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The Case of the UK's Universities Superannuation Scheme (USS)

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Alternative Risk-based Levies in the Pension Protection Fund for Multi-employee Schemes: the Case of the UK's Universities Superannuation Scheme (USS)

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Alternative Risk-based Levies in the
Pension Protection Fund for Multi-employee Schemes

Abstract

This paper estimates the risks of financial distress in UK universities, and uses these estimates to examine the basis of the annual levies paid to the UK's Pension Protection Fund by the Universities Superannuation Scheme, a multi-employer scheme covering 391 universities and related institutions. The paper compares the payments between the two alternative participating arrangements for multi-employer pension schemes to the PPF, namely Last-Man-Standing and Segmented levies. Using an Ohlson (1980) logit model to predict the financial distress risk for higher education institutions, we find that financially distressed institutions are smaller, with higher leverage and lower earnings. By comparing the implied financial distress probabilities from the PPF risk-based levy using USS accounts with the simulated probabilities using our logit model, we estimate whether USS levies are fairly priced. Our estimates suggest that in 2006/07 USS member institutions appeared to be paying less than the fair risk-based levy. However this is because during the initial phase of the PPF the risk-based levies were much lower as a proportion of the total levy than the intended steady-state values. The implication is that if USS had paid the same total levy but where the risk-based component was four fifths of the total, then USS would have been paying substantially more than its fair risk-based levy. In addition by looking at the distributions of individual university risk-based levies under a segmented PPF arrangement, we find evidence of significant cross-subsidies under the current last-man-standing levy between participating USS institutions.

Keywords: Financial Distress Risks; Pension Protection Fund; Universities Superannuation Scheme

JEL Classification: G23

I Introduction

This paper estimates the risks of financial distress in UK universities, and uses these estimates to examine the basis of the annual levies paid to the Pension Protection Fund by the Universities Superannuation Scheme, The UK's Pension Protection Fund (PPF), modelled on the US's Pension Fund Guarantee Corporation, was established in 2005 and pays compensation to members of occupational defined benefit pension schemes when their employer becomes insolvent and is unable to honour its pension commitments. The PPF operates like an insurance company where members of solvent schemes pay an annual levy in exchange for future compensation in the event of insolvency. Like any insurance product, critical questions relate to whether the insurance premium is fairly priced, and the degree of cross-subsidy between the insured heterogeneous institutions.

Pension schemes protected by the PPF can have more than one employer and in these cases are referred to as multi-employer schemes. Under the rules of the PPF, a multi-employer scheme can either participate on the basis of individual employer-schemes insured by the PPF (segmented arrangement) or participate in a self-insured pool, where the PPF will not step in until the last participating member of the pool – the last employer - becomes insolvent (last-man-standing arrangement). Under a last-man-standing arrangement, each scheme still has to pay PPF the levies, and has to support scheme members whose employers have became insolvent until the last employer falls into bankruptcy. The Pension Protection Fund charges risk-based levies to solvent schemes, and in the case of multi-employer schemes, these levies depend on the correlations between the constituent employers, and whether the arrangements are segmented or last-man-standing.

This paper investigates the empirical trade-off between the two Pension Protection Fund participating arrangements for multi-employer pension schemes, namely Last-Man-Standing and Segmented levies, using a sample dataset from participating Higher Education (HE) institutions in the Universities Superannuation Scheme (USS) Ltd. USS Ltd is the UK's fourth largest occupational pension scheme and is an example of a multi-employer scheme, covering 391 universities and related institutions in the UK, with 239,144 members and assets of £30.138 billion.[1] The USS scheme had a deficit of £6.568 billion at the full actuarial valuation on 31 March 2005, and therefore a study of the issues surrounding the choice by USS Ltd as a multi-employer pension scheme, of the basis for its participation in the UK's Pension Protection Fund is timely.

To assess the insolvency risk of USS participating institutions, the paper introduces a modification of the traditional bankruptcy prediction models, applicable to not-for-profit organisations such as universities. It may seem surprising that universities face insolvency risk, but we note that USS is required to pay into the PPF fund on the basis of the sponsoring employer's risk profile. Under the provisions of the Pensions Act 2004, sponsoring employers *must* pay into the PPF, and the levy *must* be partly risk-based, reflecting the sponsoring employer's risk of insolvency. There are two main categories of insolvency: stock-based insolvency, which occurs when the value of a firm's assets is less than its liabilities, and flow-based insolvency, which occurs when firms' cash inflows are insufficient to cover contractually required outflows[2]. Due to the unlikely event that the assets of a higher education institute fall below its liabilities, it is the flow-based definition of insolvency that we will focus on in relation to HE institutions. Even with this restricted definition, it may seem unlikely that a UK higher education institution will go bankrupt - although a small number of institutions have been threatened with a bankruptcy process in the past few years.[3] In discussing the financial problems at University College Cardiff in 1987, Smith and Cunningham (2003) report on the hands-on role of the University Grants Commission, "The direct intervention of the UGC broke all the conventions that had been established to separate universities from government influence . . . From this time on government . . . . would play a much more interventionist role" (page 29). An implication of this policy change is that in a future changed political climate, the funding councils may reverse this policy and re-adopt a less-interventionist role. Indeed McClintock and Ritchie (2003) note that the funding councils refused to intervene in the financial crisis at Lancaster University in 1995-97, "They had been

[1] USS Members Annual Report 2006/07

[2] Ross, S., R.W.Westerfield and J.Jaffe, Corporate Finance (2005), Ch. 30.

[3] Kealey (2006) notes that University College Cardiff during the 1980s and Lancaster University during the 1990s "are two recent examples of British universities hitting the edge financially". The performance of these and other universities with financial problems are discussed in Warner and Palreyman (2003).

told that they would get no help from the Funding Council . . . . and the University should make its own way" (Lancaster's Vice-Chancellor quoted in McClintock and Ritchie: page 40), and "The HEFCE was unwilling to do other than reschedule monthly payments of the recurrent grant" (page 40)

Rather than investigate bankruptcy probabilities, instead we look at the probability that a higher education institution encounters financial distress, which could lead to 'potential' insolvency of the institution. The term 'financial distress' refers to 'a situation where a firm's operating cash flows are not sufficient to satisfy current obligations and the firm is forced to take corrective action'[4]. Our paper is informed by the empirical findings of Kraatz and Zajac (1996) that distressed higher education institutions are likely to be those undergoing a restructuring and abnormal Funding Council (FC) grants are taken as an indicator of such restructuring. The Ohlson (1980) logit model is used to predict the probability of this abnormal funding council grants, and this prediction model is then used to assess the insolvency risks for USS and its participating institutions. Together with other data such as the pension funding ratio, the levies under LSM and segmentation will be calculated and compared.

We find that financially distressed institutions are smaller in size, with higher leverage ratio and lower earnings, which is consistent with the conventional results of bankruptcy prediction literature. As a robustness check for the prediction power of our model, we compare the institutions identified as being in financial distress with the list of higher education institutions at risk of financial failure recently disclosed by the Education Guardian (10 July 2007). We find that over two thirds of the universities from the Guardian list can be retrieved by our model. We use information provided by USS on its levies to the Pension Protection Fund to calculate the implied probabilities of insolvency of USS institutions and compare these implied probabilities with the simulated insolvency probability using our empirical specifications, and we estimate whether USS levies are fairly priced. Our estimates suggest that in 2006/07 USS member institutions appeared to be paying less than the fair risk-based levy. However this is because during the initial phase of the PPF the risk-based levies were much lower as a proportion of the total levy than the intended steady-state values. The

[4]Defined by Wruck. (1990). McMeeking (2003) investigates the level of tuition fees required to ensure that UK universities break-even.

implication is that if USS had paid the same total levy but where the risk-based component was four fifths of the total (the intended log-run solution), then USS would have been paying substantially more than its fair risk-based levy. By looking at the distribution of risk-based levies for individual institutions under a segmented arrangement with the PPF, we find an asymmetric distribution skewing towards lower values, providing evidence of cross-subsidy under the current last-man-standing arrangements from institutions with better financial conditions to potentially financially distressed institutions.

The paper is organized as following, Section II discusses current bankruptcy prediction models and defines the proxies for financial distress in higher education institutions, and a modified prediction model is introduced. Section III provides descriptive statistics of the data for the variables used in the analysis. Section IV presents the empirical results and evaluates the prediction performance of the model. Section V gives a detailed discussion of the Pension Protection Fund and the calculation of risk-based levies and Section VI uses the empirical results to estimate different levies under alternative participation rules and suggests appropriate USS PPF levies. Section VII presents robustness checks for the model using different measures of financial distress within higher education institutions. Section VIII concludes the paper.

II. Financial Distress and Bankruptcy Prediction Models

Altman's (1968) multivariate discriminant analysis (MDA) of bankruptcy prediction provides an early statistical analysis of financial ratios as important indicators of corporate failure. Instead of the MDA model, we follow Ohlson (1980) who developed a logit bankruptcy models to avoid the problems associated with the MDA analysis. Logit and probit models state that the probability of a firm failing within some pre-specified time period is a function of the product of a vector of predictors and a vector of unknown parameters. Depending on the functional form of the dependent variables it is called probit (normal distribution) or logit (logistic cumulative distribution) model. For an event Y to occur ($Y = 1$), the logit model has the form

$$\Pr(Y=1|X)=\frac{e^{X'\beta}}{1+e^{X'\beta}}=\Lambda(X'\beta) \qquad (1)$$

where X is a vector of explanatory variables. The logit model is estimated by maximizing the log-likelihood function

$$\ln L=\sum_{y_i=0}\ln(1-\Lambda(X'\beta))+\sum_{y_i=1}\ln\Lambda(X'\beta) \qquad (2)$$

In bankruptcy prediction models the predictors capture the firm's characteristics such as size, profitability, leverage and cashflow. Ohlson (1980) uses firm's characteristics such as size and financial ratios such as total liabilities/total assets (reflecting leverage), working capital/total assets (reflecting liquidity), current liabilities/current assets and net income/total assets (performance measurement). He finds greater prediction powers using logit model than the z-score model by Altman (1968) and Taffler (1982). Using UK data, Lennox (1999) finds superior predicting power of well-specified non-linear probit and logit models over MDA and linear probit and logit models, and finds that compared to non-failing companies, failing companies are typically small, have poor cashflow and profitability, and are highly leveraged.

We apply the probit/logit model to evaluate the insolvency risks for USS participating institutes. Unlike publicly traded firms in the private sector, government support makes it almost impossible for a UK higher education institution to go bankrupt and therefore an appropriate proxy for financial distress needs to be chosen to identify the insolvency risk. Kraatz and Zajac (1996) argue that organizations facing financial distress are more likely to recognize the need for strategic change/restructuring. Therefore they use measures that capture organizational restructuring as the proxy for financial distress and find that institutions undergoing restructuring have lower income, higher debt, and lower reputations, which are variables related to specific situations of financial distress. In our paper the choice of predictor for financial distress is related to Kraatz and Zajac (1996): we identify 'unanticipated payments' from the funding councils to HE institutions as the indicator of financial distress.

Higher education institutions in the UK attract income from a variety of sources. These include tuition fees, funding council (FC) grants, research grants and contracts, endowments and investment income and other income. Funding council grants provide the largest proportion at around 38 per cent[5]. The funding council grants fall into four main categories: funding for teaching, funding for research, special funding and capital funding. The teaching and research grants are allocated by formula, with the former mainly related to student numbers which institutions are required to deliver in return for the funding and the latter related to the research quality, staff numbers and the most recent RAE (Research Assessment Exercise) performance of an institution. The special funding is attributed to institutions for specific purposes such as learning and teaching strategies, widening participation, regional collaboration and closer links between higher education and business and the wider community. The capital funding is used to help building the infrastructure for HE institutions.

There are three FCs in the UK, namely Higher Education Funding Council for England (HEFCE) and Wales (HEFCW), and Scottish Funding Council (SFC, formerly Scottish Higher Education Funding Council—SHEFC)[6]. These funding councils publish in their annual reports the expected allocation for the following year of the largest four categories of grants: teaching and research grant, special funding and capital funding. As these four kinds of funding take up the majority of funding council grants for most HE institutions, the sum of the funding from those four categories can be regarded as the best estimate for the expected funding council grants in the following year.

The Higher Education Statistics Agency (HESA) also publishes annual data on the realised funding council grants for each HE institution. The difference between the predicted funding council grant and HESA's actual grant is the 'unanticipated payments', and we take these unanticipated payments as evidence of financial distress. This is because we would expect that for financially solvent institutions the actual grants received will be similar to what was expected. Indeed the Chief Executive of HEFCE, in evidence to the Parliamentary Select Committee on Education and Skills on 19th October 2005 explained that "Part of the raison d'Etre of the Funding Council, and always has been, is to intervene at an early stage before institutions get themselves into so much trouble that they fold" (Answer to Q57). We define the

[5] HESA finance record.

[6] Department for Employment and Learning, Northern Ireland (DELNI) is responsible for the funding of HEI's in Northern Ireland and has no specific dataset for HEI's in Northern Ireland.

difference between the realised (HESA) and the anticipated funding council grants (FC) as:

$$\Delta GRANTS_{it} = GRANTS_{it}^{HESA} - E[GRANTS_{it}^{FC}]$$
$$= GRANTS_{it}^{HESA} - E[(Teaching_{it} + Reseach_{it} + Special_{it} + Capital_{it})] \quad (3)$$

where subscript *it* indicates the value for institution *i* in year *t*. $\Delta GRANTS_{it}$ is the difference between the actual funding council grants and its predicted value, and can be either positive or negative. A positive $\Delta GRANTS_{it}$ value means there were some grants paid in addition to those predicted from the four main categories of FC grants. A negative $\Delta GRANTS_{it}$ implies that the realised HESA grants were less than the predicted funding council grants. In both cases large forecast errors on the absolute values of this difference, is taken to reflect institutional financial distress. For large positive values of $\Delta GRANTS_{it}$ the institution is being given additional unanticipated funding, and could reflect the need for cash flows from the funding councils. For example the annual HEFCE report on how much money it would distribute to Universities in 2004-05 revealed that 13 institutions facing serious cuts would receive "safety-net" grants totally £3.7 million. In particular, Cranfield University whose research money had been reduced by 9.3% per year following poor RAE2001 performance, had received emergency funding of £3 million in the preceding year.[7] On the otherhand, large negative unanticipated payments mean that institutions received less monies than they were expecting, possibly due to a decline in the drivers in the forecasting model, such as a decline in student numbers. For example in 1998-99 HEFCE withheld funds from the University of East London, when it discovered discrepancies in student numbers after a data audit. Similarly in 2002 HEFCE withdrew £6.2 million of its grant from London South Bank University following under-recruitment.[8]

As larger institutions are likely to receive higher grants from the funding councils and have a large absolute value of $\Delta GRANTS_{it}$, we scale this variable by the total assets of an institution ($SIZE_{it}$). We then define a dummy variable *ABNML* indicating whether an institution receives significant 'unanticipated ad hoc payments' as:

[7] Reported in Goddard (2004)
[8] Reported in Baty (2007)

$$ABNML = 1 \text{ if } \left| \frac{\Delta GRANTS_{it}}{SIZE_{it}} - mean\left(\frac{\Delta GRANTS_{it}}{SIZE_{it}}\right) \right| \geq 2 \times stdev\left(\frac{\Delta GRANTS_{it}}{SIZE_{it}}\right) \quad (4)$$
$$ABNML = 0 \text{ otherwise.}$$

The value of the dummy variable *ABNML* reflects the size of the forecast error in equation (3) and identifies the distribution of these ‘unanticipated payments’ from a reasonable range, i.e. the mean of $\Delta GRANTS_{it}/SIZE_{it}$[9]. We will see that the distribution of $\Delta GRANTS_{it}/SIZE_{it}$ is highly leptokurtic, and justifies the use an dummy variable for these abnormal grants. A further advantage for choosing this unanticipated change in funding as the predictor for financial distress is that it avoids using the leverage ratio or earnings—two fundamental variables that may be used to define financial distress but also appear to be equally important in traditional bankruptcy prediction models—as the predictor.[10]

Our measure of financial distress may be compared with another definition identified by the Funding Councils. Using information obtained from HEFCE under the Freedom of Information Act, Education Guardian (10th July, 2007) identified 46 universities on the HEFCE's list of institutions “at risk” of financial failure between 1998 and 2003. In effect our empirical model is attempting to replicate the HEFCE criteria using publicly available information. In section V below we compare our list of institutions in financial distress with the Guardian list.[11]

The financial distress prediction model in this paper adapts the empirical models of Ohlson (1980) and Lennox (1999). Explanatory variables include: the size of the institution (*LNSIZE*) (calculated as the logarithm of total assets); working capital/total

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[9] One can roughly regard it as a *t*-test on the hypothesis that the value of $\frac{\Delta GRANTS_{it}}{SIZE_{it}}$ is equal to its mean. A naive *t*-statistic would be $t = \left| \frac{\Delta GRANTS_{it}}{SIZE_{it}} - mean\left(\frac{\Delta GRANTS_{it}}{SIZE_{it}}\right) \right| / stdev\left(\frac{\Delta GRANTS_{it}}{SIZE_{it}}\right)$ and a *t* value greater than 2 means one can reject the hypothesis at briefly 95% confidence level.

[10] As a robustness check on our results in section VII we estimate a financial distress model based on successive negative earnings.

[11] As a second robustness check we estimate an unreported alternative model of financial distress using the Guardian list, identifying those universities that were “at risk”, and then using the financial data to predict the probability of being on the HEFCE critical List. We have re-estimated our logit model, using the observations of being on the at-risk list in a particular year as the dependent variable. This alternative model makes no use of the funding grants, and relies solely on the HEFCE at-risk list.

asset ratio (*WCTA*); total liabilities/total assets ratio (*TLTA*); current liabilities/current asset ratio (*CLCA*); total long-term liabilities/total assets ratio (*LLTA*); earnings before interest and taxes/total asset ratio (*EBITTA*) and variables representing the growth path of earnings (*NEGTWO* and *GROW*). The estimated model is

$$\Pr\left(ABNML_t = 1 \mid X\right) = \Lambda\left(X'\beta\right) = \Lambda(\alpha_0 + \alpha_1 LNSIZE_{t-1} + \alpha_2 WCTA_{t-1} + \alpha_3 TLTA_{t-1} + \alpha_4 CLCA_{t-1} + \alpha_5 LLTA_{t-1} + \alpha_6 EBITTA_{t-1} + \alpha_7 NEGTWO_{t-1} + \alpha_8 GROW_{t-1} + \varepsilon_t) \quad (5)$$

where *NEGTWO* is set to equal to 1 if *EBIT* is negative for the last two years and 0 otherwise and

$$GROW_t = \frac{EBIT_t - EBIT_{t-1}}{\left|EBIT_t\right| + \left|EBIT_{t-1}\right|} \quad (6)$$

is a variable used by McKibben (1972) to measure the change in earnings. The subscripts t and $t - 1$ imply that the data from the previous year is used to predict the *EBIT* value in the current financial year. The discussion above and the previous work on financial distress suggest that size and working capital should be positively related to the financial health of an institution. Earning patterns and earning growth both relate to the flow-based aspect of financial distress and institutions with higher earnings and earnings growth tend to be safer and vice versa. The leverage ratio measures the ability of an institution to payback its debt and should be lower the better is the financial solvency of the institution. To summarize, α_1, α_2, α_4 and α_6 are expected to be negative and α_3 and α_5 should be positive.

III. Data and Descriptive Statistics

The data for higher education institutions is obtained from HE Finance Plus dataset provided by Higher Education Statistics Agency (HESA). This dataset contains the full finance statistics returned from annual accounts for UK higher education institutions. Data includes detailed income and expenditure analysis and balance sheet information. It also contains finance profile ratios in the recent editions. The data used in this paper covers HE Finance Plus data from 2001 to 2005. All the variables used are book values. *EBIT* is defined using the HESA terminology as the ‘deficit/surplus on continuing operations after depreciation of fixed assets at valuation and before exceptional items, tax and minority interest', which is equal to the difference between total income and total expenditure on the consolidated income and expenditure statement. For HE institutions in England, Scotland and Wales the data for funding allocation is published annually by HEFCE, SFC and HEFCW, respectively. Since HE institutions in Northern Ireland are funded by DELNI jointly with other institutions[12], four Irish institutions in the HESA dataset are not included in the analysis.

Panel A of Table 1 shows the distribution of funding council grants for the sample institutions from the two sources: HESA HE Finance Plus dataset ($GRANTS^{HESA}$) and the grants allocation data from the funding councils (*Teaching*, *Research*, *Special* and *Capital*), for three groups, namely the whole sample, and the two sub-samples of institutions with and without the large 'unanticipated payments', as calculated from equation (4). It can be seen that grants for teaching and research take up 70 per cent of the FC grants for the whole sample, and institutions identified as at risk (*ABNML* = 1) have a higher percentage of special funding. Further the realised grants for the *ABNML* = 1 sample is half as large as the not-at-risk sample, which is consistent with the at-risk sample being predominantly smaller institutions. The distribution of the normalised *ΔGRANTS* is highly leptokurtic, which provides an additional motivation for defining *ABNML=1* where the absolute value of the deviations of *ΔGRANTS/SIZE* from its mean represents an abnormal financial state. Note that the special funding for distressed and non-distressed institutions are similar in absolute values, implying that distressed institutions receive more funding for specific purposes after taking into account their relatively smaller size. By construction, the elements in the row *ΔGRANTS,* shows that institutions identified as being in financial distress have a much higher standard deviation of these 'unanticipated payments' than those institutions not in financial distress.

Panel B of Table 1 reports the descriptive statistics for the input variables for two groups of institutions: those with and without significant abnormal funding council grants. In total there are 38 institutions identified as having abnormal FC grants for the four sample years 2001-2005 and 572 institutions without abnormal grants. So around 6 per cent of institutions are receiving abnormal grants and are regarded

[12] See fn. 4.

therefore as being in financial distress or ‘at-risk’. Institutions with abnormal grants are significantly smaller sizes than the rest of the sample (this is equivalent to over £65 million in absolute value), which means smaller institutions are relatively vulnerable to financial distress. However since the difference between FC grants from the two data sources are weighted by total assets when calculating *ABNML*, it is possible that smaller institutions are more likely to have larger ratios and consequently be identified as having abnormal grants. Therefore the size effect is taken into account in the empirical analysis.

Table 1
HESA Descriptive Statistics

This table reports the mean, standard deviations, skewnes and kurtosis for the variables of the logit model defined in equation (5) using the HESA HE Finance Plus dataset of 158 higher education institutes from 2002 to 2005. Panel A reports the descriptive statistics for funding council grants and Panel B for the regression variables. $GRANTS^{HESA}$ is the total FC grants disclosed by the HESA HE Finance Plus. *Teaching*, *Research*, *Special* and *Capital* are the teaching, research, special and capital grants disclosed by individual FCs. *ΔGRANTS* is defined as in equation (3). *ABNML* is defined as in equation (4). *SIZE* is the total book assets (*TA*). *WCTA* is the ratio of working capital to total assets. *CLCA* is current liabilities divided by current assets (*CA*). *CLTA* is current liabilities divided by total assets. *LLTA* is long-term liabilities divided by total assets. *TLTA* is the ratio of total liabilities (*CL* + *LL*) to total asset. *EBITTA* is the ratio of EBIT (earnings before interest and taxes) to total asset. *NEGTWO* is set to be equal to 1 if *EBIT* is negative for the last two years and 0 otherwise. *GROW* is the McKibben (1972) growth ratio defined in equation (6).

Panel A: Funding Council Grants

	Total				*ABNML* = 1		*ABNML* = 0	
£ 000s	*Mean*	*S.D.*	*Skew*	*Kurt*	*Mean*	*S.D.*	*Mean*	*S.D.*
$GRANTS^{HESA}$	38,742	34,142	1.56	2.53	19,290	17,146	40,034	34,603
$E[GRANTS^{FC}]$	39,374	36,598	1.65	2.83	20,248	24,747	40,645	36,917
Teaching	25,545	21,201	1.47	4.87	13,252	15,282	26,483	21,309
Research	7,685	14,518	3.08	10.18	1,407	5,484	8,165	14,880
Special	6,801	8,053	2.44	6.94	6,024	9,400	6,861	7,950
Capital	2,592	3,075	11.67	171.30	0.00	0.00	2,592	3,075
ΔGRANTS	-631	6,186	-1.54	7.60	-958	10,840	-610	5,762
ΔGRANTS/SIZE	0.018	0.102	2.34	27.40	0.13	0.34	0.01	0.05

Panel B: Regression Variables

	ABNML = 1		*ABNML* = 0	
	Mean	*S.D.*	*Mean*	*S.D.*
SIZE	9.813	1.272	11.337	1.153
WCTA	0.052	0.150	0.038	0.093
CLCA	1.073	0.561	0.995	0.638
CLTA	0.221	0.142	0.151	0.081
LLTA	0.152	0.125	0.137	0.105
TLTA	0.373	0.153	0.288	0.132
EBITTA	0.011	0.029	0.007	0.031
NEGTWO	0.105	0.311	0.212	0.409
GROW	0.030	0.746	0.089	0.639
Samples	38		572	

Institutions with higher working capital and therefore a higher current ratio should be less likely to encounter financial distress However the results in the descriptive statistics do not suggest this behaviour. The mean of the inverse of the current ratio (*CLCA*) for institutions with abnormal grants is 1.1—just roughly greater than that of those identified as safer institutions. The ratio of working capital to total asset (*WCTA*) is 5.2% for institutions with abnormal grants, which is higher than 3.8% for those without abnormal grants. This is possibly because cash is less important in the higher education sector than industrial sectors. As for variables related to cash generating abilities, again there are some surprising results. For example, the earning/asset ratio (*EBITTA*) for 'distressed' institutions is 1.1%, which is 0.4% higher than those identified as 'safe'. However on reflection, from the definition of the *ABNML* variable, this result is not that surprising, since institutions with *ABNML=1* value tend to have smaller sizes. Actually when looking at *EBIT* alone, the finding is reversed—the mean figure is £46,000 for distressed institutions and over £800,000 for non-distressed ones. The mean earnings growth (*GROW*) for institutions with higher abnormal grants is 3% whilst it is 9% for the rest of the institutions, indicating that it is indeed the institutions with lower earnings growth that experience higher unanticipated payments.

The leverage ratios support the stock-based view of financial distress. The ratio of total debt to total assets is 0.37 for institutions with *ABNML=1* and 0.29 for those with *ABNML=0*. This finding suggests that institutions with larger unanticipated abnormal grants are more financially constrained than other institutions, and this evidence is further supported by decomposing total liabilities into current and long-term liabilities. The liability that differentiates the two groups more notably is the current liability (*CLTA*), which is 0.22 for institutions with abnormal grants, 0.7 higher than their counterparts. This implies that institutions with higher abnormal grants thus are supposed to be more financially distressed have lower liquidity than financially stable institutions.

One might argue that by including non-USS institutions within the HESA dataset in the financial distress regressions, the results might be biased due to the unobserved correlations between pensions and cash flows or corporate expenditures[13]. Here we assume that there is no cross-correlation between the explanatory variables and pensions, and including the maximum number of institutions ensures the most precise estimates that best fit the higher education sector. As a robustness check we included only USS participating institutions in our regressions, but this did not alter the results significantly.[14]

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[13] See Bunn and Trivedi (2005) and Rauh (2006).
[14] A possible extension to this work would be to include pension related variables in the logit model as

IV. Empirical Results for the Prediction Model

Table 2 reports the prediction results for the logit model in equation (5) under seven different specifications. Unlike the univariate analysis in the descriptive statistics, the logit regression shows that the main results have the same patterns and predicted signs as the Ohlson (1980) logit model, and we take this as evidence that our model and dependent variable used is a valid representation of financial distress within the higher education sector.

In specification I, the coefficient on the size variable (*LNSIZE*) is -1.25 and is significant at 99% confidence level. This result holds across all the alternative specifications of the model, and suggests that smaller institutions are more likely to be in financial distress. The leverage ratio (*TLTA*) measures how much the institution's assets decline in value (market value of assets plus debt) before the liabilities exceed the assets and the institution becomes insolvent. This is a commonly used predictor for bankruptcy because of its direct link to the stock-based definition of financial distress. In specification I, the coefficient estimate for the leverage ratio is 5.73 and significant at 99% confidence level. The results hold for specifications II, III and IV, where the coefficient estimates are all positive and very significant. Specification V decomposes total liabilities into current liabilities (*CLTA*) and long-term liabilities (*LLTA*). The coefficient estimate for *CLTA* is 4.38 and 7.32 for *LLTA*, which are both significant at 99% confidence level, but are not significantly different from each other.

The variable *EBITTA* (*EBIT* divided by total assets) captures earnings power of the assets and measures the true productivity of the institution's assets net of any tax or leverage effects. The regression result is as expected: for all specifications (except specification IV), with the coefficient estimates exceeding 10 and are all significant at 95% confidence level.

Two more variables related to the earning-abilities of the institutions are also included in the regression. *NEGTWO* measures the continuity of the earnings. However in

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a control once such data is available to see whether there is any difference between USS and non-USS institutions.

contrast to the expectation that institutions with consecutive negative earnings should have higher probabilities of receiving abnormal funding, as in Ohlson (1980) the coefficient estimates are significantly negative. The variable *GROW* measures the change in *EBIT* and the coefficient estimates are positive for all specifications (except for specification IV).

A straight-forward way to measure the goodness of fit for the model is to look at each specification's likelihood ratio index, calculated as:

$$LRI = 1 - \frac{\ln L}{\ln L_0} \tag{7}$$

where ln L is the log-likelihood function for the model and ln L_0 is the log-likelihood computed with only a constant term, i.e. when all the slopes in the model are zero. The index provides an intuitive measurement for the goodness-of-fit similar to the R^2 in a classical regression. The index equals zero when all the slope coefficients are zero and is close to unity when the model correctly predicts the sample. The likelihood ratio indices for all seven specifications are reported in the final column of Table 2. For all specifications except specification IV the likelihood ratio index is more than 0.27 and the hypothesis of all coefficients being zero is strictly rejected.

Specification IV excludes the *LNSIZE* variable in the regression, to examine the importance of collinearity with the remaining variables. It can be seen that the explanatory power of the regression drops substantially, and overall, the *LNSIZE* variable is regarded as an important variable that should not be excluded from the model. Specification VI includes a dummy variable for whether the institution was classified as a university pre-1992, which is that date at which a number of former polytechnics and colleges converted to full universities. This dummy variable takes the value of unity if the institution was a pre-1992 university and zero otherwise, and is related to both the age of the institution and also its size. It can be seen that the coefficient on the pre-1992 dummy is significantly negative, demonstrating that the pre-1992 universities have lower probabilities of financial distress. However this variable is highly correlated with the size of the university, and therefore the final model to be used to calibrate the insolvency risk is given in specification VII.

Table 2: Prediction Results for the Logit Model

The table represents the results for the logit regression described in equation (5) with dependent variable as Pr ($ABNML_t$ = 1|X) where X is the set of explanatory variables. *ABNML* is defined as in equation (4) and is the measure of financial distress. *LNSIZE* is the log of total book assets (*TA*). *WCTA* is the ratio of working capital to total assets. *CLCA* is current liabilities divided by current assets (*CA*). *CLTA* is current liabilities divided by total assets. *LLTA* is long-term liabilities divided by total assets. *TLTA* is the ratio of total liabilities (*CL* + *LL*) to total assets. *EBITTA* is the ratio of EBIT (earnings before interest and taxes) to total assets. *NEGTWO* is set to be equal to 1 if *EBIT* is negative for the last two years and 0 otherwise. *GROW* is the McKibben (1972) growth ratio defined in equation (6). Specification (I) is the basic model as in Ohlson (1980). Specification (III) adds current liabilities in the regression and specification (II) excludes working capital from specification (II). Specification (IV) removes the size variable to check whether there exists any size effect. Specification (V) splits *TLTA* into *CLTA* and *TLTL* to look at the effects of different liabilities. Specification VI adds in a pre-1992 university dummy. Specification (VII) is the one used in the simulation in Section VII. Robust *t*-statistics are reported in the parenthesis and *, **, *** stand for 10%, 5% and 1% significance levels, respectively.

Specification	Constant	LNSIZE	WCTA	CLCA	CLTA	LLTA	TLTA	EBITTA	NEGTWO	GROW	PRE1992	LRI
I	9.01***	-1.25***	-0.75				5.73***	-14.34**	-1.12*	0.15		0.275
	(4.85)	(-6.63)	(-0.43)				(4.42)	(-2.38)	(-1.80)	(0.54)		
II	8.82***	-1.24***		0.02			5.74***	-14.88**	-1.13*	0.16		0.274
	(4.82)	(-6.68)		(0.10)			(4.45)	(-2.55)	(-1.80)	(0.58)		
III	9.21***	-1.26***	-1.25	-0.10			5.73***	-14.17**	-1.11*	0.14		0.275
	(4.62)	(-6.60)	(-0.50)	(-0.28)			(4.44)	(-2.32)	(-1.77)	(0.49)		
IV	-4.74***		3.75*	0.54*			4.50***	-2.63	-0.97*	-0.09		0.072
	(-7.67)		(1.72)	(1.70)			(3.65)	(-0.51)	(-1.65)	(-0.32)		
V	10.17***	-1.36***	-0.81		4.38***	7.32***		-12.99**	-1.17*	0.11		0.280
	(4.81)	(-6.36)	(-0.45)		(2.61)	(4.06)		(-2.27)	(-1.88)	(0.40)		
VI	7.99***	-1.14***	-1.06				6.39***	-12.63**	-1.29**		-2.79***	0.321
	(4.01)	(-5.62)	(-0.57)				(4.84)	(-2.44)	(-2.06)		(-2.58)	
VII	8.91***	-1.24***	-0.83				5.70***	-13.10**	-1.08*			0.274
	(4.82)	(-6.62)	(-0.47)				(4.41)	(-2.51)	(-1.77)			

An alternative method to check for the predictive ability of the model is a 2×2 matrix of the hits and misses of a prediction rule such as

$$\hat{y} = 1 \text{ if } \hat{F} > F^{*} \text{ and } 0 \text{ otherwise.} \qquad (8)$$

where $\hat{F}$ is the estimated probability from the model and F^{*} is a threshold value or 'cut-off' point, which is usually set to be 0.5. In the context of a financial distress prediction model a `hit' means an observation is predicted to either be in financial distress or not, and the sample is also classified according to whether it is in actual financial distress or not . A `miss' means a wrong prediction of the model for either a financially distressed or non-financially distressed firm. An error is Type-I if the estimated probability is greater than the cut-off point and the firm is non-financially distressed and Type-II if the probability is less than the cut-off point and the firm is financially distressed. This is an intuitive way to check the predictive power of the model since one can easily calculate the proportion of the sample that has been correctly predicted.

There is no criterion for the best cut-off point to use: it depends on the setting and on the criterion function upon which the prediction rule is based. In the multivariate discriminant analysis a "good" model is one that minimizes the sum of the two types of the errors. Table 3 shows the prediction results for specification VII in Table 2 using a 0.5 cut-off point.

Table 3
Accuracy Matrix for the Logit Model

The table depicts the performance of the logit model defined in equation (5) by looking at how many observations are correctly identified by the model as being financially distressed or non-distressed. The empirical specification used is Specification (VII) in Table 2. ***Predicted*** is the projected financial conditions identified by the logit model using a cut-off point of 0.5. ***Actual*** is the financial condition of an institution defined by the value of *ABNML*.

		Predicted		
		Non-distressed	Distressed	Total
Actual	Non-distressed	570	2	572
	Distressed	33	5	38
	Total	603	7	610

The table shows that the model predicts 575 out of 610, or 94.3 percent, of the observations correctly. Considered jointly with the likelihood ratio index of 0.27, the result is suggestive of a good fit. The finding that only 5 out of 33 institutions are correctly identified as in a financial distress is not surprising given the above arguments. Note that in this sample of 610 observations, only 38, or 6 percent, are identified as in financial difficulties (ie *ABNML* = 1), which means that the average predicted probability of financial distress is also 0.06. As such, it may require an extreme configuration of regressors even to produce an estimated probability of 0.2, to say nothing of a value of 0.5. The reasoning is because a one half chance of financial distress for the higher education sector is very high given that these are public sector institutions. Reducing the cut-off point will increase the correct prediction for distressed institutions but will also increase the predictive error for non-distressed institutions[15].

An alternative method of checking the performance of the model is to compare the results of our financial distress predictions with the results of other models within a similar sample. Recently the Education Guardian (10th July, 2007) released a list based on information obtained from the Higher Education Funding Council for England under the Freedom of Information Act, naming 46 universities (about one third of the total) from England on the HEFCE's list of colleges at risk of financial failure between 1998 and 2003. HEFCE had established a model to assess the financial performance of higher education institutions, but this model was not publicly accessible. It contained four risk categories: first: institutions at immediate risk; second: at risk unless urgent action was taken; third: at risk unless action was taken; and lastly: no risk.

The empirical financial distress prediction model in our paper is attempting to simulate the HEFCE prediction model using publicly available information. Our estimated probabilities are calculated from the logit regression and the 30% of institutions with the highest probabilities of financial distress are compared with the institutions identified by HEFCE as to fall within their first two risk categories, i.e. those institutions with immediate risk or at risk unless urgent action was taken.[16] For

[15] These results are not reported.
[16] There are 159 English higher education institutions covered in the sample; therefore the top 30th percentile should give a reasonable match with the list of 46 institutions identified as being at risk by HEFCE.

the set of the institutions that appear on both the HEFCE list and also in the dataset in this paper (that is, 36 out of 46 institutions), 25 institutions from the top 30 percentile from the sample appear at least once on the HEFCE list. This implies that the model used in this paper predicts over two thirds of the universities that are likely to encounter a financial distress correctly. Given that three year's worth of data from 1998 to 2000 that formed part of the Guardian list are missing from the HESA dataset in this research, the result provides strong evidence that the model used in this paper is appropriate and can be used to simulate the Pension Protection Fund insolvency risk and the risk-based levy in the next section.

V The UK Pension Protection Fund

The UK Pension Protection Fund is a statutory fund run by the Board of the Pension Protection Fund, established under the provisions of the Pensions Act 2004. It was established to pay compensation to members of eligible defined benefit pension schemes, when there is a qualifying insolvency event in relation to the employer and where there are insufficient assets in the pension scheme to cover Pension Protection Fund levels of compensation. Existing schemes are charged an annual levy, which is a mixture of a scheme-based and a risk-based levy. The scheme-based levy is based on the scheme's pension liabilities and makes up 20% of the total pension protection levy. The risk-based levy is based on the scheme's underfunding risk and the insolvency risk of the sponsoring firm. The Pensions Act 2004 prescribes that after a transitional period at least 80% of the pension protection levy (the levy) must be risk-based.[17] McCarthy and Neuberger (2005a) provide a model of a generic pension protection fund in which claims of the fund are infrequent but lumpy, and question whether the PPF will be able to build up sufficient reserves to be self-financing.

Together, the scheme-based levy and the risk-based levy make up the total PPF levy. From 2006/07 onwards, according to PPF (2006) the scheme-based levy is just proportional to the scheme's PPF protected liabilities L

[17] As PPF (2005c) makes clear that although in the longer term it is intended that around 80% of the levy will be raised through the risk-based element, in the early years of the scheme this principle is modified to allow for a gradual introduction of the risk-based levy. In the first year of the scheme in 2005/06 the initial levy was a flat rate calculated at £15 per member and pensioner, and £5 per deferred member.

$$SBL = 0.00014 \times L$$

where in 2006/07 the factor of proportionality is set as 0.00014. This long-term value of this parameter will be set to ensure that the scheme-based element comprises approximately 20 per cent of the pension fund levy. Generally speaking, the PPF protected liability is the level of compensation that would be paid if the scheme were transferred to the PPF, it can either be the complete actuarial valuation according to section 179 of the Pensions Act 2004 or the adapted MFR (minimum funding requirement) liability (but only for 2006/07 is MFR valuation eligible). Normally it should be smaller than the 'true' pension liabilities such as FRS17 or IAS19 liabilities[18].

In order to calculate the risk-based levy the Board of the Pension Protection Fund considers the level of scheme underfunding (underfunding risk) and the likelihood of sponsoring employer insolvency (insolvency risk) and may also consider the asset allocation and any other risk factors that may be prescribed in regulations when setting the risk-based pension protection levy, which is reflected in the levy scaling factor the Board sets up and updates annually.

According to the PPF (2005b), the most recent risk-based levy (RBL) formula set by Pension Protection Board is calculated as

$$RBL = U \times P \times 0.8 \times c \tag{9}$$

where U is the underfunding risk, P is the PPF assumed probability of insolvency, 0.8 is the percentage risk-based for levy year 2006/07 and c is the levy scaling factor,

[18] According to the Pensions Act 2004, PPF protected liabilities include: (a) the cost of securing benefits for and in respect of members of the scheme which correspond to the compensation which would be payable, in relation to the scheme, in accordance with the pension compensation provisions if the Board assumed responsibility for the scheme in accordance with this Chapter, (b) liabilities of the scheme which are not liabilities to, or in respect of, its members, and (c) the estimated cost of winding up the scheme. Therefore the liabilities of the Pension Protection Fund shall be "any sums or properties falling to be paid or transferred out of the Fund required to meet liabilities listed in section 173(3) of the Act; and the value of a liability shall be the present value of that liability at the valuation date". As a comparison, a typical FRS17 liabilities for a pension plan is liabilities of the Pension Protection Fund is (a) any benefit promised under the formal terms of the scheme; and (b) any constructive obligations for further benefits where a public statement or past practice by the employer has created a valid expectation in the employees that such benefits will be granted.

which will be set at 0.53 for levy year 2006/07. The Board decided to set the risk-based levy cap, after the application of the levy scaling factor, at 0.5% of section 179 liabilities in order to protect weaker schemes and no risk-based levy is payable for schemes that are more than 125% funded on a PPF basis. McCarthy and Neuberger (2005b) criticise the proposed PPF levy structure in Pension Protection Fund (2005a) on the basis that the risk-based structure relies on taxing the weakest schemes, which is infeasible as it will significantly increase the financial burdens for already distressed firms.

The underfunding risk is a measure of a participating scheme's pension fund deficit and this value is decreasing as the PPF funding level (scheme assets divided by liabilities) of the scheme increases. According to PPF (2005b), if a scheme is less than 104% funded on a PPF funding level, then the underfunding risk will remain the difference between 105% of the value of PPF liabilities and the value of scheme assets:

$$U = 1.05 \times L - A \tag{10}$$

For schemes that are funded above 104% on a PPF funding basis, the underfunding risk is tapered from 1% of PPF liabilities at the 104% funded level down to 0% in steps of 0.25%. This approach is detailed in table 4.

Table 4: Pension Protection Fund Underfunding Levy

Pension Protection Fund funding level %	Assumed level of underfunding for levy formula
< 104	$1.05 \times L - A$
= 104	$0.0100 \times L$
104 – 111	$0.0075 \times L$
111 – 118	$0.0050 \times L$
118 – 125	$0.0025 \times L$
>= 125	0

It can be seen that the greater the participating scheme's assets exceed its liabilities, the lower is the underfunding risk.

The PPF assumed probability of insolvency is calculated in conjunction with a third party provider. In 2006/07 this was Dunn & Bradstreet (D&B). The assumed probability of insolvency for the risk-based levy is calculated by identifying each participating scheme as being in one of the 100 risk bands related to the D&B failure score (the higher the score the lower the insolvency risk). Each risk band has an associated assumed probability of insolvency which is capped at 15%.

One of the complications regarding the risk-based levy arises from the structure of the eligible pension schemes. An eligible pension scheme covered by PPF can either be sponsored by a single employer (single-employer scheme) or more than one employer (multi-employer scheme) and according to the initial findings reported in Pensions Protection Fund (2005a), many of the largest 500 pension schemes are multi-employer schemes with over 100,000 participating sponsoring employers between them. For a single-employer scheme the Board only needs to consider the risks underlying this individual employer when calculating the pension protection levy. However the risks faced by a multi-employer scheme may be different to those faced by single-employer schemes. The structure and the rules of different types of schemes have an impact on how the risk is shared among participating employers and therefore on the calculation of levy risk factors. Multi-employer schemes are classified into several categories according to the Pension Protection Fund (Multi-employer Schemes) (Modification) Regulations 2005 (or the Pension Protection Fund (Multi-employer Schemes) (Modification) Regulations (Northern Ireland) 2005) depending on whether the employers in the scheme are from the same or similar sectors (sectionalised/non sectionalised) and whether the scheme has an option or requirement to segregate upon cessation of a participating employer.

For schemes with neither a requirement nor discretion to segregate on cessation of participation of an employer a 'last-man-standing (LMS)' pension protection levy applies, under which the Board will not trigger an 'assessment period' until the last employer in that scheme becomes insolvent. For multi-employer sections/schemes with an option or requirement to segregate on cessation of participation, the scheme pays a 'segmented' levy, which means each sponsoring employer is only responsible for its own pension liabilities and in the event of insolvency, only the insolvent firm's pension liabilities are transferred to the PPF, not the whole scheme[19].

[19] According to the Pension Protection Levy Consultation Document December 2005, the Board will also undertake another calculation (calculation A) where the insolvency probability for the scheme will be the assumed

For both LMS and segmented multi-employer schemes the insolvency risk is calculated as the weighted average probability of insolvency for all participating sponsoring employers, but in the case of an LMS arrangement, these probabilities are adjusted by a scaling factor $\delta < 1$ to reflect the degree of correlation across the employers in the scheme[20].

Hence, the scaling factor ensures that the last-man-standing risk-based levy is lower, but raises a cross-subsidy issue, since an insolvent participating employer will be funded by the rest of the employers in the set of multi-employers. Consequently there is a potential moral hazard problem, since managers of the participating pension schemes may behave irrationally or undertake risky activities once they realise that their pension fund is partially ‘insured’ by other firms in the scheme. Formally, for a segmented arrangement the levy is

$$RBL_S = U \times P_S \times 0.8 \times c \qquad (11)$$

For a LMS arrangement the levy is

$$RBL_{LMS} = U \times P_{LMS} \times 0.8 \times c \qquad (12)$$

The only difference between the risk-based levy for segmented and last-man-standing schemes is the calculation of the insolvency probability P,

$$P_S = \sum_i^N \frac{employee_i}{employee_{\mathrm{ALL}}} \times p_i \qquad (13)$$

where p_i is the assumed probability of insolvency for each participating employer/scheme. For all multi-employer last-man-standing schemes the assumed insolvency probability will be the same weighted average probability multiplied by a

insolvency probability of the sponsoring employer with the most members. Where the weighted average calculation (calculation B) applies, the insolvency risk will be determined by taking the minimum of calculation A and calculation B.

[20] The PPF defines an associated pension scheme as one that has more than one sponsoring employer and where the sponsoring employers are financially dependent or linked to the same parent company .For associated schemes the scaling factor is 0.9 whilst for non-associated schemes the scaling factor is the ratio between members of the largest employer and the total number of members for the entire scheme.

scaling factor defined as:

$$P_{LMS} = P_S \times \delta \tag{14}$$

with δ as the scaling factor.

VI Simulated PPF Risk-based Levies for USS under Different Arrangements

The Universities Superannuation Scheme Ltd publishes annual reports and accounts that provide information on the Pension Protection Fund levies in the statement of operating costs. For the year ended 31 March 2007, the total PPF levy for the USS, currently participating in the PPF according to a last-man-standing basis, was £3.142 million, and this was the first year that the PPF split the levy into scheme-based and risk-based parts. According to the information provided by the USS, on 31 March 2006 it had a PPF liability of £22,214 million and its funding level on a PPF basis was 124%. Based on this information, one can use the risk-based levy formula given in equation (9) to calculate the implied aggregate probability of insolvency that the PPF applies to USS.

Using the information on the scheme's PPF liabilities and the PPF funding level provided by the USS, the scheme-based levy is 0.014% of the PPF liabilities, equal to £3.11 million so the estimated risk-based levy for 2006/07 is £0.032 million[21]. As USS is 124% funded, the underfunding risk is 0.25% of PPF liabilities, equal to £55.52 million. Using the levy formula in equation (9), the implied P_{LMS} is 0.14% for year 2006/07. Within the 100 insolvency risk bands imposed by the PPF, this is equivalent to a D&B failure score of 99, and is extremely low-risk in terms of the PPF's measure of insolvency risk[22].

However consider an alternative measure of university insolvency risk implied by the Guardian list of 46 universities identified by HEFCE to be at risk of financial failure over the five-year period between 1998 and 2003. Now we obtain a completely

[21] Therefore when the USS accounts refer to the increase being due to "the increase in the levy rate calculated by the PPF (and its new risk-based calculations)", it is actually referring to the change in the way the scheme-based levy is calculated.

[22] The insolvency probability of 0.14% is based upon a failure score across all USS employers which represents a overall D&B score of 99. Although the method by which D&B on behalf of the PPF decided that the scheme's score should be 99 wasn't shown, the PPF would have calculated the average failure score across the employers with each employer weighted based upon the number of members it has.

different picture. Even if these 46 universities fell into financial distress no more than once over the five years, this would imply an average probability of financial failure of over 5%, a number that's over 30 times higher than the PPF implied probability of insolvency![23] Of course one might argue that universities as public sector organisations will never be allowed to go bankrupt as the government will provide sufficient funds, in the event of insolvency and the PPF implied probability is a reflection of this fact. However this would imply inconsistencies in the use of the HEFCE term "at risk", and/or the amounts of risk-based levies collected by the PPF from USS. Either some individual universities are at serious risk of financial failure and the PPF levy should reflect this, or universities are not at serious risk, in which case why does the PPF collect any risk-based levy from USS in the first place?

Other inconsistencies in the PPF funding have been emphasised by McCarthy and Neuberger (2005a, 2005b) and Blake et al (2007). McCarthy and Neuberger (2005a) show that there is a large chance the PPF will default on its liabilities if it sticks with its proposed levy structure and it will also raise severe moral hazard and agency problems. Blake et al (2007) make similar arguments by comparing the PPF regulation with the regulatory system applied to other financial institutions like banks and insurance companies, as well as with the government-sponsored schemes in other countries such as the Pension Benefit and Guarantee Corporation in the US. McCarthy and Neuberger (2005b) criticise the risk-based levy for its reliance on weaker schemes to pay the levy, and propose an alternative levy structure through a less distortionary mechanism which also considers seriously underfunded firms not being able to afford the PPF levy.

We will now proceed by assuming that there is a "real" risk of some universities becoming insolvent, and we will simulate the appropriate aggregate P_{LMS} that USS should pay, based on the individual insolvency probabilities of each institution calculated from our financial distress prediction model. The simulation uses the estimated probabilities from 2004/05 since this is the most recent HESA data available to us and we believe provides an adequate approximations for the

[23] This number is calculated as (46/5)/(140+46) = 4.95% (where 5 is the number of sample years; 46 is the number of institutions identified by HEFCE as at risk in the Guardian articles; and 140 is the other universities not at-risk referred to in the Guardian article over the period 1998-2003).

insolvency risk for the following years.

The information in USS 2005/06 Reports and Accounts on the participating members in each institution enable us to estimate the weighted average probability of insolvency across institutions. Table 5 shows the composition of USS member institutions and comparison with the available institutions reported in the HESA dataset. The membership numbers for a PPF scheme, according to the PPF (2005a), is the sum of active, deferred and pensioner members. As USS only provides splits of active and pensioner members of the scheme, the number of PPF members in our simulations used the sum of the active and pensioner numbers[24]. It can be seen that within the HESA data for 2005/06, 109 institutions can be matched with the USS membership statistics. Within these 109 institutions, only 9 are non-university and the rest are all university institutions. Although losing 80 university institutions and most of the non-university institutions, the HESA data captures a total membership of 139,288 which includes more than 90% of the total PPF members.[25] We believe our sample is sufficiently representative to estimate the distribution of the PPF levies for USS.

[24] The only information given by USS on deferred members is that the total number of deferred pensioners on 31 March 2006 is 66,065.

[25] Most of the 80 missing institutions are the subsidiary colleges of Oxford and Cambridge Universities which USS counts as separate institutions in its database.

Table 5
Comparison of USS Membership Statistics

This table shows the composition of USS membership and the USS members that can be matched with the HESA HE Finance Plus dataset for year 2005/06. Under the column labelled Number of institutions, HESA is the number of institutions that are within the HESA Finance Plus dataset and are also USS participating institutions and USS is the total number of USS participating institutions. The number of PPF members is the sum of active and pensioner members, high and low are institutions with the highest and lowest number of PPF members.

		Number of institutions						
		HESA	USS	Active members	Pensioner members	PPF members	High	Low
University institutions	England and N. Ireland	81	159	92,238	29,390	121,628	7,468	0
	Wales Total	8	9	5,654	1,956	7,610	3,472	10
	Scotland Total	11	12	14,114	4,363	18,477	4,706	0
All University Institutions Total		100	180	112,006	35,709	147,715	–	–
Non-university Institutions Total		9	200	3,623	833	4,456	295	0
All Institutions Total		109	380	115,629	36,542	152,171	–	–

Table 6
Statistics for Estimated Probabilities of Financial Distress

This table reports the yearly simulated probabilities of insolvency for UK higher education institutions (that participate in the USS) estimated by the logit model defined in equation (5) using the coefficient estimates in specification (VII) of Table 2 from financial year 2001 to 2004. Low and high stand for the lowest and the highest value, and 25% and 75% stand for the 25 and 75 percentile of the estimated values, respectively.

	Estimated financial distress probabilities by year						
Year	Sample size	Mean	Median	Low	High	25%	75%
2001/02	100	5.32%	1.92%	0.03%	79.67%	0.82%	3.77%
2002/03	99	4.56%	1.83%	0.02%	67.61%	0.80%	4.76%
2003/04	107	4.62%	1.40%	0.03%	71.36%	0.73%	3.95%
2004/05	109	3.95%	1.42%	0.02%	44.92%	0.73%	3.71%
Overall	415	4.60%	1.59%	0.02%	79.67%	0.77%	4.02%

Table 6 shows the basic distribution of the estimated financial distress probabilities from equation (5). The mean probability of financial distress for the entire 4-year sample is 4.6%, which matches the probability implied by the Guardian list of 46 universities identified as being at risk (implying approximately 5% probability of annual insolvency risk). In Table 6, the mean estimated probability of financial distress is decreasing for the 4 sample years, and is supportive of the claim made by the HEFCE in Education Guardian (2007) that higher education institutions have improved their finances over the period.

Using the logit model in equation (5), we estimate the individual insolvency risk associated with each of the universities participating in USS. We then compute the aggregate insolvency risk as the weighted average of these probabilities using equation (13). We calculate this aggregate probability P_S, to be 1.20%, and since the current USS participation in the Pension Protection Fund is on a last-man-standing basis, with a scaling factor δ = 0.9, then from equation (14), the simulated P_{LMS} is 1.1%. This is greater than the implied insolvency probability P_{LMS} of 0.14% obtained from the aggregate USS accounts.

By comparing these two sets of probabilities, our estimates suggest that currently, USS member institutions appear to be paying less than the fair risk-based levy. However this is because during the initial phase of the PPF the risk-based levies are much lower as a proportion of the total levy than the intended steady-state value. The implication is that if USS paid the same total levy but where the risk-based component was four fifths of the total, then USS would be paying substantially more than its fair risk-based levy.

Having assessed whether the risk-based levy paid by USS members is fairly priced, we now turn to the implicit cross-subsidy under a last-man-standing PPF levy relative to a segmented arrangement. As we have seen, as a multi-employer defined benefit pension scheme, USS contributes to the PPF under a last-man-standing basis and benefits from the less-than-perfect positive correlation between the solvency of the schemes' institutions. However the scaling factor of 0.9 for associated schemes means that the total risk-based levies do not differ dramatically whether the USS participates as an LMS scheme or as segmented schemes, since the scaling factor is so close to unity. The main difference between the last-man-standing and segmented participating methods arises from the cross-subsidy among the schemes — under LMS institutions with lower risks pay a higher pension protection levy for those more financially distressed institutions. In addition, whenever these riskier institutions become insolvent the remainder of the institutions will be obliged to fund those insolvent schemes. Evidence of the existence of the cross-subsidy phenomena would be a highly asymmetric distribution of risk-based levies paid by individual participating institutions skewing towards lower values (i.e. left-hand towards the mean value). This idea is the starting point for the empirical design to compare the two alternative risk-based levies.

In order to simulate the distribution of risk-based levies for individual institutions, we first need to estimate imputed values for PPF liabilities for each institution. These are imputed values since USS is constituted as a mutual organization and there is no provision within USS rules for a segmentation arrangement. USS Ltd publishes in its annual report and accounts membership statistics for all participating institutions each year which include the number of the members in each institution as well as the value of the USS pension assets and liabilities under FRS17 Retirement Benefit. We estimate pension liabilities for individual member institutions on the basis of the number of USS members within that institution, and is calculated as

$$PensionLiability_i = PensionLiability_{USS} \times \frac{Members_i}{Members_{ALL}} \tag{15}$$

where subscript *i* indicates the *i*th institution and subscript *USS* stands for the data for the entire Universities Superannuation Scheme. Assuming the same funding level with the USS (124%) for all participating institutions, the underfunding risk is therefore 0.25% of the PPF liabilities for each institution according to Table 4. Moreover considering that the USS members within the HESA dataset are only proportional to the total number of USS members as shown in Table 5, we therefore scale the total USS pension liabilities by the ratio of the total number of HESA-USS members to the total number of USS members[26].

From Table 6 we know that the average estimated probability of insolvency for 2004/05 is 3.95%, which is lower than the average for 2005/06 using samples that can be retrieved from the USS annual report only (5.9%, results not reported). This is because some institutions with extremely high estimated probabilities cannot be retrieved from the USS membership data, which are then excluded from the simulation. Recall that the weighted average simulated probability of insolvency was 1.2% - much lower than the arithmetic mean. This finding confirms the result from the logit regression that it is the small institutions that are more likely to encounter financial difficulty, and these institutions will have a low weight in the average

[26] The total number of members of the USS institutions in the HESA dataset is 139,288 (result not reported) and the total USS members as shown in Table 5 are 152,171, therefore the scaling factor is 139,288 divided by 152,171, which is equal to 0.92.

probability.

If the weighted average simulated probability were scaled properly as a last man standing associated scheme by 0.9, this would imply that the USS insolvency probability is 1.08%. Using these weighed average probabilities in the 100 risk bands to calculate the Pension Protection Fund assumed probability of insolvency, the USS falls between the 74th (with assumed insolvency probability of 1.11%) and 75th band (assumed probability of 1.06%), which is consistent with the view that universities have a low risk of financial failure. The fairly-priced risk-based levy simulated from PPF formula equation (9) should be £255,542 for 2006/07, which works out to an average of £1.70 for each individual USS member.

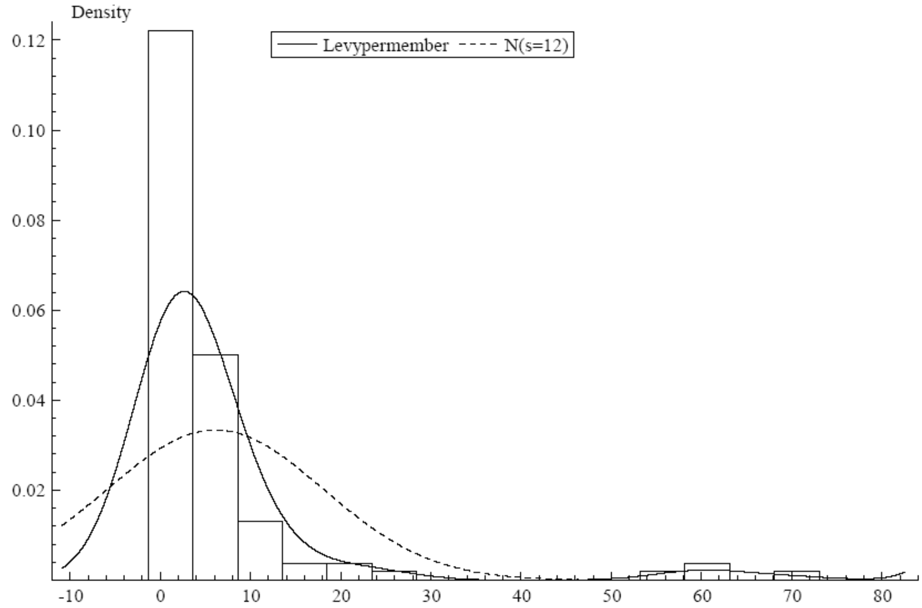
Graph 1 depicts the histogram and the density for the distribution of the estimated levies per USS member using forecasted probabilities of financial distress for 2004/05. The numbers for each institution are listed in Appendix 1. Using levy per member rather than levy per participating institution guarantees that the value of the levy does not pick up the size of the institution and the levy reflects directly the probability of financial distress for each institution. Compared to the normal distribution, represented by the dashed line, the distribution of the simulated risk-based levy is obviously asymmetric and positively skewed (i.e. to the left). From the histogram which describes the frequencies for different levy values, the range of levy with the highest frequency is also the smallest range of levies, which is between £0 and £4 per member and most of the distributions clustered within the levy below £10 per member. The peak for the probability density function for risk-based levy, which is just more than £2, is significantly lower than that of the sample mean of £6, which is depicted by the highest point of the normal distribution. This can be seen more intuitively from Graph 2, where the distribution of the simulated risk-based levy is compared to that of the normal distribution.

These findings suggest that under a segmented participating rule for the PPF most of the USS member institutions would pay a relatively low risk-based levy. However the fact that the levies with the highest frequencies are less in value than the mean levy across all USS members means that schemes paying higher levies are contributing more than those paying lower levies. Schemes that pay high levies are normally larger institutions with high pension liabilities and therefore larger underfunding risk and from the regression results they are usually low risk institutions.

The levy paid by the USS under the last-man-standing rule is just a weighted average of individual levies and therefore this is evidence of the cross-subsidy amongst the participating schemes where low-risk institutions provide a free insurance to those with higher risk of failure because they have to use their own assets to pay for the deficits of the high-risk institutions as long as the USS as whole stays solvent. This cross-subsidy is a cost to the financially secure universities. The last-man-standing arrangement is a consequence of the mutual organisation of USS, and the cross-subsidy disadvantages, may be outweighed by other advantages of mutuality.

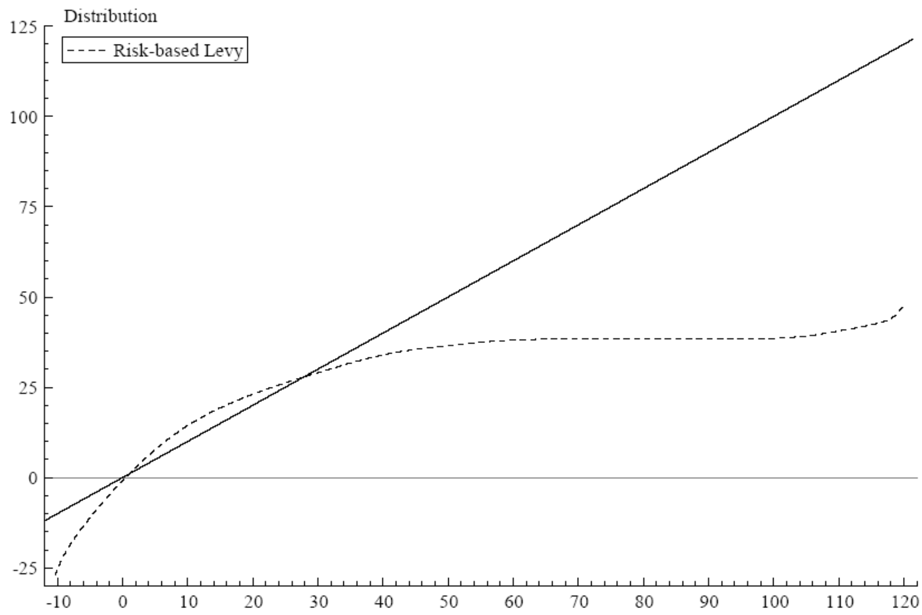
We note that there are other advantages from USS being organised as a mutual institution. First there may be economies of scale in pension fund management, from having a single large pension fund, rather than a large number of smaller ones. However the optimal arrangements for pension fund management are unclear, since the economies of scale advantages need to be weighed against any second-best principal-agent considerations in a delegated portfolio management environment (Sharpe, 1980; Lakonishok, Shleifer and Vishny, 1992; Kapur and Timmermann, 2005; Tonks, 2006; van Binsbergen, Brandt, and Koijen, 2008). Second, the existence of an industry-wide pension scheme allows for flexibility in job turnover across the participating institutions (Dorsey, 1995; Blake and Orszag, 1998; Blake, 2000). Thirdly, it is well known from the corporate governance literature (Smith and Stulz, 1985; Guay, 1999; Huang and Sudarasanam, 2006), that risk-averse executives, whose human capital is tied up in their organisation, under-invest in risky projects: a segmented university pension scheme might result in decision-makers at universities making sub-optimal investment decisions.

Graph 1: Histogram and Density for the Simulated Risk-based Levy (per member) against Normal Distribution



* Source: HESA HE Finance Plus.
** Simulated using data for 2004/05 under the formula set by PPF for 2006/07.
*** Results using Specification VII in Table 2.
**** Levy value represented by the horizontal axis which is scale in £ sterling.

Graph 2: Distribution of the Simulated Risk-based Levy against Normal Distribution



* Source: HESA HE Finance Plus.
** Simulated using data for 2004/05 under the formula set by PPF for 2006/07.
*** Results using Specification VII in Table 2.
**** Levy value represented by the horizontal axis which is scale in £ sterling.

VII. Robustness Checks

An alternative measure of financial distress in higher education institutions are variables related to the earning power of that institution. EBIT (earnings before interest and taxes) are a natural candidate since they are linked to both stock-based and flow-based aspects of the financial distress definition: a negative EBIT reflects the firm's inability to generate positive cashflows to cover future contractual and operating expenses and will eventually reduce the firm's assets. They are an indicator of poor performance and as they determine the fair value of firms' assets, are negatively related to firms' solvency. The model also adopts the logit model in Ohlson (1980) and Lennox (1999) and uses two-year consecutive negative earnings as predictors, which is equivalent to the independent variable $NEGTWO_t$ in equation (3).

As the model uses EBIT as the proxy for financial distress, it captures the components of earnings, normally equal to the difference between incomes and expenditures. We have already discussed that income of HE institutions mainly consists of funding council grants, tuition fees and research grants and contracts. Expenditure can be decomposed into staff costs, other operating expenses and interest payable. The remaining variables are typical control variables in bankruptcy prediction models, including *LNSIZE*, *WCTA* and *TLTA* as defined in Section II. The final model is in the form of

$$\Pr\left(NEGTWO_t = 1 \mid X\right) = \Lambda\left(X'\beta\right) = \Lambda(\alpha_0 + \alpha_1 LNSIZE_{t-1} + \alpha_2 WCTA_{t-1} + \alpha_3 TLTA_{t-1} + \sum_{i=1}^{4} \beta_i INCOME_{t-1}^{i} + \sum_{j=1}^{3} \gamma_j COST_{t-1}^{j} + \varepsilon) \tag{16}$$

where

$INCOME^1$	=	funding council grants/total asset
$INCOME^2$	=	tuition gees & education grants/total asset
$INCOME^3$	=	research grants & contracts/total asset
$INCOME^4$	=	other income/total asset
$COST^1$	=	staff cost/total asset
$COST^2$	=	other operating expenses/total asset
$COST^3$	=	interest payable/total asset

and the subscripts t and t – 1 imply that the data from the previous year is used to predict the EBIT value in the current financial year. Variables related to income should be negatively correlated to the probability of continuous low earnings and opposite should hold for variables depicting the costs. The rest of the explanatory variables should have the same sign as in the original model.

Table 7 reports the estimates of the parameters from the logit regression in equation (5) and the predicted probability of financial distress. As expected variables related to the income and expenditure streams are significantly correlated with the earnings pattern at 99% confidence interval. Higher income will lower the probability of continuously poor financial performance and vice versa for the cost-related variables. The combined coefficients on incomes and expenditures effectively cancel out. In all four specifications the size of an institution appears to be unimportant in predicting the probability of consecutive negative earnings. This might be because other variables scaled by total assets may capture the statistical significance of the size variable. However, size is still insignificant when regressed as the only explanatory variable (results not reported). Working capital is significant and is negatively correlated with the probability of consecutive negative earnings, as expected. This implies that working capital is important in explaining the income pattern of HE institutions. The total liabilities/total assets ratio is insignificant and with the wrong sign, indicating that the dependent variable is a poor proxy for financial distress in the HE sector. The estimated financial distress probabilities are more than 17% for all four specifications, and are much higher than the 6% mean probability predicted in the original model using unanticipated funding council grants as the predictor of financial distress.

In summary, using consecutive negative earnings as a predictor of financial distress partially confirms the relation between financial statement variables and the probability of financial distress. However it performs less well than the model using abnormal funding council grants as the proxy for financial distress both in the explanatory power of important variables and the predicted probability of financial distress.

Table 7

Robustness Tests Using Continuous Negative Earnings as the Financial Distress Predictor

The table represents the results for the logit regression described in equation (16) with dependent variable as Pr ($NEGTWO_t = 1|X$) where *X* is the set of explanatory variables. *LNSIZE* is the log of total book assets (*TA*). *WCTA* is the ratio of working capital to total assets. *CLCA* is current liabilities divided by current assets (*CA*). *CLTA* is current liabilities divided by total assets. *LLTA* is long-term liabilities divided by total assets. *TLTA* is the ratio of total liabilities (*CL + LL*) to total asset. *INCOME* and *COST* are as defined in equation (16). Specification (I) is the basic model as in Ohlson (1980). Specification (II) adds working capital in the regression and specification (III) includes current liabilities from specification (II). Specification (IV) only includes long-term liabilities as compared to specification (I). Robust *t*-statistics are reported in the parenthesis and *, **, *** stand for 10%, 5% and 1% significance levels, respectively.

Specification	Constant	*LNSIZE*	*WCTA*	*CLCA*	*LLTA*	*TLTA*	$INCOME^1$	$INCOME^2$	$INCOME^3$	$INCOME^4$	$COST^1$	$COST^2$	$COST^3$	Estimated Mean Prob.
I	-3.174**	0.180		0.438***		-2.315	-32.175***	-37.338***	-37.725***	-32.788***	35.517***	32.840***	69.463***	17.6%
	(-1.975)	(1.358)		(2.740)		(-1.513)	(-6.799)	(-7.057)	(-7.033)	(-6.827)	(6.984)	(6.932)	(3.268)	
II	-2.363	0.159	-4.541***			-2.130	-33.088***	-38.497***	-38.926***	-34.064***	36.658***	33.912***	65.266***	17.6%
	(-1.534)	(1.216)	(-3.130)			(-1.404)	(-6.907)	(-7.174)	(-7.107)	(-6.980)	(7.098)	(7.066)	(3.104)	
III	-2.543	0.167	-4.014*	0.079		-2.171	-32.922***	-38.358***	-38.767***	-33.878***	36.502***	33.744***	65.512***	17.6%
	(-1.543)	(1.251)	(-1.807)	(0.311)		(-1.424)	(-6.836)	(-7.124)	(-7.055)	(-6.896)	(7.040)	(6.992)	(3.106)	
IV	-2.475	0.164	-4.440***		-2.333		-32.369***	-38.603***	-39.021***	-33.682***	35.898***	33.194***	66.736***	17.6%
	(-1.623)	(1.265)	(-3.077)		(-1.229)		(-6.786)	(-7.211)	(-7.176)	(-6.923)	(6.961)	(6.936)	(2.827)	

VIII Conclusions

This paper has estimated the risks of financial distress of UK universities, and has then used these estimates to examine the basis of the annual levies paid to the UK's Pension Protection Fund by the Universities Superannuation Scheme, a multi-employer scheme covering 391 universities and related institutions. We have investigated the trade-off between the two PPF participating arrangements for multi-employer pension schemes, namely Last-Man-Standing and Segmented levies, using a sample dataset from participating USS higher education institutions We estimated an insolvency prediction model, using the allocation of unanticipated funding council grants as the proxy for financial distress, and we found that financially distressed institutions are smaller in size, with higher leverage ratio and lower earnings, which is consistent with the conventional results from the bankruptcy prediction literature. As a check on the predictive accuracy of our model, we compared the institutions identified as being in financial distress with the list of HE institutions at risk of financial failure disclosed by Education Guardian (10 July 2007). We find that over two thirds of the universities from the Guardian list can be retrieved by our financial distress prediction model.

We then used the information provided by USS Annual Reports to calculate the implied probabilities of financial distress. Then we compared this implied probability with the simulated financial distress probability using our empirical specifications to assess whether the Pension Protection Fund levies are fairly-priced. Our estimates suggest that in 2006/07 USS member institutions appeared to be paying less than the fair risk-based levy. However this is because during the initial phase of the PPF the risk-based levies were much lower as a proportion of the total levy than the intended steady-state values. The implication is that if USS had paid the same total levy but where the risk-based component was four fifths of the total, then USS would have been paying substantially more than its fair risk-based levy.

In addition by examining the distribution of risk-based levies for individual institutions under a simulated segmented PPF arrangement, we find a highly asymmetric distribution skewed towards lower values. This provides evidence of significant cross-subsidies under the current last-man-standing levy between participating USS institutions, from those institutions with better financial conditions to financially distressed institutions. Of course there may be advantages in USS mutuality, in terms of: economies of scale in pension fund management; flexibility in job turnover; and appropriate alignment of goals of the institutions and their executives. However the implied segmented levies make explicit the cross-subsidy between the financially stronger and weaker HE institutions.

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Appendix 1

Rank by RBL per member	University Name	USS Members	Estimated Risk-Based Levy	Estimated Risk-based Levy per member	On Guardian list?
1	UHI Millennium Institute	7	£486.59	£69.51	
2	School of Pharmacy	160	£9,815.95	£61.35	yes
3	Roehampton University	12	£727.91	£60.66	yes
4	Trinity College, Carmarthen	49	£2,839.10	£57.94	
5	Institute of Education	668	£16,650.43	£24.93	
6	Royal Northern College of Music	5	£115.71	£23.14	
7	University of Greenwich	4	£82.70	£20.68	yes x 2
8	Buckinghamshire Chilterns University College	126	£2,315.32	£18.38	yes
9	Liverpool Hope University	4	£56.42	£14.10	
10	Royal Agricultural College	1	£13.21	£13.21	
11	Bournemouth University	8	£99.11	£12.39	
12	University of Luton	10	£121.03	£12.10	yes
13	London School of Hygiene & Tropical Medicine	641	£6,336.53	£9.89	
14	Newman College of HE	56	£546.11	£9.75	
15	University of Wales, Lampeter	166	£1,553.03	£9.36	
16	Royal Veterinary College	325	£2,910.85	£8.96	
17	University of Keele	1236	£10,079.63	£8.16	
18	University of Worcester	29	£210.96	£7.27	
19	University of St Andrews	1258	£9,026.69	£7.18	
20	University of Sunderland	12	£85.18	£7.10	
21	University of Bath	1696	£11,027.98	£6.50	
22	University of Essex	1284	£8,152.37	£6.35	
23	Liverpool John Moores University	14	£88.64	£6.33	yes
24	University of Northampton	4	£25.30	£6.33	
25	University of Bradford	1377	£8,374.29	£6.08	
26	University of Wales, Newport	1	£5.75	£5.75	
27	University of Bolton	1	£5.75	£5.75	
28	London Metropolitan University	27	£154.93	£5.74	yes x 3
29	University of Abertay Dundee	4	£22.84	£5.71	
30	University College Falmouth	4	£22.58	£5.65	
31	University of Paisley	3	£16.72	£5.57	
32	University of Wales, Swansea	1667	£9,251.37	£5.55	
33	University of Stirling	1075	£5,902.92	£5.49	
34	Queen Margaret University College, Edinburgh	9	£48.44	£5.38	
35	University of Kent	1456	£7,379.00	£5.07	
36	Heriot-Watt University	1068	£5,318.54	£4.98	
37	St George's Hospital Medical School	571	£2,801.57	£4.91	yes
38	University of Lincoln	27	£124.92	£4.63	yes
39	University of Sussex	1478	£6,827.60	£4.62	
40	Oxford Brookes University	27	£123.27	£4.57	
41	Open University	7468	£30,657.84	£4.11	
42	London Business School	340	£1,359.58	£4.00	
43	University of Hull	1524	£5,867.16	£3.85	
44	University of Plymouth	38	£134.23	£3.53	
45	University of Westminster	21	£73.23	£3.49	yes
46	Goldsmiths College	751	£2,470.50	£3.29	
47	University of the Arts, London	11	£32.46	£2.95	
48	Birkbeck College	895	£2,597.21	£2.90	
49	London South Bank University	39	£93.02	£2.39	yes
50	De Montfort University	14	£33.15	£2.37	yes
51	University of East Anglia	1692	£3,987.41	£2.36	
52	University of Leicester	1833	£4,291.92	£2.34	
53	University of York	1918	£4,420.84	£2.30	
54	University of Huddersfield	19	£43.35	£2.28	

Rank by RBL per member	University Name	USS Members	Estimated Risk-Based Levy	Estimated Risk-based Levy per member	On Guardian list?
55	University of Surrey	1922	£4,226.26	£2.20	
56	Sheffield Hallam University	17	£36.09	£2.12	yes
57	Institute of Cancer Research	245	£518.07	£2.11	
58	University of Dundee	2056	£4,090.25	£1.99	
59	Aston University	957	£1,850.41	£1.93	
60	University of Durham	2140	£3,856.07	£1.80	
61	University of Wales, Bangor	1205	£2,147.37	£1.78	
62	Thames Valley University	11	£19.05	£1.73	
63	University of Salford	1623	£2,751.42	£1.70	
64	Kingston University	6	£10.00	£1.67	
65	Royal College of Music	2	£3.29	£1.65	
66	Royal Holloway and Bedford New College	984	£1,606.56	£1.63	
67	Loughborough University	1886	£3,022.73	£1.60	
68	School of Oriental and African Studies	667	£1,042.55	£1.56	
69	University of Southampton	3493	£5,389.68	£1.54	
70	University of Lancaster	1669	£2,554.66	£1.53	yes
71	University of Central England in Birmingham	13	£19.84	£1.53	
72	University of Teesside	2	£2.98	£1.49	
73	Swansea Institute of Higher Education	10	£14.62	£1.46	
74	University of Central Lancashire	17	£24.52	£1.44	
75	University of Warwick	2291	£3,251.66	£1.42	
76	City University	1618	£2,205.05	£1.36	
77	Royal Academy of Music	2	£2.68	£1.34	
78	University of Glamorgan	16	£20.78	£1.30	
79	University of Brighton	40	£50.19	£1.25	
80	London School of Economics and Political Science	1204	£1,482.83	£1.23	
81	University of Exeter	1732	£2,070.86	£1.20	
82	University of Nottingham	3553	£4,035.30	£1.14	
83	University of Hertfordshire	2	£2.25	£1.13	
84	University of Newcastle-upon-Tyne	3084	£3,029.37	£0.98	
85	University of Reading	2273	£2,202.30	£0.97	
86	Brunel University	1230	£1,181.60	£0.96	
87	University of Wales, Aberystwyth	981	£934.46	£0.95	
88	University of Wales Institute, Cardiff	10	£9.45	£0.95	
89	University of Leeds	4491	£3,738.87	£0.83	
90	University of Strathclyde	2520	£1,724.03	£0.68	
91	Queen Mary and Westfield College	2022	£1,357.36	£0.67	yes
92	Coventry University	38	£20.91	£0.55	
93	Manchester Metropolitan University	26	£13.61	£0.52	
94	University of London (Institutes and activities)	1168	£512.62	£0.44	
95	Imperial College of Science, Technology & Medicine	4124	£1,778.39	£0.43	
96	University of Sheffield	3758	£1,542.36	£0.41	
97	Nottingham Trent University	19	£7.72	£0.41	yes
98	University of Manchester	6505	£2,251.33	£0.35	
99	University College London	5437	£1,860.58	£0.34	
100	King's College London	3709	£1,193.56	£0.32	
101	Cardiff University	3472	£864.27	£0.25	
102	University of Bristol	3457	£794.64	£0.23	
103	University of Aberdeen	2249	£458.49	£0.20	
104	University of Liverpool	2934	£588.19	£0.20	
105	University of Birmingham	3827	£512.11	£0.13	
106	University of Edinburgh	4706	£405.54	£0.09	
107	University of Oxford	5491	£448.53	£0.08	
108	University of Glasgow	3529	£234.28	£0.07	
109	University of Cambridge	5712	£184.17	£0.03	

The total sample of the Guardian list contains 180 (English) universities of which 43 are deemed "at risk". From our table of 109 institutions (including non-English universities) 20 institutions can be found in the Guardian list. The entry "yes x n" means either the institution has been identified in the list n times or the n institutions have now merged as one. Many of the missing institutions have subsequently merged with larger universities that are not now at risk (e.g. Bretton Hall which is now part of University of Leeds) or they no longer exist. The rest of the missing institutions are due to not being identified from the USS membership data.