The actual financing costs of English higher education student loans

Neil Shephard, Nuffield College, Oxford & Economics Department, University of Oxford

8/5/2013

Background

There has been extensive discussion of the workings of the English system of higher education income contingent student loans. Major focuses have been on what former students are likely to pay and when, distributional characteristics and how much the Government guarantees made to students about having their loans forgiven after 30 years are likely to cost the budget of the Department of Business, Innovations and Skills (BIS) in the longer term. Leading contributions to this work includes Barr(2004), Goodman et al (2008), BIS Ready Reckoner (2012) and Chowdry et al (2012).

Here we look at a vital but entirely unstudied area, the actual cost the Government faces in financing these loans through borrowing in the gilts market[1]. We use a financially conventional "liabilities matching" approach, just as we would if we were trying to match or value pension obligations. To do this we identify financial instruments which proxy the behaviour of the time series of former student expected repayments. This allows us to estimate each year the direct cost to the state of providing these student loans. The results are remarkably different from the conventional calculations used by H. M. Treasury to charge BIS in their Departmental account[2]. The reason for this is very simple to explain, it relies entirely on the next observation. Once that is accepted all of the other arguments are conventional economics and the conclusions follow immediately.

---

[1] This note follows a letter to the Financial Times by Dr Tim Leunig and Neil Shephard about this issue published on February 8, 2012. Dr Leunig is now a civil servant so has no responsibility for the content of this article.

[2] The argument I develop here is more subtle in terms of the UK's National Accounts. The national accounts do not typically hypothecate interest payments, so even if borrowing for a particular "investment" is carried out using a particular bond then the national accounts would not reflect this directly when itemising the "profit" or "loss" from that investment. Instead in the national accounts uses an interest rate which reflects the average borrowing costs across the government's debts. This is rather odd economically, but it follows a particular international accounting convention. Of course that does not mean that the government would not benefit from the funding in exactly the way I am discussing here, it is just that the benefits of doing this will be smeared across the national accounts and not directly or solely seen in the student loan part of the accounts.

Cash flows from student loans are indexed linked

Income contingent student loans have repayment obligations which are, in effect, index linked[3].

The reason for this is that repayments are a proportion of earnings above a threshold, the interest rate charged on balances ranges from 0% real to 3% real and (in the medium term at least) earnings rise with inflation. Further, the threshold is indexed by money wages (i.e. through time the threshold rises by inflation plus real wage growth). Hence future loan repayments by former students will vary in proportion to the price level.

The annual income contingent repayments by former students go to the Government over a nearly 35 year period. Hence the Government provides funding for the students and in return de facto the Government owns an index-linked asset. The risk the government has in holding this asset on its books is that real wage growth from former students will disappoint compared to what we have seen in the past.

This indexed linked characteristic of student loans is important economically[4], both in reducing the risk exposure of former students and the way the Government can efficiently manage its financial obligations. The latter point has been neglected in the literature. This has a very large impact on the cost of running the student loan scheme.

Estimates of the expected real repayments by former students

At this point it is helpful to record out best estimates of the expected real repayments by former students. These are calculated using the methodology detailed in Goodman et al (2008) and Chowdry et al (2012). Related methods are used in BIS Ready Reckoner (2012). I am extremely grateful to Haroon Chowdry for giving me these up to date figures using the best available information in April 2013. Of course he has no responsibilities for their use here.

The results are given in Table 1 and Figure 1. All numbers are given in 2012 prices. In particular they report the real value of the annual repayments made by former

[3] There is a small effect which is not index linked. This is that the threshold for repayment has been fixed in nominal terms to be £21k in 2016, after which it will be indexed by money wages. To allow for that fact (and the resulting fiscal drag), we apply to our modelling of earnings profiles the expected inflation and real earnings growth between now and 2016-17. This is taken from the projections in the Office of Budget Responsibilities "Economic and Fiscal Outlook". Beyond 2016-17, we revert to our long-run assumptions.

[4] Notice is reduces the risks of both former students and the government. The students are protected against the effects of deflation and the Government from excess inflation.

students from the 2012 cohort for different real earnings scenarios. These calculations assume: (i) that the borrowing by each 2012 student was £40,351 , (ii) the population of the 2012 cohort (enrolling in September 2012) is made up of 307,100 home-domiciled, full-time first year undergraduates at English universities, (iii) there are no voluntary repayments. These figures imply the aggregate borrowing is thus £12,391M. At no point is any discounting used, we simply record the expected real repayments.

The table and figure reports three scenarios for the growth of real earnings through time. The central earnings scenario follows the Office of Budget Responsibility in assuming a 2% real wage growth in the long run. This is also the assumption which underpins nearly all of the analysis published in this area and reflects the rates of growth in real earnings we have seen in the UK since world war two. We also include a pessimistic and optimistic scenario, which assumes real growth rates of 1.5% and 2.5%, respectively. This will allow us to assess some of the robustness of our conclusions later.

Real repayments **(**per student in 2012 prices**)**							
Year	**Central**	**Pessimistic**	**Optimistic**	**Year**	**Central**	**Pessimistic**	**Optimistic**
2016	**£186**	£168	£195	**2031**	**£1,772**	£1,576	£1,936
2017	**£342**	£306	£363	**2032**	**£1,693**	£1,515	£1,836
2018	**£504**	£450	£539	**2033**	**£1,606**	£1,442	£1,723
2019	**£691**	£616	£744	**2034**	**£1,514**	£1,375	£1,627
2020	**£887**	£789	£959	**2035**	**£1,419**	£1,294	£1,527
2021	**£1,073**	£952	£1,167	**2036**	**£1,365**	£1,239	£1,441
2022	**£1,252**	£1,106	£1,368	**2037**	**£1,281**	£1,170	£1,350
2023	**£1,419**	£1,248	£1,559	**2038**	**£1,217**	£1,116	£1,271
2024	**£1,563**	£1,370	£1,726	**2039**	**£1,148**	£1,063	£1,192
2025	**£1,693**	£1,478	£1,875	**2040**	**£1,095**	£1,011	£1,130
2026	**£1,784**	£1,556	£1,980	**2041**	**£1,028**	£961	£1,062
2027	**£1,854**	£1,621	£2,057	**2042**	**£974**	£909	£1,005
2028	**£1,876**	£1,637	£2,082	**2043**	**£920**	£860	£937
2029	**£1,872**	£1,645	£2,070	**2044**	**£843**	£794	£852
2030	**£1,822**	£1,607	£1,998	**2045**	**£767**	£725	£770
				Total	**£37,458**	£33,600	£40,342

Table 1. Our best estimates of the average real value of the annual repayments made by former students from the 2012 cohort for different real earnings scenarios. The real repayments are in terms of September 2012 prices. The income contingent loan is assumed to be £40,351. Central earnings scenario assumes 2% real wage growth in the long run; pessimistic and optimistic scenarios assume 1.5% and 2.5% respectively. The estimates are made using information available at the start of April 2013.

Table 1 shows that the pessimistic and optimistic scenarios are very slightly asymmetric about the central guideline, with more downside risk associated with lower real earnings growth than upside potential associated with higher real earnings growth. Over the entire term of the 35 year student loan contract the pessimistic scenario underdelivers repayments compared to the central scenario by £6,751 while the optimistic screnario underdelivers by £9. The central scenario delivers a real repayment of £37,458, which is £2,893 less than was lent to the students in the first place. But of course this comparison does not take into account the real financing costs the Government has for its debts. We will now turn to this core issue.

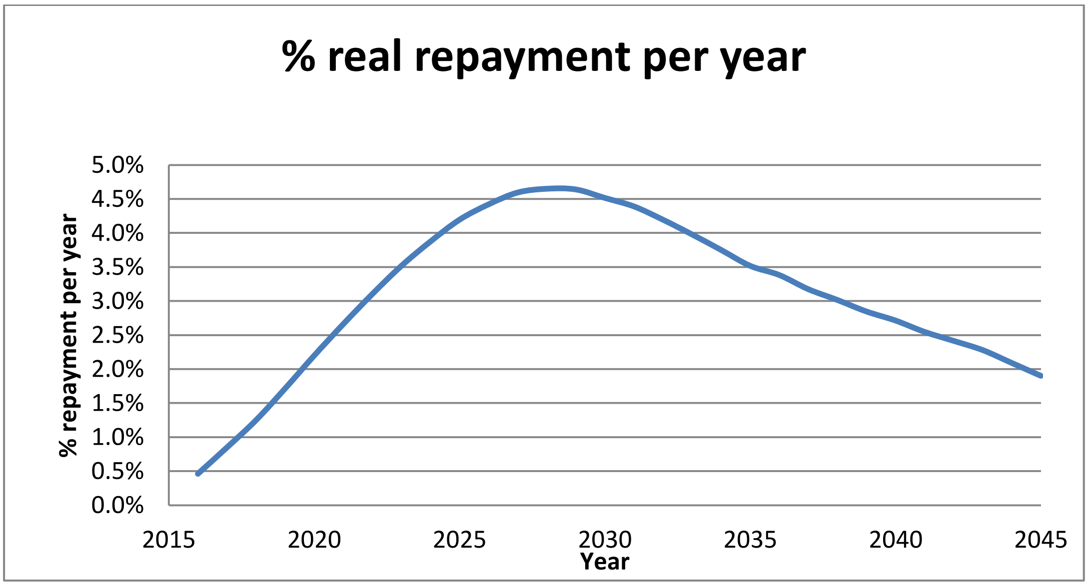

Figure 1. The real value of the annual repayments made by former students from the 2012 cohort for different real earnings scenarios expressed as a percentage of the original loan. Central earnings scenario assumes 2% real wage growth in the long run.

Liability matching

The Government's right to receive the real cash flow from student loans is a de facto index-linked asset. It is not a perfectly safe asset, in that real incomes can be greater or less than expected, but it is index linked come what may. The closest matched liability is therefore index linked bonds.[5]

Concretely this means we can match through time the entire expected real cash flow of the Government's student loan programme by doing the following.

[5] This avoids the Government being exposed to unhedged inflation risk. Funding via non-indexed linked bonds implies substantial losses if inflation becomes unexpectedly low (as the money value of repayments will disappoint) and very large gains if inflation becomes high unexpectedly.

The Government in effect issues index linked bonds to cover the student loans and these are set to mature and be paid off as the former students make repayments[6].

As an example of this, recall from Table 1 that £1,854 real is expected to be repaid in 2027, 15 years after the students need the loans in 2012. To exactly match the £1,854 the government could sell in 2012

$$\frac{£1{,}854}{(1+r_{15})^{15}},$$

of a zero coupon 15 year index linked bond with real annual yield of 100 r_{15}% (the subscript denotes the maturity of the bond and the yield varies with time). If the real market yield was 0%, 1%, 2% or 3% real it can raise now, respectively, £1,854, £1,597, £1,377 or £1,190. This sale can be used in 2012 to part fund the 2012 cohort of students.

The above can be stated more generally at the cost of introducing some notation. Let X_j denote the real amount realised in Table 1 from the former students' repayments in year 2012+j and the real yield on the zero coupon j-th year index linked bonds be 100r_j%. The real income X_j in year *j* can be accessed now by selling in 2012 a bond for:

$$\frac{X_j}{(1+r_j)^j}.$$

If we do this for every maturity, then the total value raised by the index linked bond sale would be

$$P=\sum_{j=1}^{34}\frac{X_j}{(1+r_j)^j}.$$

Of course these sums are particularly sensitive to the yields at high levels of maturity. The sum *P* can be used in 2012 to fund the students.

[6] If the Government issues standard non-index linked gilts instead then the Government is exposed to unhedged inflation risk through student loans. In particular it will make substantial losses on the student loans in the national accounts if inflation becomes unexpectedly low (for although real repayments but students come in as expected, the money value of the repayments will disappoint compared to the funding costs) and very large gains if inflation becomes high unexpectedly. Of course it is also exposed to the uncertainty associated with real wage growth, which is shares with the index linked financed version of this scheme.

The value of *P* could be above or below the £40,351 actually lent to the students. If the number is higher, the Government will make an expected profit on the loans. If it is lower, it will be an expected loss.

When the yield is 2.2% real, the so-called Government's cost of borrowing, then the expected loss is the so-called RAB charge used within the UK Government as its official estimate of the expected losses on the student loans.

The yield curve

Graphing $100r_j\%$ against *j* is called the real yield curve which can be backed out from a basket of index linked bonds. Figure 2 shows the key real yields curves over the last 13 years, breaking up the period to check for sensitivities. The six lines we draw correspond to:

- Govt CB --- the Government's cost of borrowing, which is set as 2.2% real
- Median 00:06 --- this is the median of the yields from 2000 to 2006, inclusive. Each yield is taken as the first trading day on or after 1st October in each year.
- Median 07:10 --- replicates the above but looks at yields from 2007 to 2010, inclusive.
- 03 Oct 10 --- is the yield curve on 3rd October 2010.
- 01 Oct 11 --- is the yield curve on 1st October 2011.
- Median 00:12 --- replicates the above average but looks at yields from 2000 to 2012, inclusive.

Overall the Figure shows a long-term decline in real yields. This followed the move to make the Bank of England independent in order to improve inflation credibility and the move to liability matching by the pension industry which has driven up demand for long dated index linked bonds, as well as the shorter term effects of quantitative easing which has supressed yields particularly at the short maturities.

It is important to understand that the cost of issuing the index linked bonds for the students in the 2012 cohort is fixed by the yields on offer in the market in 2012 when the money was actually borrowed. The movements in yields after 2012 has no impact on the costs to the Government of the 2012 student financing policy: the die is cast. Hence the yield curve for October 2012 really determines the cost the government shoulders for the student loan policy in that year.

In terms of long term policy, perhaps the best long-term guide we have is the median of rates over the last 13 years which has a long term real yield of about 1.1%.

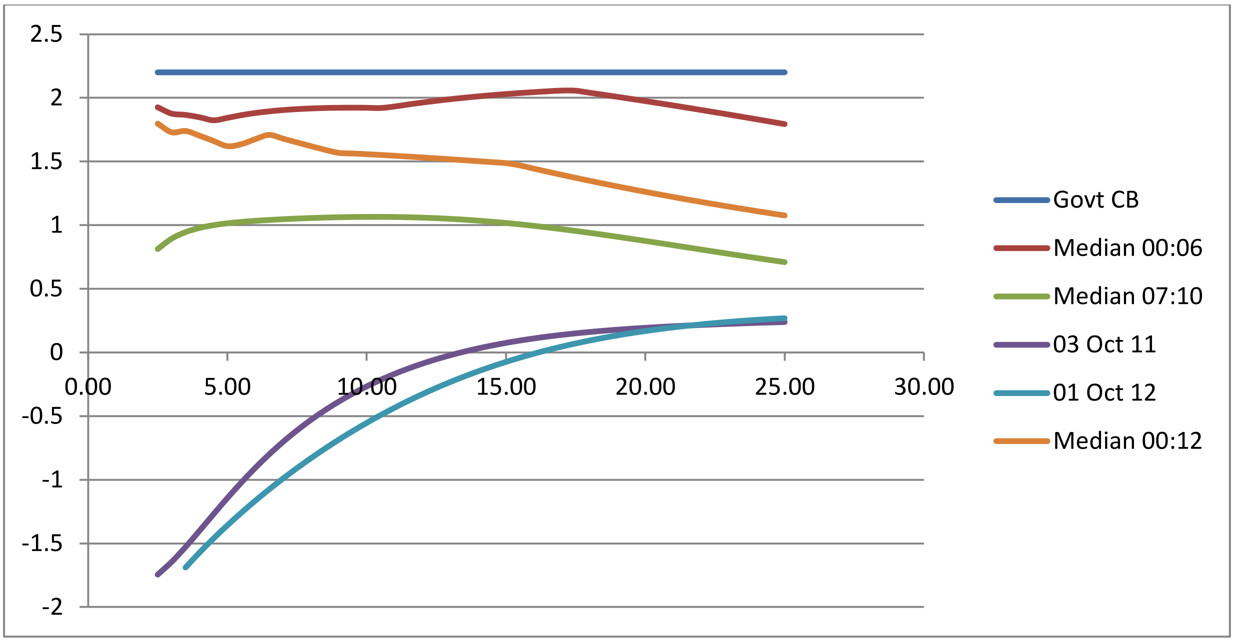

Figure 2: The real yield curves on index linked Government bonds on 1st October for the last few years. The data is taken from the Bank of England's bond website, using the "implied real spot curve". The notation Median 00:06 denotes, for example, the median real yield from 2000 to 2006 on each 1st October of each year. Govt CB denotes the "Government's cost of borrowing" which is fixed at 2.2% real by H.M. Treasury. 03 Oct 11 denotes the yield curve on 3rd October 2011, while 01 Oct 12 denotes the corresponding one for 1st October 2012.

Understanding index link bonds a bit better

In our view the H.M. Treasury should charge BIS an interest rate of a long-run average of real yields from index linked bonds for funding student loans.

At the moment it charges the long-run average of the difference between gilt yields and inflation (the so-called "Government cost of borrowing", which is currently set at 2.2% real[7]).

Minus the difference between these two terms is the so-called "inflation risk premium," which is well studied in the academic, central banking and commercial literatures (e.g. Campbell, Shiller and Viceira (2009) and Place (2000). The former

[7] The Government's cost of borrowing is the standard rate of interest charged across the Government's Departments for longer term projects. It is usually thought to be roughly the long-run average real costs of borrowing faced by the government in the gilts market. It is currently set at 2.2% real, although in the past it was much higher. H. M. Treasury can charge a different rate than this for large projects. An example of this is Crossrail, whose interest rate was not set at 2.2% real. The student loan book will develop into an enormous asset over the next 35 years and so a careful treatment of its value is worthwhile.

gives a very extensive discussion of the literature focusing on the UK and US index linked markets). This risk premium varies through time, but on average it is quite substantially positive due to the massive use of index linked bonds as "safe" retirement savings by the pension industry who use index linked bonds to match liabilities. It is difficult to be precise about the size of the inflation risk premium, but it is likely to be the order of 1% a year. 1% below 2.2% is around 1.2% real, which is close to the median of the longer maturity real yields on index linked bonds we have seen over the last 13 years.

Recommendation: that H.M. Treasury charges BIS a long-run average of real yields from index linked bonds. A median of the last 13 years suggests a rate around 1.1% real as the interest rate.

Example: flat real yield curve

Real yield curves for index linked bonds are typically quite flat. To get a first impression of the cost to the Government of running the student loan scheme, we will compute the expected profit from the student loan system P-£40,351 in the very simplest case where the yield curve is exactly flat, that is $100r_j\%$ is constant over j. This is given in Table 2 below.

Yield assumptions	HMT's profit	% profit		
100r%	P-£40,351	**Central**	**Pessimistic**	**Optimistic**
-1.0%	£5,068	13%	1%	21%
-0.5%	£859	2%	-8%	10%
0.0%	-£2,893	-7%	-17%	0%
0.5%	-£6,243	-15%	-24%	-9%
1.0%	-£9,240	-23%	-31%	-17%
1.1%	-£9,800	-24%	-32%	-18%
1.5%	-£11,925	-30%	-37%	-24%
2.0%	-£14,335	-36%	-42%	-30%
2.2%	-£15,229	-38%	-44%	-33%
2.5%	-£16,502	-41%	-47%	-36%
3.0%	-£18,453	-46%	-52%	41%

Table 2. Flat yield curve case. Expected profit from the Student Loan scheme. Notice again that the pessimistic and optimistic scenarios are roughly symmetric. The Government uses the 2.2% case in all of their calculations.

The key message from Table 2 is the significant sensitivity of the results to the real yield. It dominates the difference between the pessimistic and optimistic scenarios. As we have remarked before, the Government's internal calculations use 2.2% real.

Using the real yield curves in Figure 2

Table 3 illustrates the effects of correctly valuing this cash flow using the above six yield curves from Figure 2, which represents real data.

Yield assumptions	HMT's Profit	% profit		
100r%	P-£40,351	**Central**	**Pessimistic**	**Optimistic**
Govt CB	-£15,229	-38%	-44%	-33%
Median 00:06	-£13,917	-34%	-41%	-29%
Median 07:10	-£8,391	-21%	-29%	-15%
03 Oct 11	-£3,815	-9%	-19%	-2%
01 Oct 12	-£3,448	-9%	-18%	-1%
Median 00:12	-£10,691	-26%	-34%	-21%

Table 3. Estimated profit to the H.M. Treasury of running the student loan scheme using the different yield curves from Figure 2. Notice again that the pessimistic and optimistic scenarios are roughly symmetric. The Government uses the 2.2% case in all of their calculations, which is denoted "Govt CB" in this table.

Table 3 shows that an impact of the current very low yields is that the Government can expect to make a small loss on Student loans issued in 2011 and 2012.

Over the longer term, the current estimated loss rate on student loans used by the Government, 38%, seems to significantly overestimate the actual costs. A reasonable central approach would be to use the "Median 00:12" case which delivers losses of around 26%. The use of my benchmark of a constant 1.1% real interest rate delivers an estimated 24% loss.

If we multiply these numbers up by 307.1k students, then the total loan size was £12.39bn, while the expected loss using the Government's cost of borrowing is £4.67bn. The more accurate estimate based upon the "Median 00:12" case is £3.2bn. The 1.1% real benchmark number delivers a loss of £3.0bn. Of course voluntary repayments are likely to reduce these numbers somewhat.

The loss £3.0bn, which is a subsidy to graduates with relatively low incomes, should in my view be regarded as money well spent on educating the future generation. Further, the Government itself gains enormously from this education, as it takes a share of increased income through income tax, and a share of increased spending through VAT, etc.

If the £3.0bn loss is regarded by the Treasury as too high various methods could be used to trim it. These are outlined in Barr and Shephard (2010).

Conclusion

As the cash flow from student loans repayments are indexed the Government can use the yields on index linked bonds to value that cash flow. The financial effect of this conceptual switch is material.

We suggest that the Government should use a long-run average of the real yields on index linked bonds to implement policy in this area, allowing BIS and the Treasury the scope for longer term planning over student numbers. A long-run index linked interest rate of around 1.1% real would seem not too far away from good practice. This would materially reduce the current RAB charge BIS faces. This may allow the Government to potentially reduce number controls in Higher Education, as discussed by Barr and Shephard (2010), move us closer to finally achieving the admissions goals of the Robbins Report, liberalising the system and reducing administrative costs.

The remaining risk for the Government of the student loan system is the real growth rate of the earnings of former students. However, this risk factor is also buried in the current valuation system. It would seem odd for the Government to charge student loans a risk premium for this effect given education creates positive externalities.

As the size of the student loan book rises, it will become a very substantial asset on the public balance sheet, peaking at over £200B. The index linked characteristic of the income contingent repayments would suggest that it makes sense within the National Accounts to value this asset using index linked instruments. It may also make sense for the Government to opt to fund its deficit using a higher percentage of index linked bonds, compared to nominal bonds, as the size of the loan book increases.

Finally, the indexation argument we have used here also applies to the funding of postgraduate student loans using the system advocated by, for example, Leunig (2011).

References

Barr, N. (2004), ‘Higher education funding’, Oxford Review of Economic Policy, 20, pp. 264-283.

Barr, N. and N. Shephard (2010) “Setting student numbers free,” unpublished paper, London School of Economics.

Campbell, J., R. Shiller and L. Viceira (2009) “Understanding Inflation-Indexed Bond Markets”, Brookings Papers on Economic Activity 79-120, Spring 2009. Reprinted as Chapter 3 in Michael Haliassos ed., Financial Innovation: Too Much or Too Little?, MIT Press, 29-70, 2013.

Chowdry, H, L. Dearden, A. Goodman and W. Jin (2012) “The Distributional Impact of the 2012–13 Higher Education Funding Reforms in England”, Fiscal Studies, Vol. 33, Issue 2, pp. 211–236.

Goodman, A., L. Dearden, E. Fitzsimons, and G. Kaplan (2008) "Higher Education Funding Reforms in England: the Distributional Effects and the Shifting Balance of Costs." Economic Journal, 118, F100-F125.

Leunig, T. (2011) “Mastering postgraduate funding,” Centre Forum discussion paper.

Place, J. (2000) “Basic bond analysis,” Centre for Central Banking Studies, Bank of England.