THE RELATIONSHIP BETWEEN HE RECRUITMENT LEVELS AND EMPLOYMENT LEVELS IN THE CONSTRUCTION INDUSTRY

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Reports published in 2003 predicted that if recruitment to construction management courses in Higher Education (HE) in the UK continued to decline at its current rate then within a ten-year period there would be no construction management courses left. This seemed to contradict what was being observed in the HE marketplace with increasing levels of recruitment being experienced. The aim of this research was to investigate the levels and patterns of recruitment to construction industry related courses in HE institutions and to investigate if there was any relationship with the level of employment in the construction industry. Statistical data was obtained for HE recruitment to construction industry related courses and for employment within the construction industry. It was found that recruitment levels exhibited cyclical characteristics not dissimilar to the cycles found in construction industry employment levels. Statistical analysis of the data was undertaken to establish whether any correlation existed and the nature of any correlation should it exist. It was found that there is a strong correlation, which is statistically significant, between HE recruitment levels and employment levels in the industry. It was also found that HE recruitment lagged employment levels by around five years. This has clear implications for HE providers of construction management courses when anticipating likely demand for courses.

Keywords: employment cycles, higher education, higher education recruitment, recruitment cycles.

INTRODUCTION

The cyclical nature of the construction industry with its accompanying periods of 'boom and bust' is widely reported and understood due to the importance of the industry to the national economy and employment. (e.g. Hillebrandt, 2000; Powell, 1982). Higher education institutes play a key role in the supply of graduates to the construction industry, and HE institutes had enjoyed a period expansion and growth in the provision of industry related courses, yet since in a time of industry boom, HE appeared to be experiencing a rapid decline, and 'bust' seemed to be inevitable for some HE provision.

Research being undertaken at the time (Hurst, 2003 & 2004) was identifying that the drivers that produced the cyclical nature of employment in construction industry were also significant drivers in determining applications and acceptances for construction industry related courses in higher education.

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Research was therefore undertaken to establish whether or not there was any relationship between employment levels in the construction industry and the levels of acceptances for university courses relating to the construction industry as this could act as an important predictor for HE in establishing the likely level of applications and acceptances, thus the viability of courses.

This research therefore seeks to test the hypothesis that there is an association between the level of employment in the construction industry and the level of recruitment to higher education courses in construction industry related topics.

HE RECRUITMENT AND INDUSTRY EMPLOYMENT

In January 2003 shockwaves permeated the UK construction industry with the publication of a report by Coulter examining the state of higher education in the construction industry (Clark, 2003; Clark & Nikkhah, 2003; and Sweet & Smith, 2003). The report, the outcome of a meeting between academia and industry, supported by CEBE (Centre for Education in the Built Environment) , LTSN (Learning and Teaching Support Network), CITB (Construction Industry Training Board), CIC (Construction Industry Council) and Rethinking Construction, in November 2002 considered the problems of attracting, recruiting and retaining graduates in the construction industry.

Coulter (2003: 4) reports:

- A 45% decline in building and construction course applications from 1994 to 2000.
- A decline in the standard of applicants for these courses.
- A decline in women students applying for building and construction courses.
- A decline in the number of graduates entering and staying in construction.

Coulter's report echoes the findings of the Fairclough Report and indeed quotes Fairclough (2002: 16):

> *... there has been a dramatic decline in the numbers on new entrants on construction related degree courses. If the current rates of decline were to continue into the future, the numbers of students in built environment courses would rapidly collapse. By 2009 the number of applicants to civil engineering courses would have fallen to 0, while the last applicant to building and construction courses would enter university by 2012.*

Fairclough was not the first to highlight the impending problems in graduate recruitment in the construction industry. Rethinking Construction (2000) reported 'applications to university courses have gone down dramatically over the last five years [1996 – 2000] by 34% in the case of architecture, rising to 50 – 52% for building/construction and civil engineering.' However it was not until the publication of Coulter's report that attention was drawn to Fairclough's comments and their significance became apparent. Whilst Rethinking Construction (2000), Fairclough (2002) and Coulter (2003) paint a picture of an unhealthy future for construction higher education they all refer to the number of applicants to courses. Reference to the statistics produced by UCAS (Universities Central Admissions Service) since

1994[1] for applications and acceptances indeed confirms the decline in interest in construction related degree courses. However an important distinction must be made between the number of applications being made, and the number of acceptances made, as an applicant may not be offered a place, may not achieve the entrance requirements, or may opt for a deferred entry, or an entirely different subject. Thus there is a disparity between the number of applications made and the number of acceptances made.

Figure 1 below shows the number of acceptances made for construction industry related degree courses

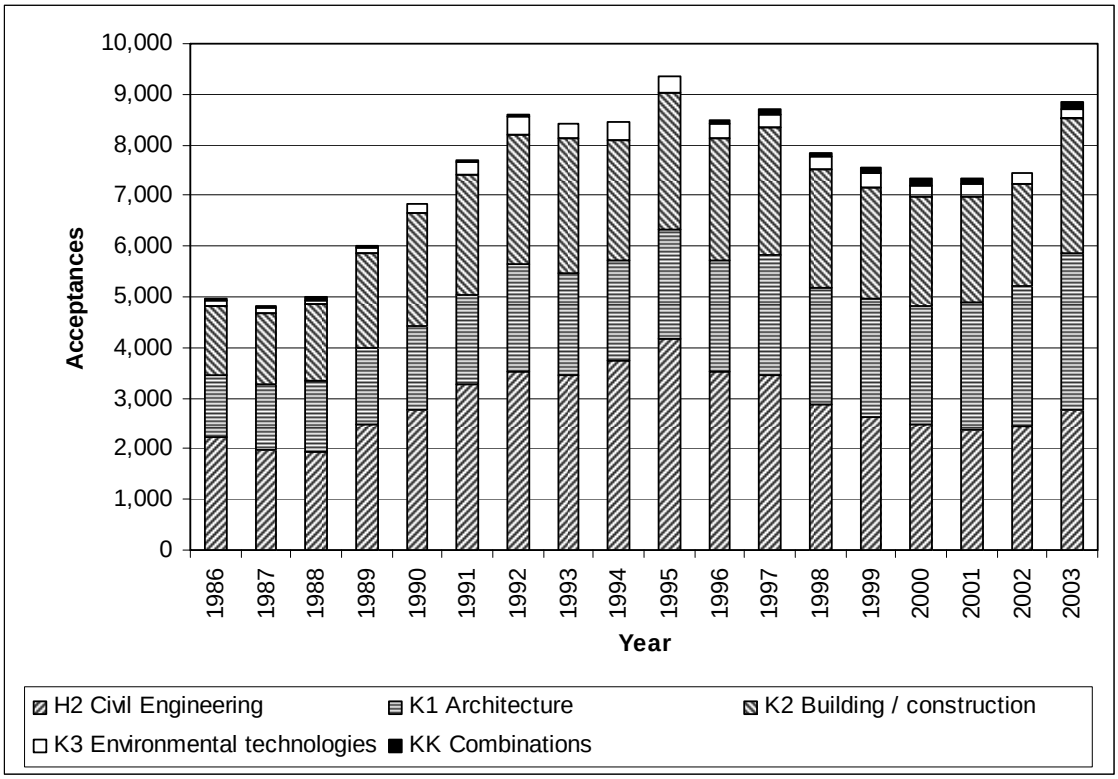


Figure 1: Acceptances to construction industry related degree courses:
Source: UCAS/UCCA/PCAS

As the focus of this research is upon construction a better picture of the state of higher education in these areas can be obtained by considering only civil engineering and building/construction degree course data as shown in figure 2. It is useful to consider these two segments of the industry together as the distinction between a building/construction company and a civil engineering company is often blurred with many firms undertaking both types of work.

It should be noted that Lighthill's report (2002) considers data only for the period 1994 to 2000 (where UCAS sourced) and in some cases 1996 to 2000 (where HESA (Higher Education Statistics Agency) sourced). Since these reports were produced there has been a levelling off of the decline in acceptances for construction industry related courses. Figures 3 and 4 show the respective graphs for civil engineering degree course acceptances and building/construction degree course acceptances.

[1] No statistics are available from UCAS for pre-1994 when UCAS was formed through a merger of UCCA (Universities Central Council for Admissions) and PCAS (Polytechnics' Central Admissions Service)

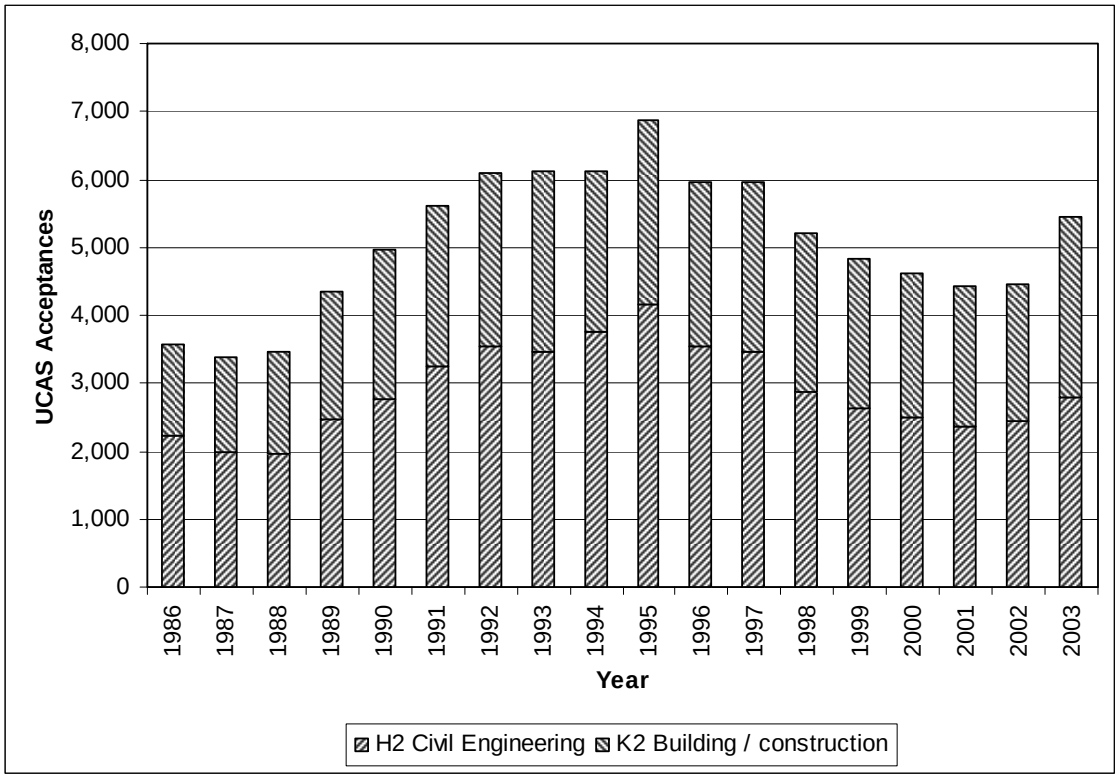


Figure 2 Acceptances to civil engineering & building/construction degree courses
Source: UCAS

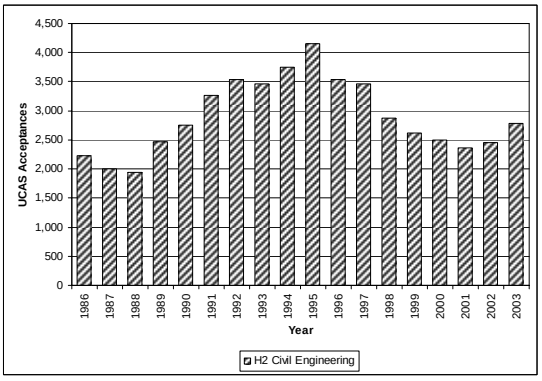


Figure 3: Civil engineering degree course acceptances

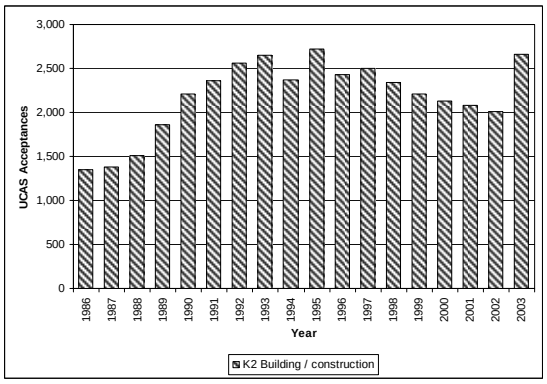


Figure 4: Building/construction degree course acceptances

The figures above, whilst confirming the decline in graduates, do not support the claims made by Fairclough (2002), who due to the limited period of data used for his report would appear to have based his projections on a naïve extension of the trend in applications. The addition of more recent data from UCAS is indicating a slowing in the decline in acceptances for building/construction courses and a slight increase for civil engineering courses. Whether this is the case or whether these figures are 'blips' in the trend will not be known until future figures for become available.

The problems of graduate recruitment are however not new in the construction industry. The Lighthill Report in 1986 was commissioned jointly by the BEC (Building Employers' Federation) and CIOB (Chartered Institute of Building) to

consider the problems of providing graduates for the construction industry. Lighthill (1986) reported that the number of degree courses had fallen from 22 to 19 in the previous two years in an environment of economic recession and contracting student numbers. Amongst Lighthill's recommendations were that the number of building[1] degree course places, and degree courses should be expanded to meet the growing demand for graduates, and that structured programmes for trainees in building management be developed.

At the same time as Coulter's (2003) report was being produced, the CIOB had commissioned its own report from Wilkie and Giddings (2003). Wilkie and Giddings (2003: 4) reported that since the 1986 Lighthill report the number of institutions providing degree courses had increased from 19 to 37, running 58 courses in 2002. It was also noted that since 1986 two of the original nineteen institutions had ceased running building degree courses. Wilkie & Giddings (2003) further report that since 2000 a further eleven courses have closed, and nine have yet to produce any graduates. Yet at the same time they acknowledge that the number of graduates produced has almost doubled (Wilkie & Giddings, 2003) since the Lighthill report to the extent that supply exceed demand in the early 1990s (Smith, 2003) when the recession was at its lowest level. Caution must however be exercised when considering the Wilkie and Giddings report as it considers only those courses which are accreted by the report's sponsors, the CIOB, and ignores other non-accredited courses.

All three reports have been produced against a background of 'boom and bust' for which the construction industry is notorious, from the recession of the late 1970s and early 1990s, and the inflationary boom of the 1980s. Lighthill (1986) reports that at that time industry required 30% more graduates than was being produced in higher education. Whilst no figures for the current shortfall are given by Fairclough (2002) or Wilkie & Giddings (2003) all acknowledge that demand outstrips supply, and that this can have serious consequences for the future of the industry. Likewise Lighthill (1986), Fairclough (2002) and Wilkie & Giddings (2003) also comment that construction education needs to reflect the changing needs and requirements of the construction industry, a fact does not escape the notice of Clark (2003).

By comparing the overall level of employment within the construction industry with the level of acceptance for civil engineering and building/construction degrees, is there any evidence of correlation? Figure 5 shows the relationship between the level of employment in the construction industry and the level of acceptance for civil engineering and building/construction degrees.

Although there is not a large enough data set for the acceptances, compared to that of employment, there is a suggestion that the level of acceptance of degree course places lags that of the level of employment by around seven years. If this is so then any upturn in the level of employment in construction will eventually lead to an upturn in the numbers of students studying for civil engineering and building/ construction degrees, but producing a growing shortage of graduates for the industry as reported by Fairclough (2002) Coulter (2003) and Wilkie & Giddings (2003).

[1] Since the 1980s many 'Building' degrees have been renamed to include the words 'Construction' and/or 'Management'. Therefore the degree titles 'Building', 'Building Management', 'Construction Management', etc., are regarded here as being synonymous.

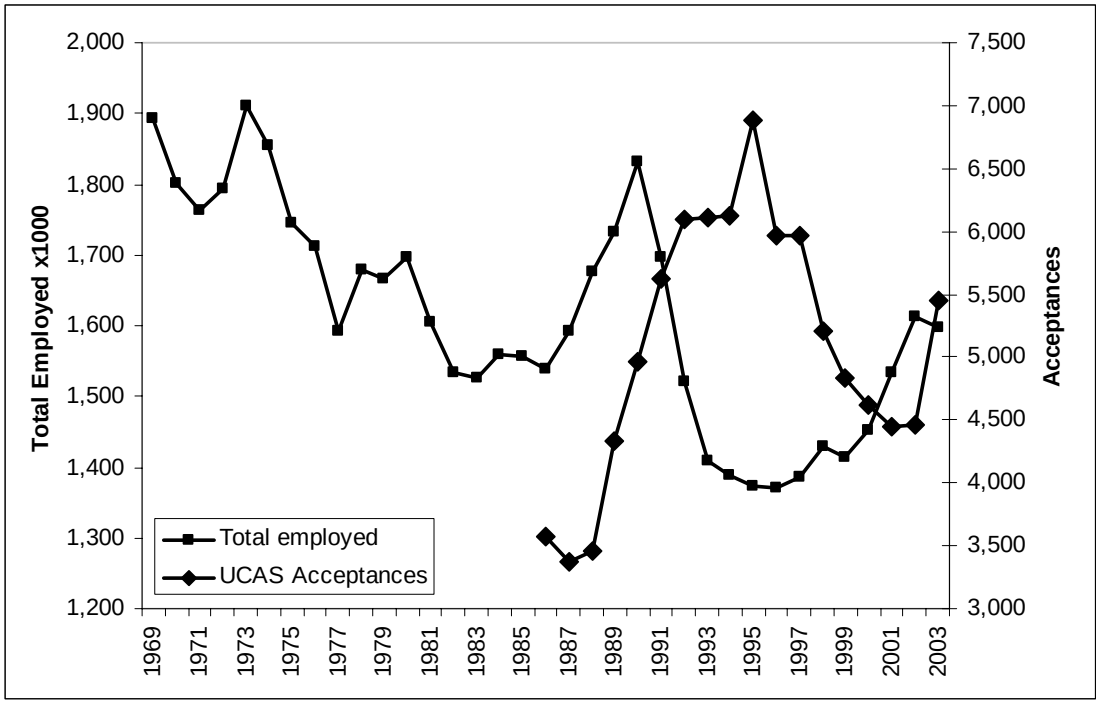


Figure 5: Acceptances of degrees and the level of construction employment.
Source: UCAS & DoE/DETR/DTI

DATA COLLECTION

Data for acceptances of university places was obtained from UCAS from the formation of UCAS in 1994; and by combining UCCA data and PCAS data for the period 1986 to 1993 Although data prior do that date was available from UCCA covering the 'old' universities for a much greater period, most construction industry courses were run by polytechnics to which applications were made individually and as no central application body for polytechnics existed prior to 1986 no overall acceptance data was available earlier than 1986.

Data for construction industry employment was abstracted from government's annual reports for the construction industry that were published from 1980 until 1997 under the title 'Housing and Construction Statistics' firstly by the DoE and then by the DETR, then from 2000 onwards with the title 'Construction Statistics Annual' published firstly by the DETR and now by the DTI. These reports cover the construction industry from 1969 to date.

Published data from UCCA/PCAS/UCAS includes both information on the numbers of applicants to universities and the numbers of places accepted. This research has used the numbers of places accepted as an applicant can only accept one place, but may make up to five applications, which can be for any subject, so provides an inconsistent and unreliable measure as to the level of students entering HE construction education.

DATA ANALYSIS

In order to test the apparent association between level of employment of in the construction industry and the level of acceptances to HE construction industry related

courses employment and recruitment data were subjected to a series of statistical test to determine the data association. These were:

1. Normality tests
2. Correlation tests

The datasets were considered in a total of five variants (data conditions):

1. The full data set from 1986 to 2004
2. The rising acceptances period 1987 – 1995
3. The falling acceptances period 1995 – 2001
4. All rising acceptances periods 1987 – 1995 and 2001 – 2003 combined
5. All falling acceptances periods 1986 – 1987 and 1995 – 2001 combined.

As the employment data had cyclical characteristics it was first tested to establish whether or not it had parametric or non-parametric characteristics using the Kolgomogorov-Smirnov test[1] (K-S test) and the Shapiro-Wilk test (S-W test) with SPSS software. It was established from the K-S test that the data had a less than 20% probability of being parametric and from the W-S test a probability of less than 24% probability of being non-parametric. Likewise tests performed on the acceptances data also confirmed its non-parametric characteristics.

Having established that both employment and acceptances data were non-parametric the appropriate tests for correlation were applied.

For each of the five data conditions the data was incrementally tested using a progressively increasing offset period of acceptance data against employment data., i.e. for each iteration of the test the acceptances data was regressed back one year against the employment data.

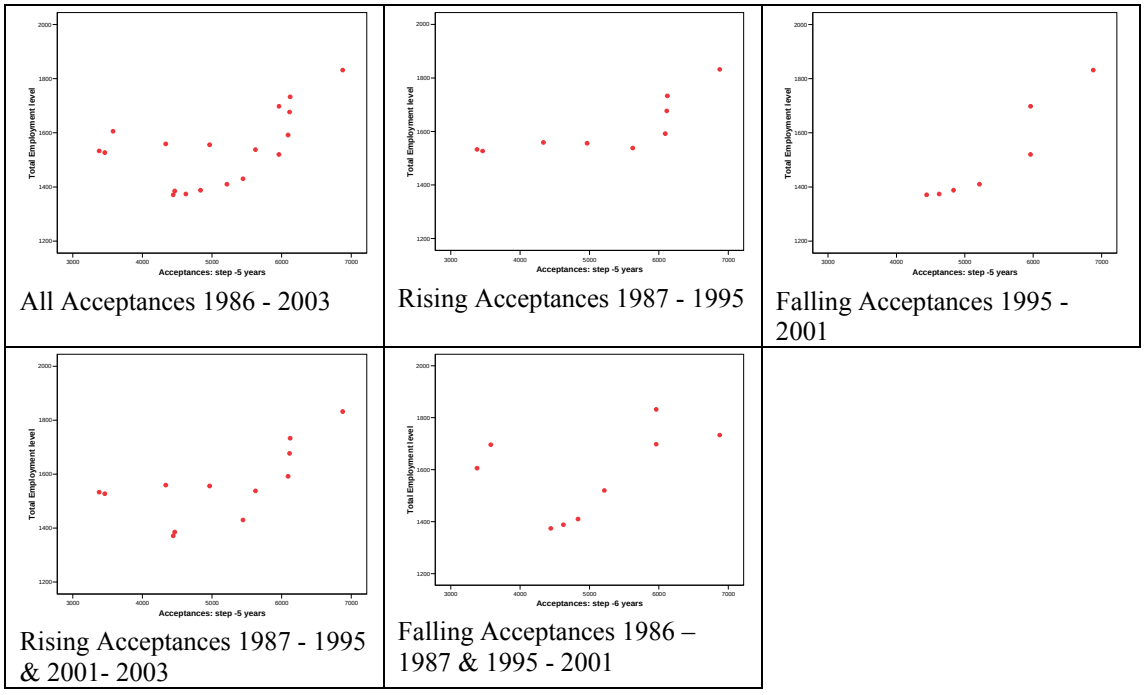
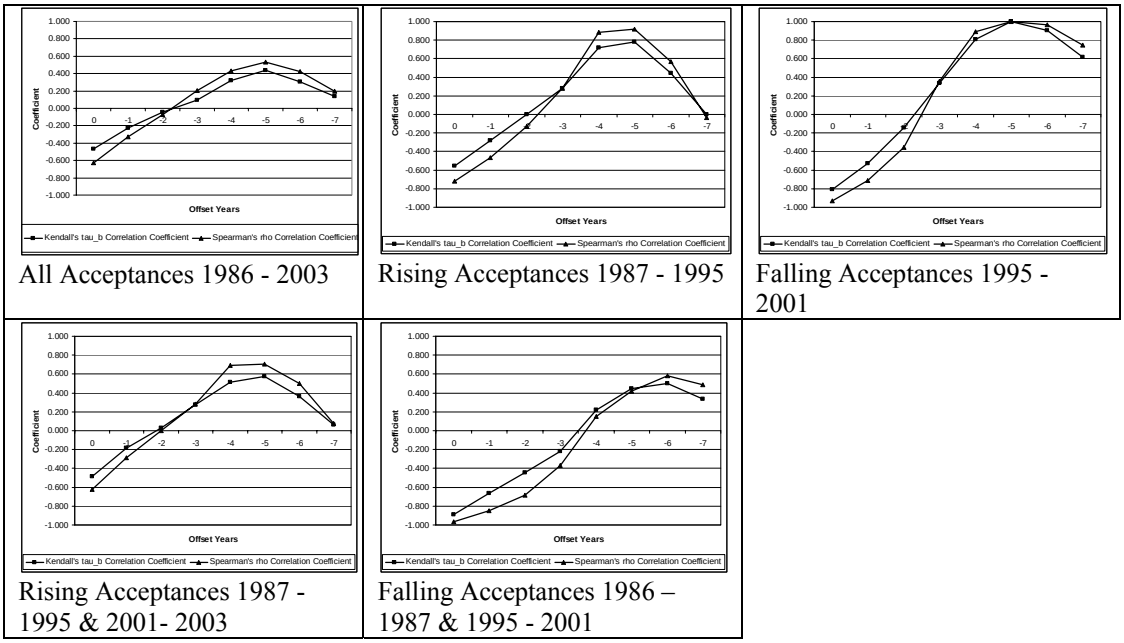


Figure 6: Scatter plots for acceptances v employment

[1] Also sometimes known as the Lillefors test.

Scatter Plots.
For each condition the 'best-fit' scatter plot is shown above, and these can be compared with the Spearman and Kendall correlation test below.

Spearman's Rho Test and Kendall's Tau test
Each condition was then tested for correlation using Spearman's Rho Test and Kendall's Tau test; Spearman because it is the most widely used and understood and Kendall because it is credited with greater accuracy than Spearman (Field, 2000).



All Acceptances 1986 - 2003 | Rising Acceptances 1987 - 1995 | Falling Acceptances 1995 - 2001

Rising Acceptances 1987 - 1995 & 2001- 2003 | Falling Acceptances 1986 – 1987 & 1995 - 2001

Figure 7: Spearman's Rho test and Kendall's Tau Test for acceptances v employment

Table 1 below shows the outcome of the nonparametric tests using Spearman's Rho test and Kendall's Tau test. Results are shown only where a statistical significance at or below the 0.05 level. Here it can be seen that the offset of -5 years is the predominant period overall.

Table 1: Summary of non-parametric tests

Dataset		-7 yrs	-6 yrs	-5 yrs	-4 yrs	-3 yrs	-2 yrs	-1 yrs	0 yrs
Full data set 1986 - 2003	Spearman	0.433	0.081	0.023	0.073	0.414	*0.779*	*0.185*	***0.005***
	Kendall	0.426	0.075	0.011	0.063	0.570	*0.791*	*0.185*	***0.007***
Rising acceptances	Spearman	0.932	0.112	**0.001**	**0.002**	0.460	0.732	*0.205*	*0.030*
	Kendall	1.000	0.095	**0.004**	**0.007**	0.297	1.000	*0.297*	*0.037*
All-rising Acceptances	Spearman	0.812	0.095	0.010	0.013	0.191	1.000	*0.366*	*0.031*
	Kendall	0.784	0.100	**0.009**	0.020	0.217	0.891	*0.411*	*0.028*
Falling acceptances	Spearman	0.052	**0.000**	**0.000**	**0.007**	0.432	*0.432*	*0.071*	***0.003***
	Kendall	0.051	**0.004**	**0.000**	0.011	0.293	*0.652*	*0.099*	*0.011*
All-falling Acceptances	Spearman	0.187	0.099	0.265	0.700	*0.332*	*0.042*	***0.004***	***0.000***
	Kendall	0.211	0.061	0.095	0.404	*0.404*	*0.095*	*0.012*	***0.001***

Statistical significance ρ	<0.01 >99%	<0.05 >95%	<0.10 >90%	≥0.10 ≤ 90%

Significance figure in italics have negative correlations.
Significances in bold type are at the 0.01 level; those in standard type are at the 0.05 level.

CONCLUSIONS

The analysis that was carried out sought firstly to establish the nature of the data, whether it was parametric or non-parametric. This was determined, as expected, to be non-parametric through the application of the Kolmogorov-Smirnov test and the Shapiro-Wilk test for normality. Secondly, having confirmed that the datasets being examined were non-parametric, non-parametric covariance tests were applied to determine correlation.

The tests that were applied were those of Spearman's Coefficient of Rank Correlation (Spearman's Rho) and Kendall's Tau Correlation. As it had been observed that there was an apparent time-lag between changes in employment levels and changes in recruitment levels the tests were run with the datasets being progressively offset to incrementally reduce the apparent time-lag between the two sets of data to determine the period of the apparent time-lag. This was established as being in the order of five years. The statistical tests also established that, for the given data-sets, there was a significant correlation, i.e. that the respective changes in employment levels and recruitment levels is probably not spurious by way of being 'accidental' or 'coincidental'.

These tests do not reveal how or why a change in employment is reflected in a change in recruitment around five years later. It must however continue to be emphasised that the change in employment level is not the cause of the change in recruitment level, merely that they both reflect changes in the construction environment, through their causal and generative factors, in different ways although the level of construction industry employment is in itself one of the causal factors in determining recruitment levels.

The significance and importance of these relationships might have been overlooked or ignored leading to inappropriate conclusions (Willmott, 2000). Furthermore this approach also helps to reinforce the argument that the correlation between the data sets is not a spurious one and is indeed a valid correlation (Curwin and Slater, 2002; Sayer, 1992).

The significance for HE institutions that provide construction industry course is clear: The numbers of students applying for and accepting places for HE construction related courses reflects the level of employment in the industry and would appear to be subject to similar cycles of 'boom and bust'. Thus when the industry experiences a 'boom' (inflationary cycle) HE institutions can expect an increase in student applications and acceptances around four to five years after the inflationary cycle begins, but when the industry begins to deflate, then a decrease in student applications and acceptances will begin to develop around five to six years later.

In terms of the hypothesis postulated it has been shown that the association is true.

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