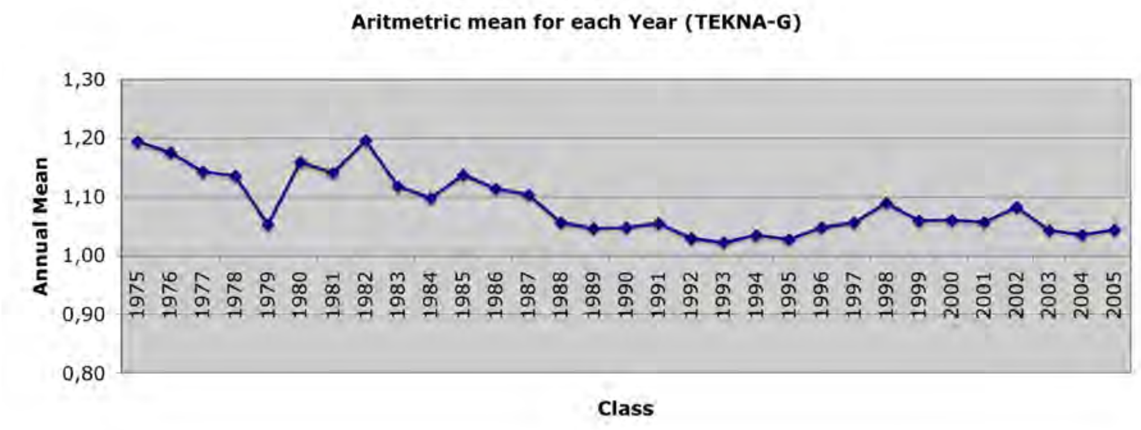



Again we see that the income growth converges, but to 6 percent for government employee. This level is lower than for employees in the private sector. The trend also seems to be pointing down for the last few years, which is strange, as the direction of the trend should point in the same direction and be related to the business cycle.

| **Average income growth for Technology Majors (TEKNA-G)** | **All** | **1974 – 1984** | **1985 - 2005** |
|---|---|---|---|
| Average income growth first 5 Years after Graduation | 10 % | 13 % | 7 % |
| Average income growth first 10 Years after Graduation | 8 % | 11 % | 6 % |
| Average income growth first 15 Years after Graduation | 7 % | 8 % | 6 % |
| **Average income after Graduation On available data** | **6 %** | | |

Again we see that there is stronger income growth in the beginning of those starting their career in the first decade of the data, this is consistent with the high inflation in the beginning of their career. It is therefore reasonable to assume a 6 percent long-term income growth for government employees in the projection analysis.

The following figure tells the same story as for the to previously shown, that there seems to be a trend of moderation in the income growth.




Again this shows the annual arithmetic average for each calendar year. If we compare the three curve it seems consistent that that they all moderate their demands from the mid eighties. The to TEKNA curve also have relatively similar shapes, while the NSF curve is slightly different.

## 4.2 A Simple model

As discuss earlier the Correct Contract Rate is the fraction the initial debt and the present value of income for that period.

$$CCR = \frac{D_0}{\frac{y_0}{r-\gamma}\left[1-\left(\frac{1+\gamma}{1+r}\right)^T\right]} \quad \text{or} \quad CCR_{t,T} = \frac{D_{0,t}}{\sum_{i=0}^{T-1} \frac{y_{t+i}}{\prod_{j=1}^{i+1}\left(1+r_{t+j}\right)}}$$

Here $\gamma$ denotes the income growth rate. The second model uses t to denote the initial year and T to denote the length of the contract. This is the model that I have used to calculate the Correct Contract Rates in the following analysis. It should be pointed out that in an ex ante situation, that is when the contract is signed, neither the borrower nor the lender knows these rates and need to make assumptions. These assumptions will have to be based on historic data, and I have made some estimate for the data that I have analyzed in the previous sections. These can be used together with an annuity formula to make a stylized projection for potential contract.

## 4.3 Variations of model used to test theory and data

In order to study the data in light of an income-linked loan contract it is necessary analyze the different variations of such a contract. As discuss earlier there are four different variations of loan contracts. Serial loans matures with equal amounts each period of the contract until the principal has matured, annuities have equal nominal payments each period, a modified annuity where payments grow by a growth factor, income-linked loans are in essence a variation of a modified annuity as I showed in previous section. Income-Linked Loans (ILL) come in two main versions; Income Contingent Loans (ICL) which is a contract where the borrower commits to paying a percentage of their gross income until the principal is repaid. That is if you imagine the loan is an account, which either generate principal due to underpayment of interest, or reduction of principal because the payments exceed that of the interest incurred for that period. The other type of income-linked loan is a Human Capital Contract (HCC), which is a contract in which the borrower commits to paying a percentage of his gross income for a set period of time.

### 4.3.1 Assumptions for the analysis

I have made a few assumptions in the following analysis. All assumptions are made on the basis that I am only going to use the properties of the financial aid offered by NSELF. I am assuming that the grant portion and other terms of the financial aid offered are unchanged. Hence I will not go into a hypothesis of a totally different financial aid system, but use the policies currently in place. The main features of the current system, apart from the annuity contract are:

- Interest free student loan while receiving financial aid
- Link between completion of education program and grant

I have also assumed that all students have successfully completed their programs. This is only a simplification. In addition I have also assumed that the TEKNA members received 4 years of financial support. The engineering programs that most of these student attended are in fact four and a half years, but since this is mainly a level adjustment in the support received, and the NSF members have a four year degree I found it convenient to use a four years financing period so that it would be more comparable.

### 4.3.2 Projections based on assumption from the data

Serial loans have the contrary properties of what we would want for a repayment plan on a student loan. It has a falling payment profile which would give the student higher payments when having a relatively low wage and the opposite later at the end of the contract. The reason to include it in this analysis is its linear properties. A serial loan has a linear principal and interest payment schedule. That is the nominal an effective interest rate is the same throughout the contract period, for a stylized static interest rate.

Annuities are the Scandinavian[92] standard student loan schedule. This is a contract type that in real terms also has a falling repayment schedule. That is the payments stay the same in nominal terms, adjusted for a changing interest rate. The Swedish National Board of Student Aid (CSN) has solved this by using a modified annuity[93] repayment schedule in which the growth factor matches the Swedish Central Banks target inflation rate[94] of 2 %. This is in essence saying that the graduates will repay with a flat real term repayment schedule, given that the central bank is able to adjust the interest rate so that the target inflation is met. In nominal terms this results in a payment profile that is rising. Hence the graduates pay increasingly higher payments, starting below the straight annuity level and finishing above it.

For the Income-linked loan contracts I have used the historic averages from the preliminary analysis of the data. That would be a long-term interest rate of 8,5 % and an annual income growth of 8% for employees in the private sector and 6 % for the public sector.

In the projection analysis I will look at the four different contracts stylistically with static interest and income growth expectations. This analysis will give an indication of the payment and amortization profiles as well as the movements of the principal and the interest payments. This analysis is intended to give the reader a good understanding of the four contracts as well as giving and indication of how the factors affect the contracts.

92 Norway (http://www.lanekassen.no), Sweden (http://www.csn.se) and Denmark (http://www.su.dk)

93 See http://www.csn.se/BlanketterOchInformationsmaterial/GenerellaFiler/PDF/6517B.pdf and http://www.csn.se/BlanketterOchInformationsmaterial/GenerellaFiler/PDF/6517B.pdf

94 See http://www.riksbank.se

### 4.3.3 Estimating the Correct Contract Rate (CCR) and Actual Years Until Repaid (AYUR)

This analysis estimates the Correct Contract Rates and the Actual Years Until Repaid[95] for the cohorts of each class of graduates. The CCR is estimates as described above.

The Actual Years Until Repaid is the number of year each cohort will need to repay their loan if they pay the CCR of the mean of their class. I estimated this through numerical analysis, running the loan at the estimated CCR for the mean. If using a Human capital contract this would be the same as the total loan being repaid by the class as a whole instead of individually, in essence an insurance portfolio between the students in each class. Alternatively it can be seen as how much off a contract rate calculated from the average student would be with regards to an Income Contingent Loan contract.

### 4.3.4 Ratios between different contract lengths

In order to get a better understanding of the dynamics of the ILL contracts I have estimated the ratios of the Income-linked loan contracts of different lengths for each graduation year. I used the upper and lower quartiles, mean and 90 percentile ten-year contracts as a base and compared them with the 15, 20, 25 year contract counterparts (matching cohorts). The ratios will give an estimation of how the different contract lengths affects the Correct Contract Rates, and therefore will give an indication of effects the contract lengths has on the price of the contract.

### 4.3.5 Estimating the Year of Repayment for different Policy Contract Rates (PCR)

Because of the problems in predicting the future, and the fact that student loans in Norway are almost completely provided by NSELF, the most likely terms of a contract would be that NSELF determined a Policy Contract Rate (PCR) and structured the contract either as a Income Contingent Loan (ICL - unlimited time length) or a Human Capital Contract (HCC – limited time length). The contract rate could also be structured as an Indexed Contract Rate, where the rate varies somewhat with the inter bank rate which is discuss below. I ran four different political rates of 10%, 7,5%, 5% and 2,5%.

95 The number of year each cohort of each class of graduates uses to repay their debt at the CCR of the mean of its class.

### 4.3.6 Estimating the affect a Indexed Contract Rate (ICR) would have on a class of graduates

The last technique is to let both the interest rate and the growth rate be variables. Lets take another look at the model.

$$CCR = \frac{D_0}{\frac{y_0}{r-\gamma}\left[1-\left(\frac{1+\gamma}{1+r}\right)^T\right]}$$

If we let the interest rate float for each period, that is we always use a marked rate, and let the $\gamma$ be the income growth be the last periods income growth, that is we adjust either annually or at some other sensible interval. This will in effect give each individual his CCR. Of course it can be argued that this will make a person pay less each time he or she gets a big raise, but that could be corrected by smoothing the growth factor by using geometric mean of the income growth from graduation until the current period. To solve for the first period it is reasonable use the current rate of an older class of graduate of the historic geometric income growth for a sensible period.

# 5. Analysis of results

## 5.1 Projection analysis

This analysis will give an idea of the characteristics of Income-Linked Loan contracts. The assumptions used in this analysis are the results of the preliminary analysis of the NSELF and NSF data in the previous chapter. I have chosen the estimates for a business student beginning his education the fall of 2006, hence due to graduate in 2011. I have used the estimates for employment in the private sector, as well as the private sector income growth of 8 percent. The reason for this is that a business graduate most likely to end up in this sector[96]. Annual financial support is currently approximately 50 000 NOK[97]. It does not however make much difference in these projections which beginning income or annual support is used. Being a stylized projection with the purpose of analyzing the characteristics of Income-Linked Loan (ILL) contracts the starting values are estimates anyhow, and that contract rate always will have to be rough estimates anyhow. As we know from the model the debt is linearly scalable; so doubling the debt only doubles the Correct Contract Rate (CCR). The opposite is true for the beginning income, given that income growth develops identically.

If we first take a look at how the length of the financing period will have on at marginal contract length of 15 and 30 years. As we observe in the table below the average CCR marginal CCR are decrease as the financing period increases. This is a positive effect as it is more likely that a longer education is more likely to generate a higher income in the future. Hence we can conclude that ILL contracts give incentives to obtain the highest degree possible. It however important to point out that these conclusions are based on the assumption that additional years of support are a result of obtaining a higher degree and not delays in the students academic progression. We also see that students will enjoy the benefit of their ILL payments being lower than the annuity payment longer with a shorter repayment period. The number of actual years of this benefit would of course be lower as well, but it seems rather consistent that in a static example an ILL would result in smaller payment for the first half of the repayment period, given the CCR for that individual is used.

---

[96] As discuss before 90 percent of the members of NSF are employed in the private sector.

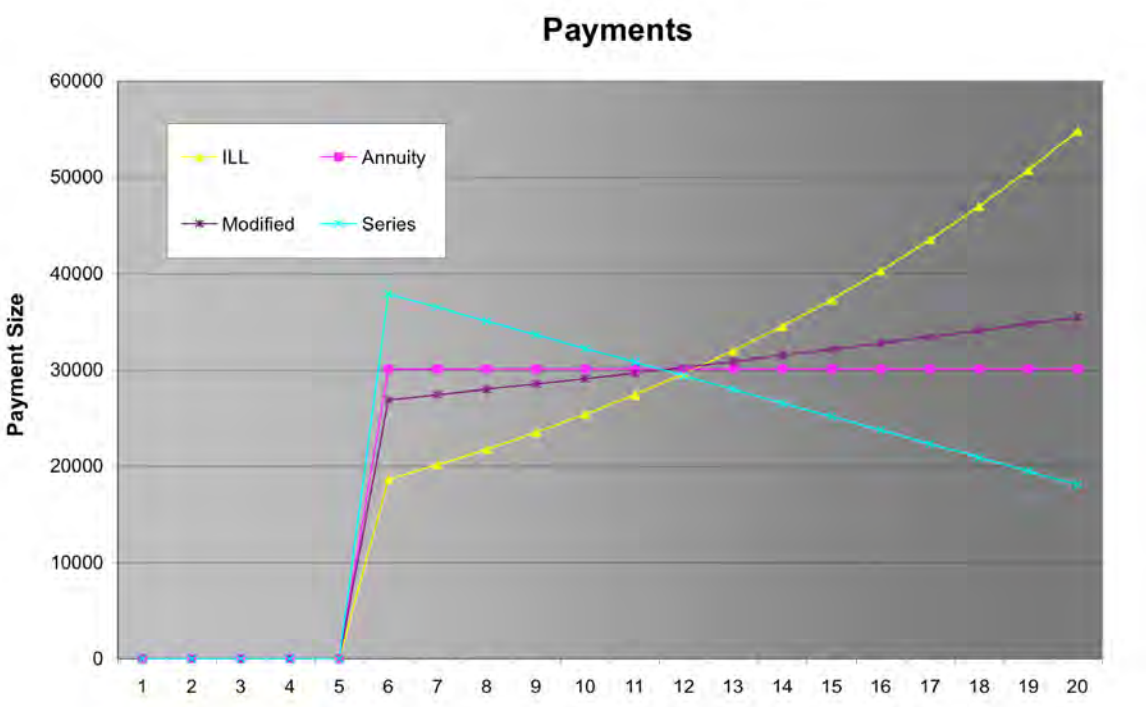
[97] The current loan is 48840 NOKfor the academic year 2005-2006, and it is likely to increase over the financing period.

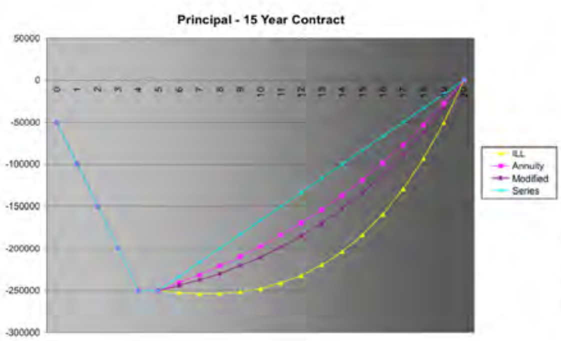
| Contract length<br>Financing period | 15<br>1 | 15<br>2 | 15<br>3 | 15<br>4 | 15<br>5 |
|---|---|---|---|---|---|
| | | | | | |
| Annual Income | 340000 | 340000 | 340000 | 340000 | 340000 |
| Annual Income Growth | 8,00 % | 8,00 % | 8,00 % | 8,00 % | 8,00 % |
| Annual Financial support | -50000 | -50000 | -50000 | -50000 | -50000 |
| Interest rate | 8,50 % | 8,50 % | 8,50 % | 8,50 % | 8,50 % |
| Repayment Growth Factor (modified annuity) | 2 % | 2 % | 2 % | 2 % | 2 % |
| CCR | 1,02 % | 1,88 % | 2,62 % | 3,23 % | 3,74 % |
| Average CCR (average rate cost per year) | 1,02 % | 0,94 % | 0,87 % | 0,81 % | 0,75 % |
| Marginal CCR | | 0,86 % | 0,74 % | 0,61 % | 0,51 % |
| ILL Beats Annuity until year | 8 | 8 | 8 | 8 | 8 |
| ILL Beats Modified Annuity until year | 5 | 6 | 7 | 7 | 8 |
| **% Repayment time with ILL advantage** | | | | | |
| Vs Annuity | 53 % | 53 % | 53 % | 53 % | 53 % |
| Vs Mod. Annuity | 33 % | 40 % | 47 % | 47 % | 53 % |

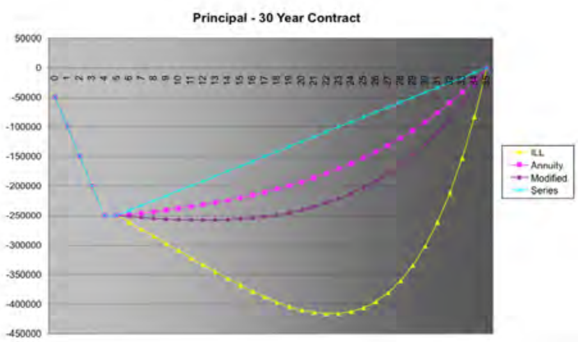
| Contract length<br>Financing period | 30<br>1 | 30<br>2 | 30<br>3 | 30<br>4 | 30<br>5 |
|---|---|---|---|---|---|
| | | | | | |
| Annual Income | 340000 | 340000 | 340000 | 340000 | 340000 |
| Annual Income Growth | 8,00 % | 8,00 % | 8,00 % | 8,00 % | 8,00 % |
| Annual Financial support | -50000 | -50000 | -50000 | -50000 | -50000 |
| Interest rate | 8,50 % | 8,50 % | 8,50 % | 8,50 % | 8,50 % |
| Repayment Growth Factor (modified annuity) | 2 % | 2 % | 2 % | 2 % | 2 % |
| CCR | 0,53 % | 0,97 % | 1,35 % | 1,67 % | 1,93 % |
| CCR / Years of financed | | 0,45 % | 0,38 % | 0,32 % | 0,26 % |
| ILL Beats Annuity until year | 13 | 13 | 13 | 13 | 13 |
| ILL Beats Modified Annuity until year | 11 | 12 | 12 | 13 | 14 |
| **% Repayment time with ILL advantage** | | | | | |
| Vs Annuity | 43 % | 43 % | 43 % | 43 % | 43 % |
| Vs Mod. Annuity | 37 % | 40 % | 40 % | 43 % | 47 % |

Financing periods here describes the number of year financed (years in school) the contract length is the number of years of repayment. The four last rows in each table show the number of years an ILL would have lower payments compare with an annuity contract.

Now if we look at the four different ways a loan contract can be structured (straight, series, modified, ILL), we see that the ILL structure (yellow line) has the lowest payments for the first half of the contract period, but is significantly higher at the last half of the contract. In essence the ILL contract is a modified annuity (purple) in which the growth rate is equal to the income growth[98]. The advantage as discuss earlier is that these contracts follow the graduate's income. The diagrams below represent the same input as the previous tables with a 15-year repayment period (the upper table) and a master's degree (5-year financing period).




[98] See chapter 4.2 for a more detail explanation

If we look at the movement of the principal for a 15 year and 30 year contract we see that there is significantly more risk involved in longer contracts, in the sense that the principal grows to approximately twice its initial size and repayments on the principal start after 18 years. These contracts effectively do not only lend the student the financial support, but actually extends the loan by letting the lender increase the principal by not covering the interest that incurs on it. This is of course a function of the interest rate applied as well at the relevant income growth.



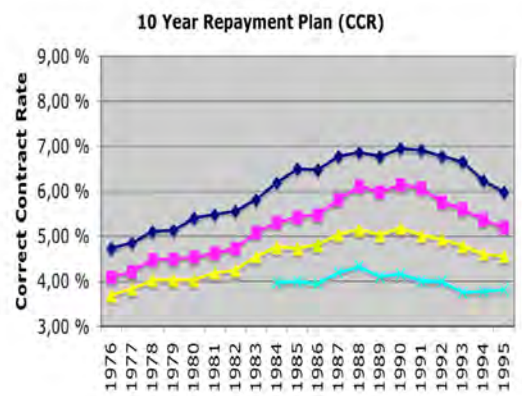
Of course one could argue that this is not a transfer of fund only a financial alternative cost, but it increases the risk of recovering the loan regardless of altruistic motives. If an ILL contract were the alternative to a grant then of course the grantor would never actually recover the grant, and so you can claim that he at least most likely will recovers some of the "grant". The point is that I do not believe that Income-Linked Loan contracts would be attractive to private investor for such a repayment period. As we have seen the Robertson Education Empowerment Foundation limits their contracts to 10 and 15 years, most likely to reduce this risk.

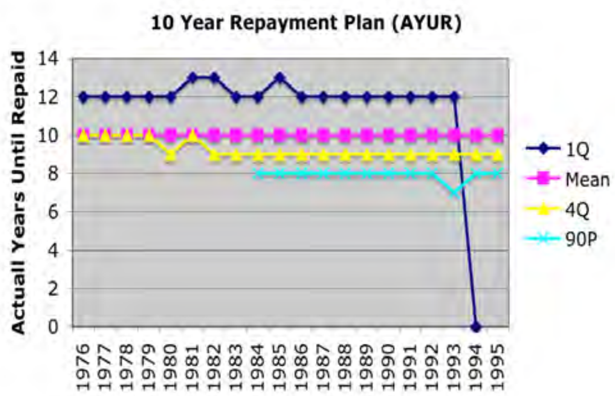
## 5.2 Analysis of Correct Contract Rates and Actual Years Until Repaid

Lets move on to the estimation of the Correct Contract Rates (CCR) and the Actual Years Until the loan is Repaid (AYUR). I estimated the CCR and AYUR for all graduate class cohorts (1$^{st}$ quartile, mean, 4$^{th}$ quartile and 90$^{th}$ percentile) with old enough data series for contract periods of 10, 15, 20 and 25 years. The AYURs are the cohort's repayment time using the mean CCR, as this would repay the loan for the class as a whole. The more fortunate pay more than the average and visa versa, but essentially the AYURs give an indication of how much of the estimation based on the average student in terms of a Income-Linked Loan contract.

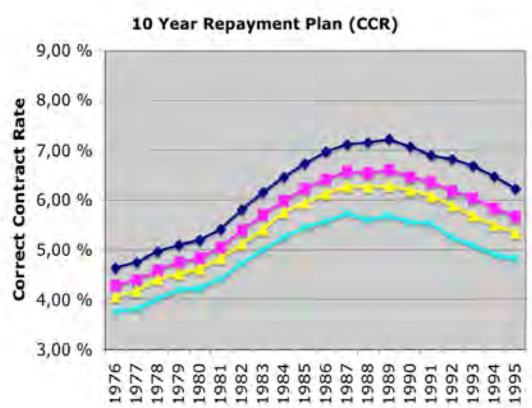
Knowing the loan portion of the financial support did not follow inflation as closely as the total financial support I ran the estimation for a perfectly inflation adjusted loan. This way the results are comparable. I will only analyze the different data sources on 10-year contracts as this gives me the maximum number of reasonable observations.

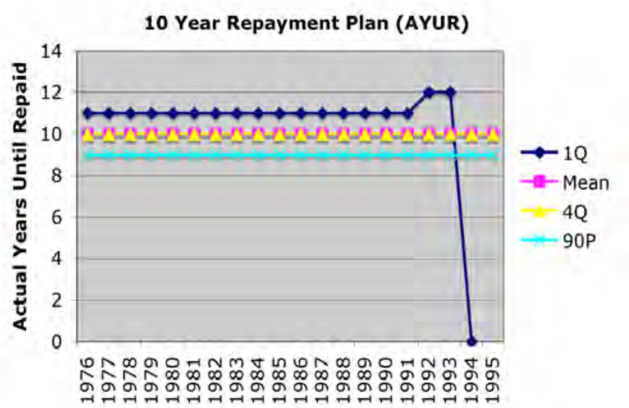
I would also like to note that I assume all of the members in these data sets to accept the contract. This is obviously a simplification, but as the purpose is to see how these contract act on real life data this does not really matter for the purpose of this analysis.



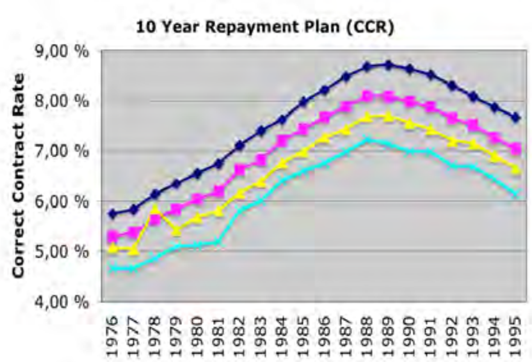



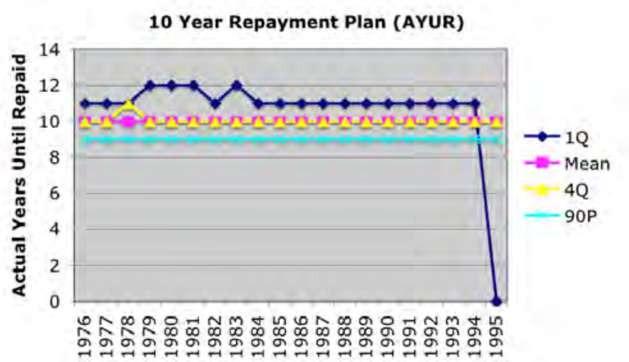

| Average CCR for a 10 Year Contract (Average NSF Member) Inflation Adjusted | |
|---|---|
| Mean 1976-1995 | 5,2 % |
| Mean 1985-1995 | 5,7 % |




| Average CCR for a 10 Year Contract (Average TEKNA Member) Inflation Adjusted | |
|---|---|
| Mean 1976-1995 | 5,7 % |
| Mean 1985-1995 | 6,3 % |




| Average CCR for a 10 Year Contract (average TEKNA-G Member) Inflation Adjusted | |
|---|---|
| Mean 1976-1995 | 7,0 % |
| Mean 1985-1995 | 7,7 % |

The curves to the left describe the Correct Contract Rate for each class of graduate. We observe that for each year the CCR would have had to increase in order to be correct. The curves to the right describe how many years it would take the each cohort of each class to repay the loan fully at the mean CCR[99].

Looking at these results the most obvious observation is the regularity of the distance between the cohorts is not as stable as for those of the TEKNA data. This may be due to a greater variance in business graduates income or the number of respondents being higher for the TEKNA data.

The TEKNA curves have almost perfectly similar distances between the cohorts over the period. The AYUR curves are also much tighter then for the Siviløkonomene data.

Even though the CCR moves in an upward trend, which seem to peak in the late eighties and early nineties. As there is not enough data to analyze beyond the class of 1995 it is hard to say if the trend is stabilizing or sloping down again. This does however fit very nicely with our previous history lesson. As we remember Røseth's fourth phase – the period of the eighties and the early nineties – was a period with excess supply of educated labor. This would most likely be the reason for the high rates.

From this it is reasonable to conclude that estimating on the rate for the average graduate of a class will yield a result that would not punish any one within these cohorts to heavily. Meaning that with a cap for the top 10 percent it seem that the contract would be fairly reasonable to all. In the next section I will compare the different contract lengths. The fact that this is estimate on a 10-year contract would imply of course that these differences in rate would increase with the contract length. We will come back to this point in the discussion of the policy rates.

[99] The AUYR being zero indicates that there is not enough data to conclude. Letting the curve go to zero is only done to highlight this fact, and graphically show the distance between cohorts.

## 5.3 Analysis of Ratios between different contract lengths and a companied contract rates

The table below contains the ratios between different contract rates of each cohort of each class for different contract lengths on each data set. Hence, a15-year CCR for the 90$^{th}$ percentile of the 1985 class is divided by a 10 years CCR of the 1985 class 90$^{th}$ percentile.

| NSF | | Cohort | Average |
|---|---|---|---|
| Contract length Ratio | **15/10** | 1Q | 1,47 |
| Average Ratio | *1,51* | *Mean* | *1,50* |
| | | 4Q | 1,53 |
| | | 90 P | 1,59 |
| Contract length Ratio | **20/10** | 1Q | 1,86 |
| Average Ratio | *1,94* | *Mean* | *1,93* |
| | | 4Q | 2,00 |
| | | 90 P | 2,08 |
| Contract length Ratio | **25/10** | 1Q | 2,24 |
| Average Ratio | *2,36* | *Mean* | *2,35* |
| | | 4Q | 2,48 |
| | | 90 P | |

| TEKNA | | Cohort | Average |
|---|---|---|---|
| Contract length Ratio | **15/10** | 1Q | 1,46 |
| Average Ratio | *1,47* | *Mean* | *1,47* |
| | | 4Q | 1,48 |
| | | 90 P | 1,48 |
| Contract length Ratio | **20/10** | 1Q | 1,82 |
| Average Ratio | *1,85* | *Mean* | *1,84* |
| | | 4Q | 1,86 |
| | | 90 P | 1,88 |
| Contract length Ratio | **25/10** | 1Q | 2,15 |
| Average Ratio | *2,20* | *Mean* | *2,19* |
| | | 4Q | 2,21 |
| | | 90 P | 2,25 |

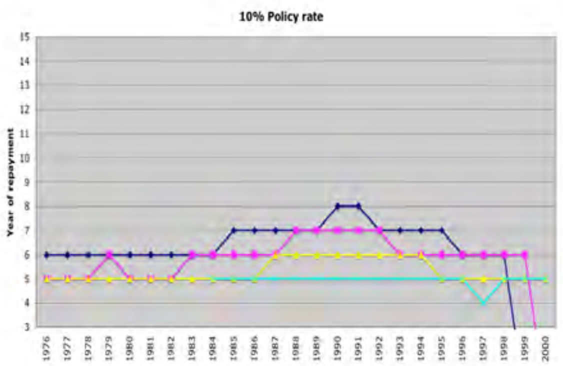
| TEKNA-G | | Cohort | Average |
|---|---|---|---|
| Contract length Ratio | **15/10** | 1Q | 1,39 |
| Average Ratio | *1,40* | *Mean* | *1,40* |
| | | 4Q | 1,40 |
| | | 90 P | 1,41 |
| Contract length Ratio | **20/10** | 1Q | 1,69 |
| Average Ratio | *1,70* | *Mean* | *1,70* |
| | | 4Q | 1,70 |
| | | 90 P | 1,71 |
| Contract length Ratio | **25/10** | 1Q | 1,98 |
| Average Ratio | *2,00* | *Mean* | *2,00* |
| | | 4Q | 2,02 |
| | | 90 P | 2,01 |

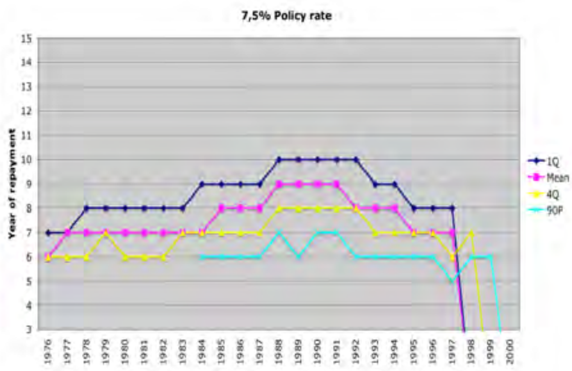
As mentioned earlier looking at the graph of the different contract lengths had a distinctly similar pattern, with the only difference being the available data and the level of the contract rate. This is also quite clear in this table were the differences between the cohort for each ratio is rather small. We can clearly see from the table above the ratios between the different contract lengths are fairly close to the average ratio between the contract rates. It seems reasonable that the ratio drops as the contract length increases as there is more interest incurred for longer contracts, but this negative effect seems rater small for most of these ratios. The ratios are worse for longer TEKNA contracts and particularly the government data. This could imply that the stronger income growth results in a more linear ratio, the only differentiating factor in these ratios[100].

[100] Starting income and initial debt are cancel out and the interest rate is the same for all three data sets.

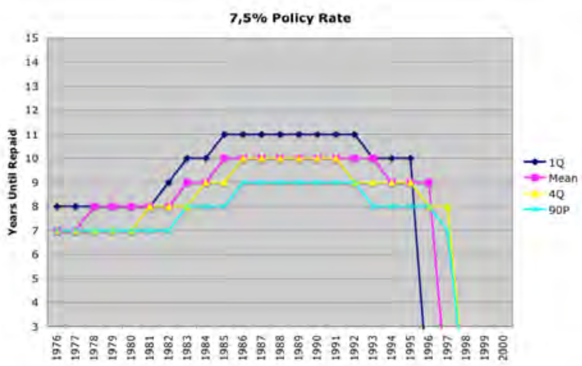
# 5.4 Analysis of Policy Rate and Year of Repayment

NSF

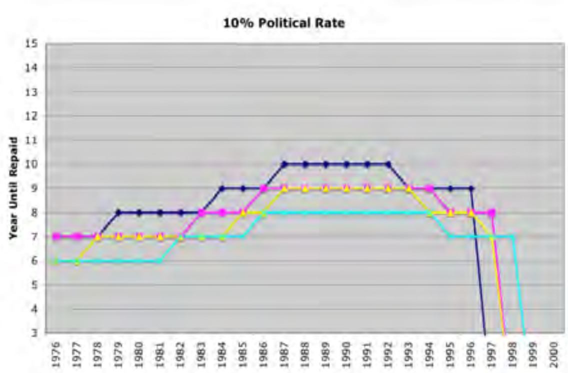


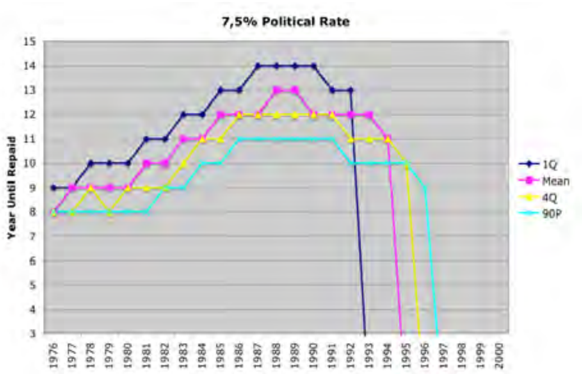




TEKNA


TEKNA-G



The purpose of this analysis is to see how long different an Income Contingent Loans would run for each cohort at different policy rates. I have, as with the CCR analysis, chosen to use a perfectly inflation adjusted loan instead of the actual loan data because the purpose of this analysis is to find the affect the rate has on the historic income and interest data and a inflation adjusted loan will provide a more comparable result.

I have run the data for a 10 %, 7,5 %, 5 % and 2,5 % policy rates. The results, like expected, where fairly similar in shape and only the 10 % and 7,5 % gave a reasonable number of observations. I therefore will only present those here[101].

### 5.4.1 Sivøkonomene (NSF)

The shape of the trend curve is very similar to that of the CCR in section 5.2, and we can also see that the spread of the cohorts is rater small for the period. The two quartiles seem to stay within a year's distances of the mean, and the 90th percentile. Repayment time also seems to be more consistent over time for the 10 percent rate compared to the 7,5 percent rate. This is however expected since a higher rate also entails larger principal payments earlier and thus makes variations in the interest rate play a smaller role in the repayment time.

### 5.4.2 TEKNA (private sector)

The TEKNA data has the largest number of respondents of the data sets, and therefore could be assumed more reliable. This may be one of the reasons that the cohorts do not deviate more than 1 year for each class. We again see the pattern emerging and there is slightly more deviation for a 7,5 percent rate compared to a 10 % rate. It also seem that the ratios are fairly consistent as for the CCR discuss earlier.

### 5.4.3 TEKNA-G (public sector)

It is obvious that the policy rates seem to affect the repayment time more for the public employees. The trend is steeper and there are fewer of the classes that have been able to repay their debts.

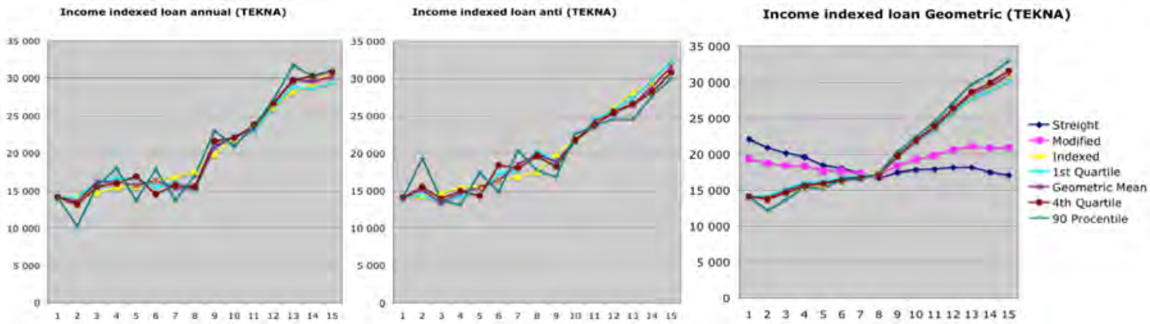
---

[101] Can be made available for anyone interested.

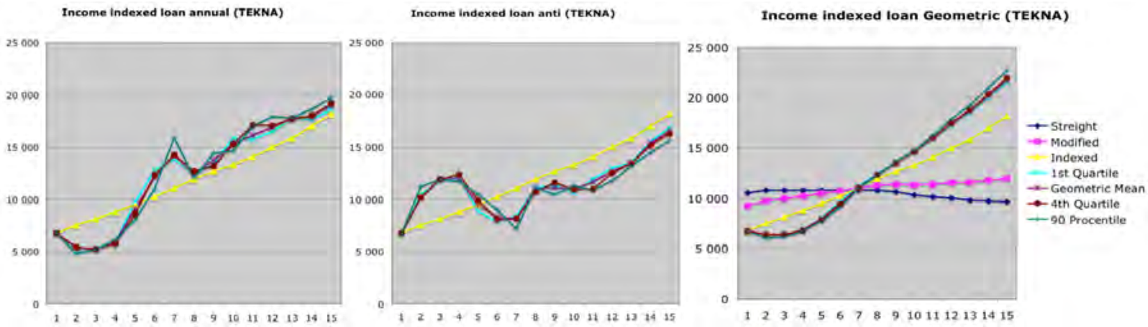
# 5.5 Analysis of Indexed Contract Rates

## 5.5.1 TEKNA

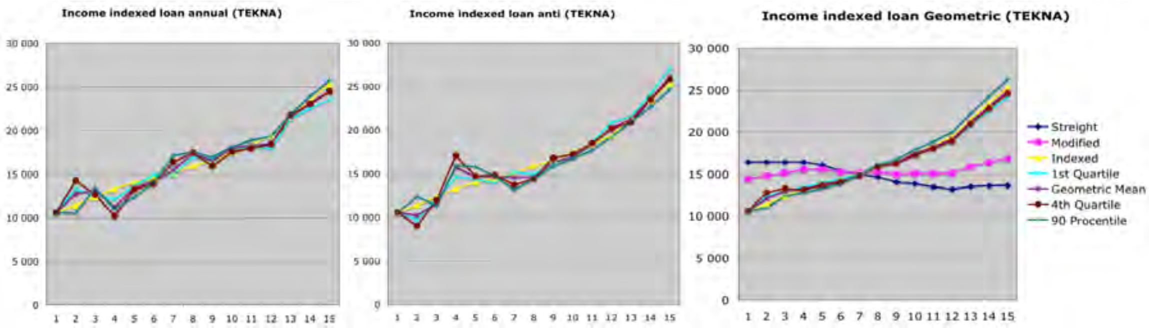
**1978**



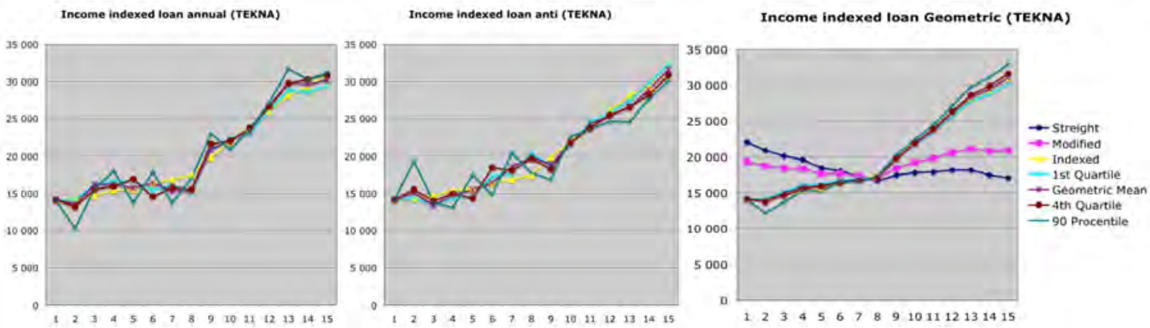

**1982**




**1986**




**1990**



These curves show the 1978, 1982, 1986 and 1990 payments schedules of the TEKNA data set. The payment curve to the left shows the payments made by the four cohorts if the previous periods income growth is used as a base for growth in the simple model. Hence the payments are rebalanced every period with regards to the interest rate and the growth in income. For these curves all four cohort used an 8 percent income growth for the first year. The growth in beginning wages could have been used, but that could result in very an unattractive initial payment, or at least payment very close to the regular annuities. With better data a geometric mean of the historic growth rate could have been used.

The curve named indexed is a modified annuity with 8 percent growth, which I showed earlier to be the expected income growth for this group. The middle curve subtracts the difference between the actual growth and the 8 percent expectation; meaning if you had an income growth of 10 percent one year your growth factor would be set to 6 percent, giving a higher amount to repay that year.

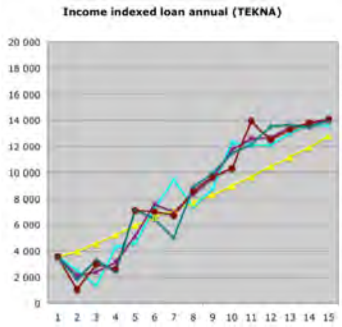
The right curve uses a geometric mean of the income growth rates from graduation until the payment is made. We see clearly that this is almost perfectly correlated with the index, with a marginal exception of the class of 1982. The class of 1982 came into the job market during a period of high inflation, which resulted in abnormal high-income growth in the beginning of their career, as we see from the annual index curve on the right that has a significant dip under the index during the first few years. The geometric mean is used as a method to smooth the growth factor; this way the effect of loosing a high paying job does not give the effect of both decreased income and a higher loan payment.

The curves on the right have the straight and modified annuities as reference. It is worth noting that the modified annuity, with a 2,5 percent growth, has a very small effect on the payment schedule. Its only effect is to give the borrower a flat repayment schedule in real terms, but not any significant financial relief.

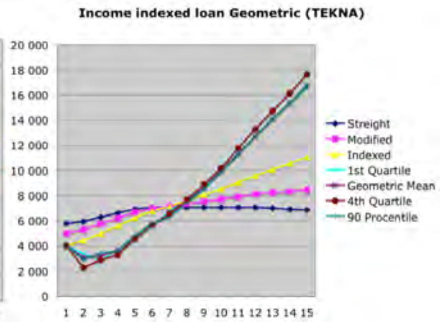
I will not analyze the Siviløkonmene data here, as they obviously would give similar results. However the geometric mean indexed schedule of that data set will be included on the comparison below.

## 5.5.2 TEKNA-G (Public Sector)

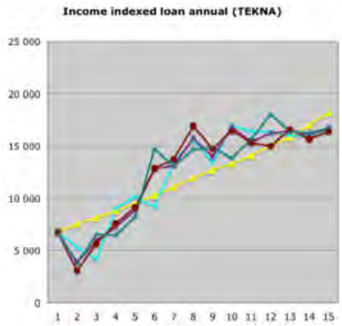
### 1978

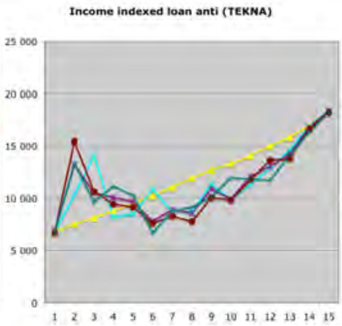


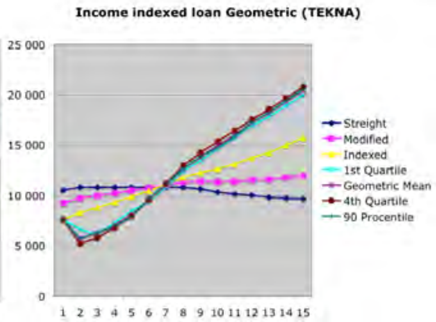





### 1982

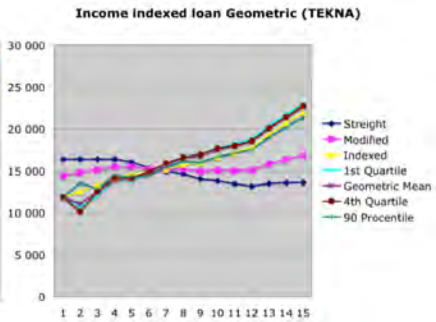


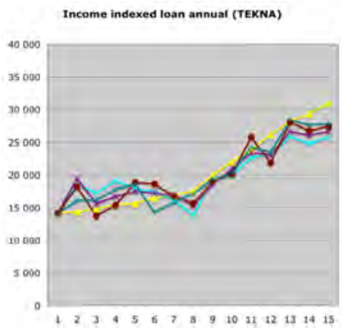



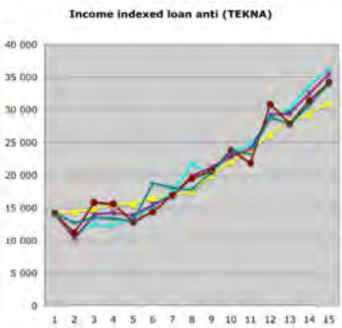

### 1986

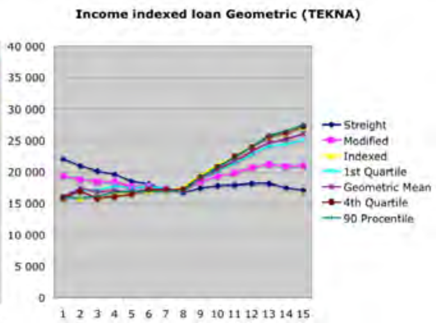





### 1990



These curves present as with the previous analysis. The indexed curve is a modified annuity with 6 percent growth. The left curve shows how rebalancing each period with regards to the annual income growth and the current interest rate affected the repayment schedule. The middle curve shows how subtracting the difference between the actual income growth and the indexed 6 percent schedule. The right curve shows the cohorts using a geometric mean of the income growth from graduation until the payment is made.

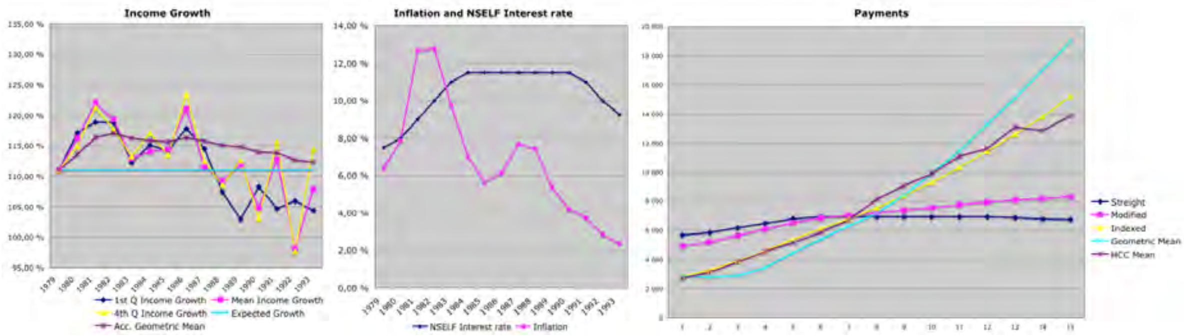
Again we see the geometric mean of each cohort is almost perfectly correlated for all classes of graduates. The two first classes have a rather significant deviation between the index and the geometric mean, but as we saw in the income analysis earlier the first period had higher volatility and therefore high growth then the average. The growth for the available data was at an average 6 percent for all classes and all data from 1985 and onwards.

The most promising result here is that the geometric averages seem to correlate with the each other and hence the geometric mean of period between graduation and the payment is made could possibly be a reasonable growth factor to use for each class. This also seems to give the effect we are looking for.

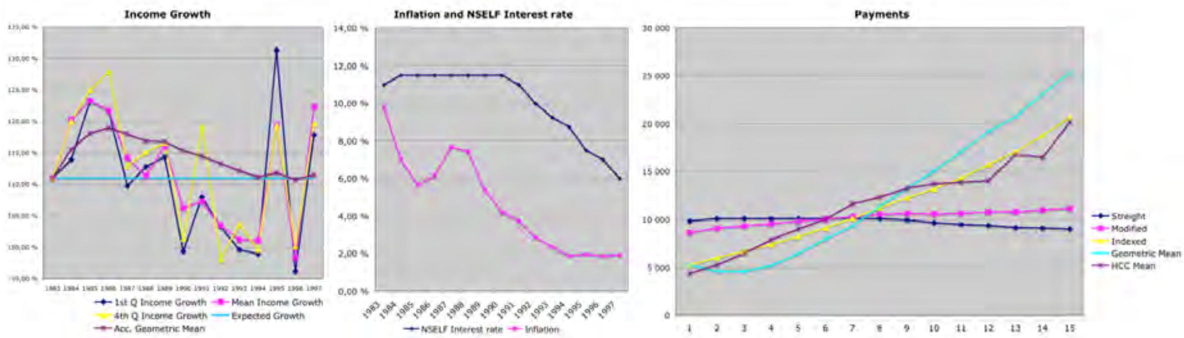
# 5.6 Comparing the different methods

## 5.6.1 NSF

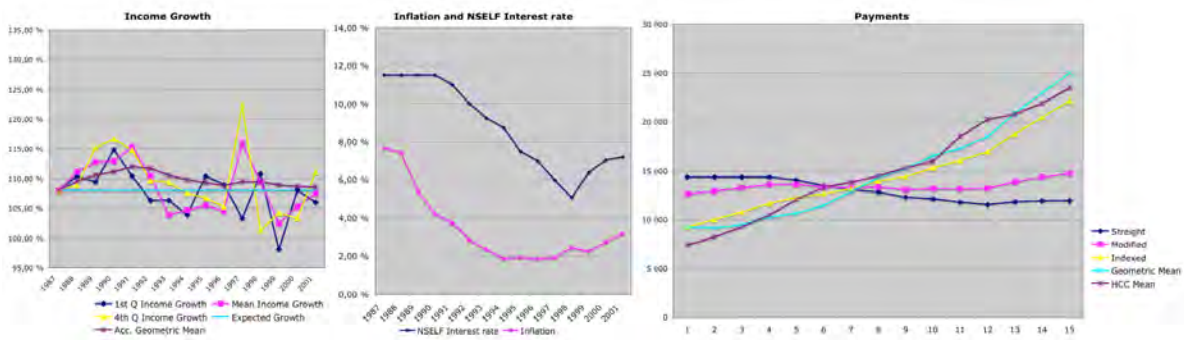
### 1978



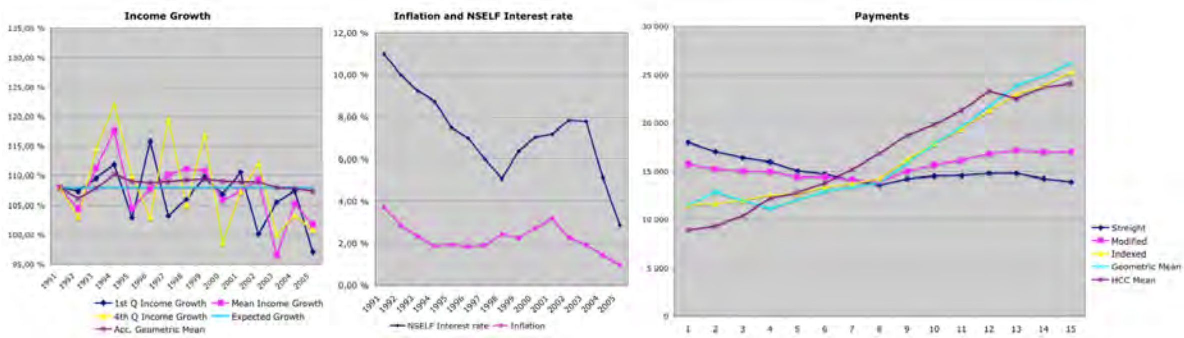

### 1982




### 1986




### 1990



The presentation on the left shows the income growth. Note that the notation is percentage of the previous year, so 100 percent growth is a zero growth. The middle curves shows NSELF interest rate and the inflation for each year. The last set of curves show the different payment schedules. These are presented in the "year of contract" as that is what we are comparing. The loans are perfectly inflation adjusted with the academic year 1975-1976 as the base year[102].

The immediate observation is that the income growth seems to be rather volatile. I should note that the expected rate for the four classes are different the classes of 1978 and 1982 I have used a 11 percent expected growth rate for the two first and 8 percent as we found for the last two. This is an adjustment is due to the fact that the income growth for business majors was higher in the first period as shown earlier and so this is closer to the likely expectation at the time these contract would have been signed.

Another interesting observation is that the Human Capital Contract at the Correct Contract Rate seem to correlate rather closely with the geometric mean index adjusted schedule. It is not perfect match but close enough to conclude that this could be an interesting method to test on individual historic data[103] in an econometric study.

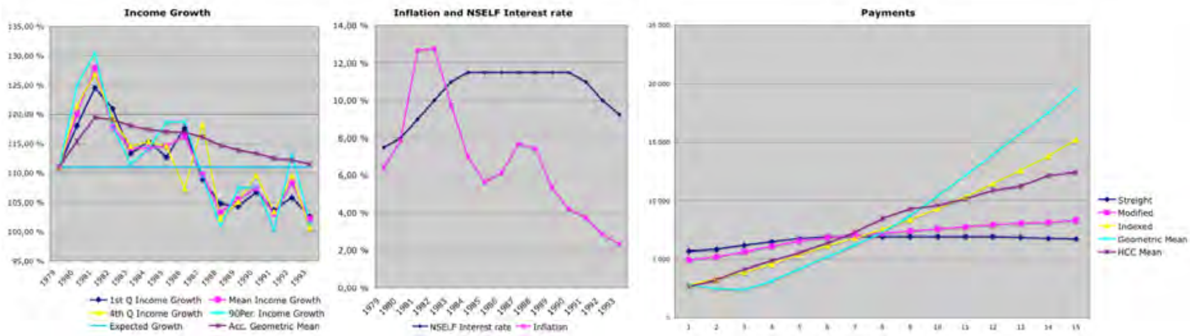
It is also worth noting that sudden changes in the interest rate kinks every payment schedule except the HCC, which smoothes the interest over the running period.

[102] The first year which had no differentiation in the support given.

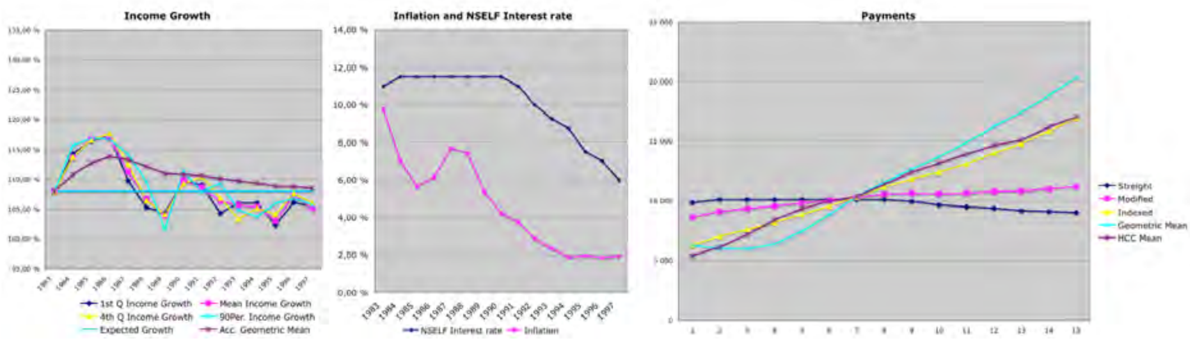
[103] There exists data on good individual data on the Norwegian workforce from 1967 until present, but these require especial permit to use in research that I do not currently have obtained.

## 5.6.2 TEKNA

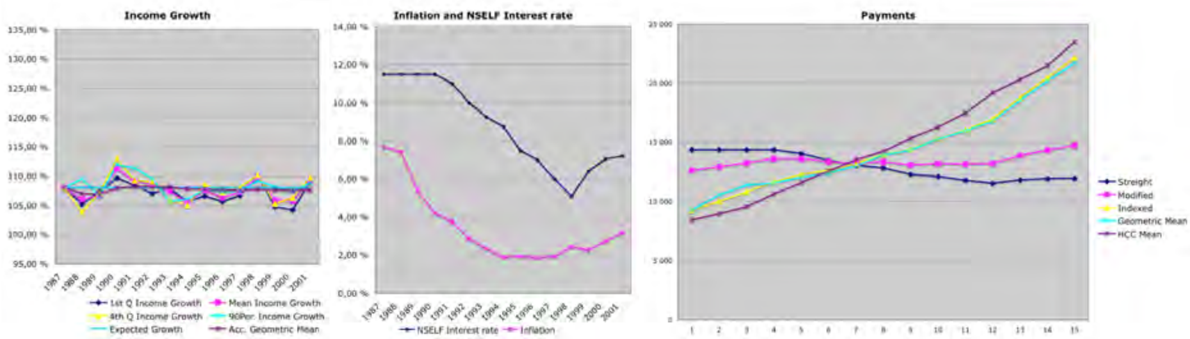
**1978**



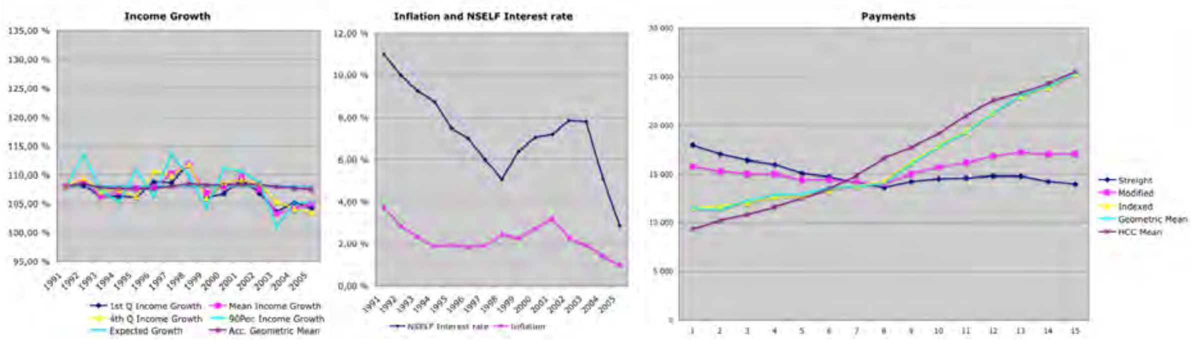

**1982**




**1986**




**1990**



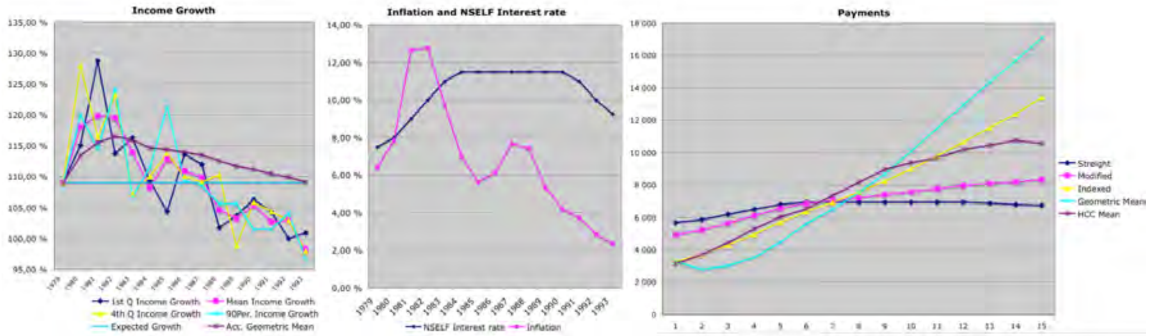
The two most obvious observations are that for the two first classes, 1978 and 1982, the geometric mean rises sharply above trend at the beginning of the career and slowly descends back to the trend. The other two classes stay on trend with fairly moderate volatility. Which is positive since this results in the Income-Linked Loans being almost perfectly correlated[104] with the geometric index. The first effect where the graduate have steeper income growth in the beginning of their careers, declining over time seem to make the index follow the Human Capital Contract at a Correct Contract Rate; while the accumulated geometric mean will over value the growth and therefore give a larger discount on the payments that received with the Human Capital Contract or index. The effect seems to be the opposite for stable income growth, but the difference seems to be marginal. This would imply that the accumulated geometric mean method actually results in a fairly equivalent result, at least on the average.

The movement of the rate of inflation has a fairly similar pattern to the income. Norway has currently a monetary policy where the central bank independently governs the interest rate by an inflation target rule of 2,5 percent. It is therefore reasonable to expect stable inflation in the known future.

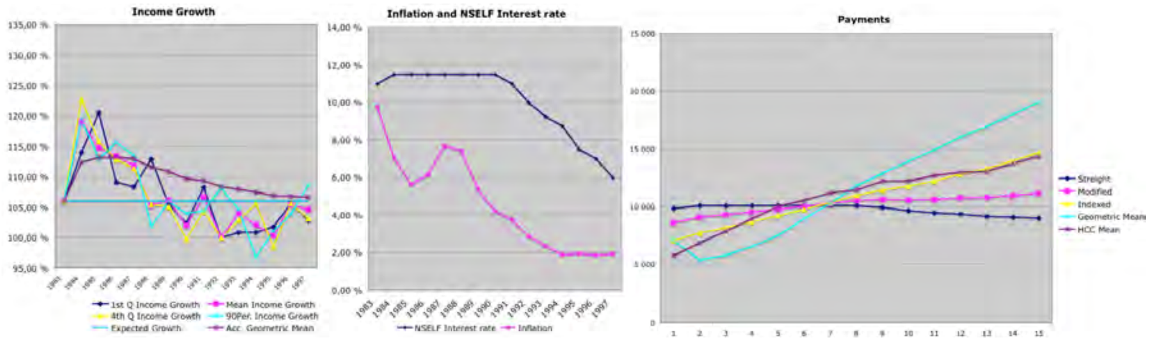
[104] Note that the correct expected geometric mean for the class of 1978 is the last observation of the accumulated geometric mean, which is approximately, 11 percent; almost 5 percent higher than the expectation used for the other indexes.

## 5.6.3 TEKNA-G

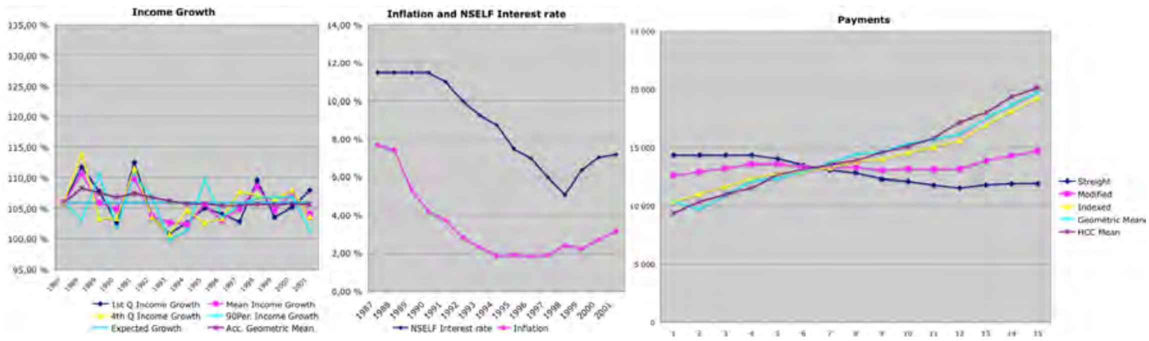
**1978**



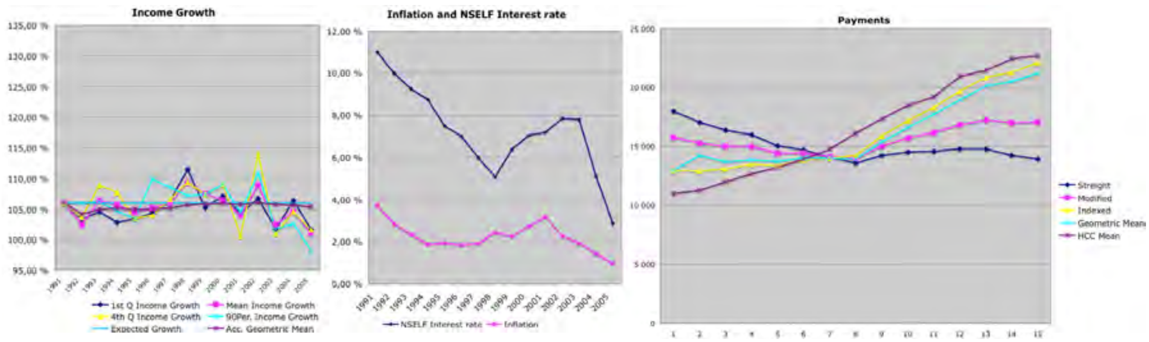

**1982**




**1986**




**1990**



The result for the public sector is very much similar to that of the private sector. These schedules are based on a 6 percent expected income growth[105]. Income growth seems to follow income growth closely. Similarly sudden and large changes in the interest rates seem to create bends in the index and accumulated geometric mean schedules. The Human Capital Contract schedule seems to be less responsive to these changes, and is therefore more attractive for the class of 1990. That said the Correct Contract Rate used for the class of 1990 is based on perfect information.

[105] For the class of 1972 I have use an expected rate of 9 percent. This is the historic rate for the period. We saw earlier the first period had high-income growth. For instance the geometric mean of the income growth for the class of 1973 in 1978 was 13,6 percent in the public sector.

# 6. Conclusions

In this thesis I have tried to show the effects an income-linked repayment scheme would have relative to a mortgage type loan in the case of Norway. The main focus has been on how student loans historically would have turned out for those with student loans provide by the Norwegian State Education Loan Fund (NSELF) from 1972 until present.

The arguments presented in this thesis for the use of such a repayment scheme can be summed up as follows. The current financial aid scheme has a repayment scheme that leaves graduates with a higher repayment load relative to income early in their career when money is tight, only to become a marginal fraction of their income towards the end of the repayment period. For those who end up in high-income careers this is no problem. Those on the other hand who choose or ending up in less lucrative careers will with the current system in effect choose to disadvantage themselves relative to just start working straight out of high school. The type of repayment scheme discuss in this thesis would provide those graduates better liquidity in the start of their career, and thus alleviate some of this disadvantage. Essentially providing them a way to smoothen their consumption.

The main reason for providing financial aid to students in Norway has been to give all citizens the same access to a higher education. Ever since NSELF was established in 1947 the policy has been to provide children of less well-off families the same opportunities as those from a high-income family. There is evidence that there still is reluctance among children from low social backgrounds to obtain a higher degree and those children from well-off families actually seem to benefit the most from the current system. A system where the loan payments are more frequent and therefore have less impact would certainly provide a reasonable compensation to those choosing to pursue a higher education.

I have through this text tried to give reasonable survey of income-linked repayment schemes, the current theory and historic experience. My analysis focuses on what the outcome of such a scheme would have on the students who in the past chosen to use NSELF's service. That said this is not to say that they would have accepted this contract as such.

## 6.1 Evidence from the analysis

In analyzing the dynamics of ILL contracts a few important properties needs to be mentioned here. (1) The marginal CCR rate decreases with the size of a loan, implying that it would favor a long degree programs as each additional year would be less expensive to add to the contract. (2) With a static interest rate and income growth over the repayment period a long period will substantially increase the implied principal, implying that a shorter contract length is preferable to for instance an average productive life approach[106]. (3) In a static scenario (as above in the previous point) the Income-Linked Loan contract would result in payments on the Income-Linked Loan contract to be less than annuity payments for approximately half of the contracts length. This would therefore give a substantial financial relief to low-income earners in the start of their career.

The analysis of the historic data mainly showed the same relationship in two different forms in these data.

First the Correct Contract Rate[107] (CCR) for the different cohorts of a class of graduates would only differ about 1 percent from the mean to the quartiles, and only slightly more for the 90 percentile[108].

Second the Actual Years Until Repaid (AYUR) under the CCR for the mean of a class would also only deviate between one or two years. As expected the CCR for the public sector was higher than for those in the private sector. For the data in question a 10 year contract yielded a historically CCR for the private sector of about 5-6 percent while the corresponding rate for the public sector was about 7-8 percent. This could indicate that a differentiation between public and private employees might be warranted.

The contract rates also seem to convey information related to the value of a certain degree. Depending on the information lag this could be an attractive feature with regards to

---

[106] I found for the expected long-term rates (approx. 8 percent) in my analysis that a 15 year contract would add virtually no principal, while a 30 year contract would add about 67 percent on the initial principal. This would result in the repayment of the principal about 20 years into the contract.

[107] The ILL rate at which an ILL contract would be repaid in exactly the repayment period specified.

[108] The business graduate had a slightly larger difference for those classes with the highest rates.

information to applicants of degree programs, as well as the labor market in terms of salary negotiations.

I demonstrated that using the geometric mean of the income growth of a class of graduates career would be a pragmatic way to index the contract rate. This would yield a good approximation for a particular cohort. This would hence be fairly accurate way to estimate a dynamic indexed contract rate

## 6.2 Past experience of Income-Linked schemes

The first conclusion that we can draw from earlier experiments and implemented schemes is that success seem to be very much related to how these schemes have been structured. At first the idea of financing your higher education through a percentage of your future income seems like an intriguing solution. This solves the risks of those from low-income families, as they do not risk to accumulate a debt the may be unable to repay. At the same time investors reduce their risks, as there is also a potential reward to these contracts if the graduate does well in his career.

The first case I presented was the Yale Tuition Postponement Option. This was a program where the student where grouped to gather and repaid in the form of an income contingent loan according to a percentage of their wage until their group had repaid there total debt. The maximum repayment period was set to 35 years, which was the estimated average length of productive life of the students upon graduation. The main lessons where that (1) the timeframe created a feeling of "perpetual obligation", (2) a lack of understanding of the time value of money resulted in the graduate feeling that the repaid many times what they owed, (3) the redistributive effect of the scheme resulted in punishing those faithful to the program and therefore promoted default, (4) Yale as an academic institution lacked the proper expertise to collect such a loan. Those four lessons where ultimately the source of the experiments critic, and the reason the experiment is not considered a success.

The second case presented was the Australian Higher-Education Contribution Scheme (HECS). This was a result of an increasing demand for higher education, and a public view that higher education should not be fully state financed combined with a tight public budget. This scheme reintroduced tuition on higher education, but with a repayment scheme that took the form of an Income Contingent Loan (ICL). The repayment schedule was progressive so that low-income earners paid less than high-income earners. This feature ensured that those with most success repaid faster then those with low-incomes, and provided a subsidy to those with less success, as there is no real interest on the principal of the loan. Repayment is made through the Australian Tax System. In addition a discount was offered to those that choose to pay their tuition without the use to a loan. The program was implemented in 1989 and is still in use today, and is considered a success.

The third case presented was Sweden's ICL scheme that was in place from 1989 until 2001. Being fairly similar to Norway is an interesting case to study with regards implementing the same type of system in Norway. The loan was to be repaid at a flat rate of 4 percent of the graduate's income and the principal was to be set annually by the Swedish government. No tax benefits applied, as the interest on the principal was tax adjusted. The scheme was terminated in due to the fact that the scheme gave the students no incentives to finish their education on time. As with the Yale TPO their seemed to be a notion of "perpetual repayment", and with no differentiation in repayment relative to the amount borrowed it is easy to see why many students took a "prolonged vacation". Students seemed uncritical to the amount of debt they accumulated and the critics argued that many would be unable to repay the large debts.

Other schemes worth mentioning because of their features are Chile, Ghana and The Robertson Education Empowerment Foundation. Chile's ICL scheme, which has dual repayment period in which the repayment stops either after 12 or 15 years depending on the amount repaid by an individual. Chile also experimented with securitization to this was unsuccessful as student disliked "being sold". Ghana chose different approach with regards to the collection and repayment scheme. Instead of collecting through either a designated agency the payments the payment were made through the social security premium. Most graduate accumulate the maximum retirement benefits before retirement age, and Ghana therefore let loan repayment take precedence over the accumulation of pension rights. Finally I want to mention the Robertson Education Empowerment Foundation scheme. This is a fairly new scheme but one of the features of this scheme is worth giving some attention. REEF has a condition that student must maintain a 3.0 GPA. This is a feature that has not been included in any of the previous scheme, and should be considered in conjunction with the Norwegian policy of including incentives into the financial aid scheme.

## 6.3 Which properties seem appropriate to use?

It seems quite obvious that many of the above mentioned features should be included in a Norwegian adoption in accordance with the NSELF tradition.

First it seems that the most effective way to collect income-linked loans is through income tax services. This seems to have been implemented into all of the successful systems. It also makes sense as since payments can be with every paycheck and reviewed through the annual tax returns and adjusted accordingly.

Secondly it seems important that the loan payments are not perceived as "perpetual". The two method described there are either by the Australian method of a progressive ICL schedule on the rates, or alternatively by limiting the payment period as with the Chilean system. As we saw in the projection analysis there is a financial argument for not using productive life as the repayment period. A reasonable adaptation of these to feature would be to estimate the rate that would approximately have the candidate repay the debt in 20 years, but let the loan run for as long as the graduate has income. This would give no incentives to wait with repayment, but at the same time crate the limited period feature. The progressive feature of the payments could be handle through the previously suggested tax deduction, which would result in an effective advantage to those with lower incomes at the same rate.

Thirdly it seems reasonable to adopt a discount for students according their performance in school. These types of incentives are currently incorporated (lightly) in the current NSELF scheme by writing off debt when students pass their exams. With an ILL scheme this could be implemented through a discount for those who performed. Say a student passes an exam he gets a discount in accordance with his grade, as it is reasonable to believe that student who perform well in school also perform well in their career. This would also match the "screening hypothesis"[109]. It would also make sense because those who perform in school are more likely to get more highly paid jobs and therefore would need to pay a smaller fraction of their income as the Correct Contract Rate.

[109] The screening hypothesis claims that education is a way for student to show their abilities and differentiate themselves to future employers. See Barr (1989, 4)

With regards to the choice of Income-Linked Loan contract I would imagine that a transition from a mortgage type loan to a Human Capital Contract would seem too extreme a case for Norway. Also I would imagine that there would be a concern that this would make the contract unattractive to the best students. The benefit of the Income Contingent Loan contract is that it does not require anyone to provide Human Capital Option in order to give students protection against substantially overpaying on their contracts. An ICL contract would also provide graduate the opportunity to repay more than what is required if they wanted to reduced interest cost[110]. Graduate moving from Norway, and hence are not included in Norwegian tax systems, would be easier to handle in an ICL system as these could be converted to annuities while abroad.

## 6.4 Final remarks

One the purpose of this thesis was to explore an opportunity; an idea that in it self is intriguing to those exposed to it. I read *The new financial order* (Shiller, 2003) the first summer of my studies at the Norwegian School of Economics and this is how I stumbled across the idea of Income-Linked Loans. The idea of a student of loan financed as a function of their future income seemed intuitively reasonable. Shiller outlined some technical issues that would be a hindrance for such loans. Among these was the ability to check a graduate income and the fact that you would be likely have the problem of adverse selection due to student using different sources to finance their education. Both of these problems are in a way already resolved in Norway. Three out of four students use the Norwegian State Education Loan Fund (though this could change with a changing policy) and our tax system is highly digitized. With these premises I think it is clear that a review not of the institution of student loan, but the way these are repaid is warranted. Norway has the ability to use a more sophisticated repayment system, and in conjunction with the trend of encouraging student to be innovative I would like to throw the ball back to the policymakers and advise them to be more innovative in the way student loan repayments are made.

[110] Although if NSELF continued to offer the marked rate with a small margin as they do to day this would not really yield much savings due to the time value of money. Essentially the student would only save the difference between the rate of return he could yield on other risk free investments (or his bank account) and the interest on the principal of his student loan.

## 6.5 Questions for future research

- A more thorough estimation on an individual level of the studies I have conducted here could give more general insights. This should include tests of the Mincerian Human Capital Functions ability to predict the future income of candidates in the historic material available.

- Checking the use of Black-Scholes pricing of Human Capital Options against historic income data in Norway. Would such a contract be attractive to private investors?

- Investigate the income distribution with in different education levels. This would give a clearer picture of the advantage and expectation of income for different degree levels. And the variance at the different level.

- Research incentives for “blue-collar” children to obtain a higher degree. Essentially investigating whom the “even bigger fool” is in the question of obtaining an (higher) education. This is essentially a more detailed investigation of income distributions. If income distributions where categorized by education (type of degree, level, trade) and done for both different higher degrees as well as high school diplomas leading to certificate of completed apprenticeship (for different trades and applications for such trades) this might render which education paths render the best opportunities for a high income irrespective of level. Essentially, which career would give the greater upside with regards to talent?

- A study of how fresh students would respond to Income-Linked Loan would also make an interesting study.

- A study of the effect of introducing tuition as was done in Australia and alternative way to create good incentive scheme for better (higher) education choice would be interesting.

# Appendix A – Derivation of the Correct Contract Rate

If we have for $t \geq 0$ that $D_t$ is remaining debt at time t and $D_{t+1}$ is remaining debt at time t+1, r is the interest rate, $y_t$ is the income at time t, $\gamma$ is the income growth rate and $f$ is the Correct Contract Rate of the income-linked loan. The next periods remaining debt at the beginning of the next period ($D_{t+1}$) will be the interest incurred for period t minus the income-linked interest fraction of the income for period t. That is the income times the CCR ($f$). We would then have that

(0) $$D_{t+1} = D_t(1+r) - y_0 \cdot f(1+\gamma)^t \cdot$$

Let R = (1 + r) and Y = (1 + $\gamma$). This would give us for t = 0 that

(1) $$\begin{aligned} D_1 &= D_0 R - y_0 \cdot f \cdot Y^0 \\ &= D_0 R - y_0 \cdot f \end{aligned}$$

This means that the remaining debt at the end of year one is the initial debt plus incurred interest minus the income-linked interest from the income of the first period. That would mean that if we wanted to payback the loan over a single period (highly unlikely because it would in essence be a traditional loan), would give us that the CCR is the initial fraction of the

(2) $$\begin{aligned} 0 &= D_0 R - y_0 \cdot f \\ f &= \frac{D_0 R}{y_0} \end{aligned}$$

Now let us continue the loan for another period. At the end of period two we would then by substituting $D_1$ from the previous (1) get

(2) $$\begin{aligned} D_2 &= D_1 R - y_0 \cdot f \cdot Y \\ &= \left[D_0 R - y_0 \cdot f\right] \cdot R - y_0 \cdot f \cdot Y \\ &= D_0 R^2 - y_0 \cdot f\left[R + Y\right] \end{aligned}$$

Moving on to the third, fourth and fifth year we get:

(3)
$$\begin{aligned} D_3 &= D_2 R - y_0 Y^2 \cdot f \\ &= \left[D_0 R^2 - y_0 \cdot f \left[R + Y\right]\right] R - y_0 \cdot f \cdot Y^2 \\ &= D_0 R^3 - y_0 \cdot f \cdot \left[R^2 + R \cdot Y + Y^2\right] \end{aligned}$$

(4)
$$\begin{aligned} D_4 &= D_3 \cdot R - y_0 \cdot f \cdot Y^3 \\ &= \left[D_0 R^3 - y_0 \cdot f \cdot \left[R^2 + R \cdot Y + Y^2\right]\right] R - y_0 \cdot f \cdot Y^3 \\ &= D_0 R^4 - y_0 \cdot f \cdot \left[R^3 + R^2 \cdot Y + R \cdot Y^2 + Y^3\right] \end{aligned}$$

If we now use the t for time notation on equation (4) and set t = 3 we get that

(5)
$$D_{t+1} = D_0 \cdot R^{t+1} - y_0 \cdot f \cdot \left[R^t \cdot Y^{t-3} + R^{t-1} \cdot Y^{t-2} + R^{t-2} \cdot Y^{t-1} + R^{t-3} \cdot Y^t\right]$$

We now see a pattern emerging in the bracket that we can generalize to

(6)
$$D_{t+1} = D_0 \cdot R^{t+1} - y_0 \cdot f \cdot \sum_{i=0}^{t} Y^i \cdot R^{t-i}$$

Since the point of any loan (hopefully) is to repay it, we know that $D_{t+1} = 0$ for any t, where t+1 would be the length of the contract. We would then find *f* as follows

(7)
$$\begin{aligned} D_{t+1} &= 0 = D_0 \cdot R^{t+1} - y_0 \cdot f \cdot \sum_{i=0}^{t} Y^i \cdot R^{t-i} \\ D_0 \cdot R^{t+1} &= y_0 \cdot f \cdot \sum_{i=0}^{t} Y^i \cdot R^{t-i} \\ D_0 &= y_0 \cdot f \cdot \sum_{i=0}^{t} Y^i \cdot R^{-(i+1)} \\ f &= \frac{D_0}{y_0 \sum_{i=0}^{t} \frac{Y^i}{R^{i+1}}} \end{aligned}$$

Finally we should adjust the equation so that the T = t + 1 denotes the contract length since this would be more intuitive. Substituting t = T – 1 and generalizing through know mathematical analysis we get that

(8) $$f = \frac{D_0}{y_0 \sum_{i=0}^{T-1} \frac{(1+\gamma)^i}{(1+r)^{i+1}}} = \frac{D_0}{\frac{y_0}{r-\gamma}\left[1-\left(\frac{1+\gamma}{1+r}\right)^T\right]}$$

Now this is of course a stylized model. It is highly unlikely that we have a flat interest rate as well as a flat income growth rate over a long period of time, and these factors must therefore be investigated in the data used for the estimation of CCR. The CCR can be interpreted as being the percentage the initial debt makes out of the present net present value of future income in the contract period (not surprisingly). Notice also that if we set T = 1 (the shortest allowable contract length) we get that you will have to pay percentage the debt (with one year interest) of your first year income. Generalizing the model so that t is the initial time of the contract and T still denotes the number of periods for the contract. $D_{0,t}$ is the initial debt at time t. We get

(9) $$f_{t,T} = \frac{D_{0,t}}{\sum_{i=0}^{T-1} \frac{y_{t+i}}{\prod_{j=1}^{i+1}(1+r_{t+j})}}$$

# References

Akerlof, George (1970): "The Market for Lemons: Quality Uncertianty and the Market Mechanism", *Quarterly Journal of Economics*, 84 (3), 488-500

Barr, Nicholas (1989): *Student Loans: The Next Steps*. Aberdeen University Press, Aberdeen.

Barr, Nicholas (2001): *The Welfare State as a Piggy Bank: Information, Risk, Uncertainty, and the Role of the State*. Oxford University Press, Oxford.

Becker, Gary S. (1993): *Human Capital*. 3rd ed. The University of Chicago Press, Chicago.

Black, Fisher and Myron Scholes (1973): "The Pricing of Options and Corporate Liabilities", *Journal of Political Economy*, 81(3), 637-654

Brealey, Richard A. and Stewart C. Myers (2006): *Principles of Corporate Finance*. 8th ed. McGraw-Hill/Irwin, Boston, Mass.

Chapman, Bruce (1997): Conceptual Issues and the Australian Experience with Income Contigent Charges for Higher Education". *Economic Journal*, 107 (442), 738-752

Edwards, Meredith (2001) with Cosmo Howard and Robin Miller (2001): *Social Policy, Public Policy: From Problem to Practice*. Allen & Unwin.

Fekjær, Silje Noack (2000): Rike barn låner mest? *Samfunnsspeilet nr. 6/2000 14. Årgang*, Statistics Norway (http://www.ssb.no/samfunnspeilet/)

Friedman, Milton (1962): *Capitalism and Freedom*. The Univerisity of Chicago Press, Chicago.

Hægeland, Torbjørn and Jarle Møen (2000): "Betydningen av høyere utdanning og akademisk forskning for økonomisk vekst: En oversikt over teori og empiri”. *Rapport 10/2000*, Statistics Norway, Oslo.

Johnstone, D. Bruce (1972): *New patterns for College Lending: Income Contingent Loans*. Columbia University Press, New York.

Macho-Stadler, I. og D. Perez-Castrillo (2001): *An introduction to the economics of information*. 2nd ed. Oxford University Press, Oxford.

Markowitz, Harry (1952): "Portfolio Selection", *Journal of Finance*, 7 (1),77-91

Mas-Colell, Andreu, Michael D. Whinston and Jerry R. Green (1995): *Microeconomic Theory*. Oxford University Press, Oxford.

Mincer, Jacob (1974): *Schooling, Experience, and Earnings*. National Bureau of Economic Research/Columbia University Press, New York.

Moen, Espen R. og Lone Semmingsen (1996): “Utdanning og livsløpsinntekt”, *SNF-rapport 96/96*, Stiftelsen for samfunns- og næringslivsforskning, Oslo.

NSELF (2005): *Årsrapport 2005*. (http://www.lanekassen.no/upload/Arsrapport/2005/Årsmelding_2005.pdf)

OECD (2005): *Education at a Glance: OECD Indicators 2005 Edition*, OECD, Paris.

Palacios, Miguel (2004): *Investing in Human Capital.* Cambridge University Press, Cambridge.

Pindyck, Robert S. And Daniel L. Rubinfeld (2001): *Microeconmics*. 5th ed. Prentice-Hall, New Jersey

Riksdagen (2000): *Motion 1999/2000:Ub10* (http://www.riksdagen.se)

Røseth, Dyre (2003): *Effektivitet og fordeling: Lånekassen som utdanningspolitisk redskap 1947-2003*. Master Thesis in History, University of Oslo, Norway.

Shiller, Robert J. (2003): *The New Financial Order: Risk in the 21st Century*. Princeton University Press, Princton.

UN (2005): *Human Development Report 2005* (http://hdr.undp.org)

Wran (1988): Committee on Higher Education Financing, 1988. *Report of the Committee on Higher Education Finance* (Wran Report). Canberra, Australian Government Publishing Service.