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MODELLING UK UNIVERSITY RANKING USING FINANCIAL RATIOS

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ABSTRACT

Ranking a university is not an easy task. Over time, competition amongst UK universities has increased considerably. They compete for prestige, students, global position in research and development, and also ranking as a whole. A lot of importance has been attached to university ranking. In today's world, the significance and impact of university ranking cannot be overemphasized as it is used for the different decision-making processes (Shin et al. 2011). The way applicants or even their parents view ranking is different from the way it's being viewed by investors or employers of labor. Employers are especially interested in employing students from a specific prestigious institution of learning and at times even a field of specialty in certain schools. To satisfy both internal and external stakeholders, some magazines in the UK have carried out the national ranking of universities using several indexes. These universities have been seen to stand out in different areas such as field medals, highly cited researchers, academic or research quality, and revenue. Some consumers in the educational services sector have criticized the basis (different methodologies) upon which these rankings were made (Altbach 2006). Hence there is a need to evaluate universities using a common criterion to be fair to all and not to have a biased result.

This research work seeks to fill that gap; it is the first attempt to try to model UK university ranking using financial information. The financial data of 50 universities in the United Kingdom are collected and examined by conducting Spearman Rank Correlation and using a regression model to estimate the simultaneous impact of about nine financial factors on university ranking via regression analysis. The study shows that all the hypotheses are correct. The analysis from the regression model shows that there is a relationship between university ranking and financial performance indicators, the current ratio is positively associated with ranking and the contribution ratio has a positive relationship with ranking.

Keywords: Financial performance indicators, School, UK University ranking, The Times Higher

INTRODUCTION

The use of Ranking systems is now extensively used in many fields of human endeavour, which include banking (financial), business, public, and even educational services to mention a few. Over the years, the universal higher educational services sector has gone through a lot of changes in terms of recognition and acceptance. Global university ranking has become a force to reckon with and there has been a relatively great increase in the factors considered when comparing and ranking universities. This is because competition in the educational sector is inevitable and it is generally agreed that top-ranked universities are of great importance for a nation's economic competitiveness and growth. However, these rankings have been based on a combination of various factors with no one giving a general analysis.

Previously, universities have been ranked based on several indicators viz: academic or research quality and revenue, staff-student ratios, statistics on demographics such as the number of international students, alumni, and staff winning Nobel Prizes and Fields Medals, highly cited researchers, papers published and the per capita academic performance of an institution. In the meanwhile, the author is not aware of any research work that has been done to analyse the ranking of schools using their financial reports to establish if a correlation exists and if yes, to measure the association between the dependent and independent variables. That is the motivational factor behind the selection of this thesis topic.

This research work aims to model UK university ranking by using the audited financial statements of the schools. These indicators would be analysed by using statistical measures viz Spearman's Rank Correlation and regression model to evaluate the impact of financial indicators on ranking and also explain the suitability of this indicator as a ranking tool. The characteristics of certain features in the educational services industry will be considered, also the relationship between financial indicators and their impact on university ranking. This study examines 50 universities in the UK. The universities being analysed are in the UK and schools in the UK were chosen because the last year's (2020) ranking of the best universities in the world was led by the same university in the UK (University of Oxford) retaining that position for the fourth year in a row.

Secondly, the schools under study must use the same accounting reporting principles to make a reliable comparison. The study is important because of the criticisms of indicators and methodology used for the existing ranking process. To achieve the aim of this study, it is necessary to conduct a review of the world-renowned ranking system (Times Higher Education), collect and evaluate financial statements of selected schools, and then analyse the information gathered using the spearman rank correlation and regression model. The research task for this study is to measure the impact of financial performance indicators on ranking.

The hypotheses to be tested are:
H1: There is a relationship between University Ranking and financial performance indicators.
H2: Current ratio is positively associated with Ranking.
H3: Contribution ratio has a positive relationship with Ranking.

The data used for the research is the financial statements (2019) that have been collected from the official website of the universities under study and from the website of Times Higher Education for 2020 ranking. A quantitative approach is used for the research since a lot of effort will go into analysing the financial statements of the universities and descriptive analysis of the data is done.

This graduation thesis is divided into three main chapters. Chapter one gives an overview of UK universities and the major university ranking body, Times Higher Education Ranking body. Moreover, it discusses the information gathered from previous research on university ranking, definitions of keywords are also discussed. Chapter two focuses on the methodology and data, descriptive and regression analysis. Chapter three analyses the result of the findings and finally a conclusion is given on the thesis.

1. THEORETICAL FRAMEWORK

This chapter introduces the theoretical background of this study. The first part gives a brief overview of university education in the UK as well as the national ranking system. The second part introduces the findings of previous researchers on university ranking focusing on different indicators. Finally, the last section discusses the research problem, and the suggested hypothesis.

1.1. Brief overview of UK universities and the national ranking system

There are about 150 universities in the UK with over 500,000 international students. Moreover, they are also well known for world-leading research. University degrees and qualifications in the UK have world recognition by employers and in the educational setting globally. An innovative teaching approach is utilized and delivered by experienced and qualified lecturers. In addition to this, UK universities have been the preferred choice of many students and important historical personalities, having about 12 prominent world leaders who attended university in the UK.

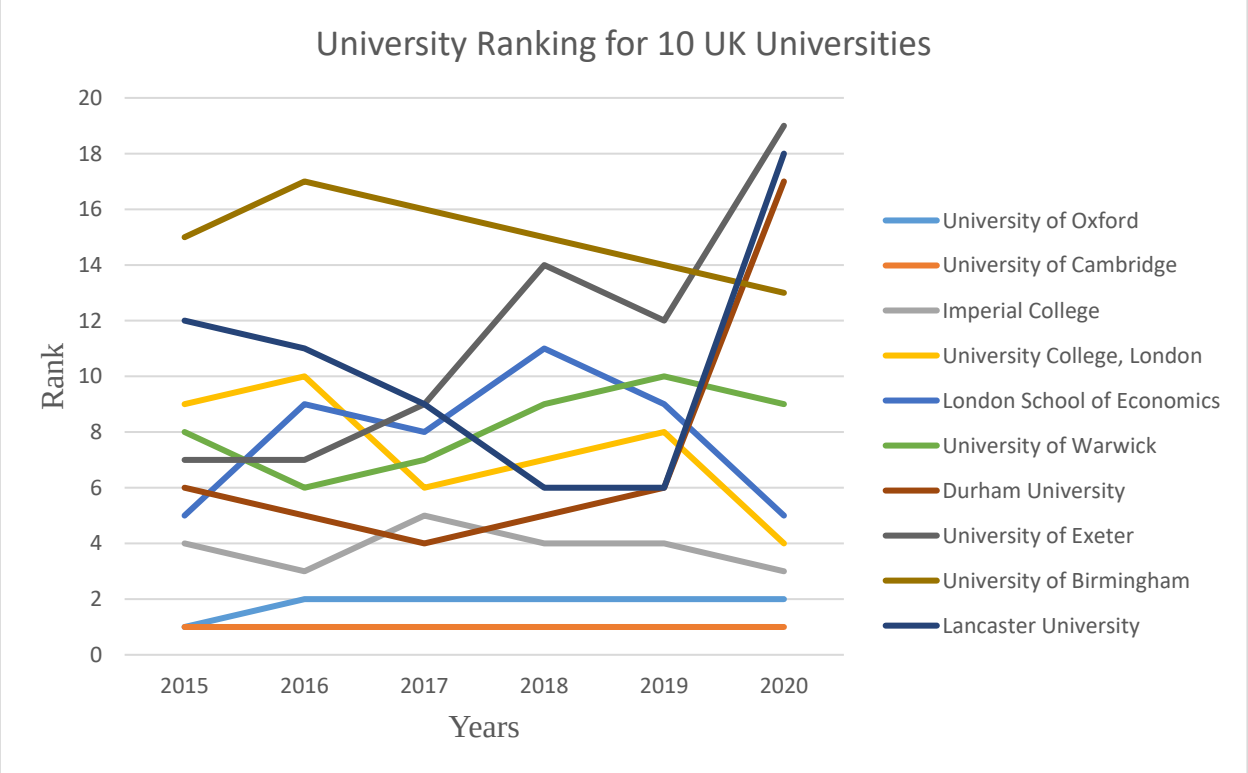
Several factors attract students to study in the UK from all over the world. Firstly, they can obtain a bachelor's degree in a relatively shorter period (three years). In addition to this, it offers post-study work opportunities as international students can apply to stay in the UK for two or three years (depending on the degree obtained) after the completion of their studies and the students are highly competitive in the labor market after graduation.

During the last couple of years, universities in the UK, have been experiencing a rapid move from being a charitable organization towards being profitoriented. According to Broecke 2015, the government in power has gradually shifted the burden of costs from the taxpayer to the students and this has brought about more competition between institutions by allowing universities to charge higher fees and the need to pay close attention to how they are ranked and viewed in public eyes. Changes in university ranking could affect the acceptance rate of the university and the applicants. When a school's rank is low, the university tends to experience a relative reduction in the number of applications received, and accepted applicants (Broecke 2015). As a result of this, it becomes important for a university to maintain a top position on the ranking table so as to

generate enough funds to keep afloat financially. UK universities have maintained a good position on the global ranking for several years. According to The Times Higher Education Ranking, the University of Oxford consecutively ranked the first position on the global ranking table from 2017 till date followed closely by the University of Cambridge. Oxford University is one of the most renowned, prestigious, and oldest universities in the English-speaking world. Teaching started in the university in about 1096. The university experienced a sudden development after Henry II banned English students from attending the University of Paris.

Figure 1 below shows different views of the graphical representation of six years ranking for 10 out of the 50 universities under study. From the graph, we can see that the University of Oxford ranked number one in the year 2015, with a tie for the first position with the University of Cambridge which ranked number 1 all through the years (2015 – 2020) being reviewed. Of all the Universities considered, the University of Exeter had the lowest rank in the six years considered, ranking the lowest in 2020. It also shows how the 10 Universities compare to the other, here we can see that Lancaster University had the best and lowest rank in the years 2018 and 2019.

Figure 1: The Ranking for 10 selected UK Universities from 2015 – 2020.



1.2. National ranking bodies in the UK and financial ratios for analysing the University

According to the Cambridge English Dictionary, ranking is a position in hierarchy or scale. It involves listing of items in a group according to a system of rating. Many bodies have been involved in the world university ranking using research-based indicators. However, the most credible of all these bodies are the Academic Ranking of World Universities (ARWU), Times Higher Education (THE), and Quacquarelli Symonds (QS) "QS World University Rankings" (Johnes 2018). However, In the UK, three magazines are responsible for the annual publishing of national university rankings. They are The Sunday Times University Guide, The Guardian University Guide, and The Times Good University Guide. Finally, The Independent produces The Complete University Guide. For this research, the focus will be on the national ranking of UK universities by Times Higher Education as it is the most respected and studied in the UK (Locke et al. 2008).

The Times Higher Education is one of the most known and used ranking systems in the UK. Through its magazine, it publishes a yearly national university ranking that assesses universities against the united nations' sustainable development goals (SDGs). Times Higher Education is the performance tables that judge research-intensive universities across missions: teaching, research, knowledge transfer, and international outlook and shows a list of the top-ranked universities in the world presented as league tables (Locke et al. 2008). Most ranking systems are prepared by the analysis of the data collected from the schools. The result is then sorted in a particular order and presented in tabular form. However, much information is not provided about how these rankings are made yet there is a lot of importance attached to the results and positions. Moreover, the final ranking is based on several weighted indicators that are not made public nor tested (Piro 2016). Hence, they have been criticized by some educationalists (Bookstein et al. 2010; Harvey 2008; Liu and Cheng 2005; Waltman et al. 2012).

The purpose of ranking is to provide information about UK universities to the world at large and to potential students or applicants to assist them with choosing a school. Due to the significant importance of ranking to the major stakeholders, it is crucial to make the decision process more transparent (Shin et al. 2011).

This graduation thesis is conducted to examine if there is an association between financial ratios and university ranking. This is done by using the publicly available financial statements of the schools under study. Financial ratios are indicators in the field of finance that can be used to evaluate the performance of a company in order to make useful decisions. It is a tool in the hands of stakeholders to understand the overall performance of the company at a point in time. Most financial indicators have a generally acceptable formula that is used for calculation hence making this a fair and transparent tool that can be used for most decision-making processes, though it has some limitations as highlighted in another section of this study.

1.3. How financial ratios used in analysing a University are different from those used for Corporations

Di Carlo et al. (2019) in their study concluded that the transition of the accounting principles used by a school to accrual or business-like accounting principles was in anticipation of getting a better understanding of the financial performance of the entity. That does not imply that the reasoning used in analysing a business for-profit organization can also be used here. However, in a study by Mulholland (2017) on Ratio analysis of financial KPI in the Higher Education sector, he showed how the financial indicators used in assessing the business sector were successfully applied to higher education sectors.

This research work is carried out focusing on the indicators required in the determination of the university's financial condition. Though some similarities do exist between the business and not-for-profit organizations (public schools) for instance, business entities compete for large market share to increase revenue and eventually profit and so do the universities. Schools compete to have more students admitted (this impacts tuition), increased government grants, and attract grants from alumni and other external sources (Chabotar 1989), in addition to this, they want to reduce debts. The mission, profit motive, and structure of a public school are not the same as that of a business. Both entities do not have a common financial management objective and their financial resources are not categorized the same way (Chabotar 1989). Universities are bothered about liquidity, ability to meet short-term obligations (cash balance – inflows from net receivables such as tuition). Hence the focus is not on net income or return on investment as they do not have shares that can be traded. Moreover, universities unlike in the business environment where the owners are looking to maximize shareholders' wealth, earn a profit, and dividend if possible, the major stakeholders in the educational sector have different interests at heart. For instance, students would be worried

about getting qualitative education as well as the percentage of the university graduate that are gainfully employed after school while organizations might be interested in the innovation, research focus, and success stories of the school. Other stakeholders (employees, government) might be interested in other aspects such as sustainability and accountability (Di Carlo et al. 2019).

In view of these differences, the financial statements of the university were reclassified based on their mission. Unlike business entities, universities could receive funding (unearned income) from the government for investment in fixed assets, for research projects, or from alumni. Hence, though most of the ratios are called by the same names, the interpretation, and composition of the formulas are not the same in some cases. For instance, the current asset and current liabilities are the only factors considered when calculating the current ratio of a business entity. In the meanwhile, the restricted and unrestricted current assets and liabilities (Chabotar 1989) are accounted for in calculating the same ratio for a university. If the donor has explicitly stated what the funds should be used for then that is classified as a restricted current asset as the funds cannot be put to another use. Also, business entities generate most of their revenues from sales of goods or provision of services while the revenues of a university could come from various sources such as tuition fees, grants from government (state or federal), private gift, contract, endowments, and sales and services of educational activities. The expenditures of the business are also not classified the same way as that of a university. It shows the percentage of the funds invested in different departments or activities of the school (Chabotar 1989).

1.4. Limitations of financial ratio analysis

Firstly, the university is a not-for-profit organization; it has a different structure from businesses and so the primary goal is not to make a profit. However, after the drastic rise in the tuition fees for UK undergraduates by the Coalition Government of Conservatives and Liberal Democrats, the universities began to make part of their funding from tuition, and this also increased the need for them to compete for students (Hillman 2016). Also, the funding received from the government depends on the number of students in the school. This further confirmed a study by Mulholland (2017) that UK universities are changing from purely charitable organizations and moving towards the business sector. Hence, this study will focus more on financial ratios that are in association with its mission and individuals who are served by that mission. However, some of the ratio analysis of financial Key performance indicators used in the business sector can also be applied to universities in the higher education sector in the UK (Mulholland 2017).

Moreover, not much has been done to model university ranking using a single indicator (financial information) so not much literature review to build upon (sparse). Thirdly, audited financial statements are prepared using the past performance of the entity being reviewed, they are not forward-looking, and past performance cannot guarantee the future performance of the university/ do not always give a precise prediction of the future hence the stakeholders should not solely rely on the financial statement analysis alone for the decision-making process (Chabotar 1989). Lastly, the accounting principles used in preparing the statements, the comparability as well as the accuracy of preparation using the established financial principles would influence the outcome of the study and should be considered (Woelfel 1987).

1.5. Findings of previous researchers on University ranking

Previous studies have shown that the indexes used in ranking a school are usually those that can be influenced by the school which also determines their placement on the ranking table (Johnes (2018). Most times, the indicators considered are those that pertain to a targeted stakeholder, it might therefore be difficult to propose an indicator that meets the needs of a group of stakeholders (Shin et al. 2011). The uncertainty in using a combined indicator is that it is not an established criterion for measuring university performance (Lock et.al 2008). Research on 'The impact of scholarly output on university ranking was carried out by Sheeja et. Al 2018. In 2015, the government of India realized the global trend of university ranking so, in order to make higher educational institutions in India globally competitive, they introduced a ranking system called the National Institutional Ranking Framework (NIRF). That study examined the impact of scholarly output on the institutional ranking based on the National Institutional Ranking Framework (NIRF) of India and also checked to see if the variables used in NIRF are similar to those of leading world university ranking systems. They collected data from the official website of the Times Higher Education, NIRF, and QS World University Ranking. Less than 10 percent of the total number of higher institution education in India participated in the study focusing on some ranking variables that were used for both national and international ranking processes. In order to achieve their goal, the ranking parameters used for NIRF were analysed together with world university ranking in order to recognize the Indian universities that appeared in both the NIRF and the world university ranking. The author carried out correlational research and concluded the study by establishing a direct relationship between scholarly output and university ranking.

Apart from different ranking agencies, individual authors have also tried to develop various models to rank universities using a collection of a number of factors. However, some stakeholders in the educational sector have condemned the method used in the process. This is due to the fact that most ranking system uses a number of indicators and it is therefore not easy to ascertain the exact variable that is crucial to university ranking.

In order to improve on the ranking processes, Kavitska, & Liubchenko. (2016) tried to ascertain the building of a multi-factor model of world university ranking systems. To achieve their aim, they performed 3 actions. They conducted a review of the world ranking system focusing on the first three acceptable and commonly used ones and also considered a set of less influential but popular ranking systems, collected original data on the indicators of considered world university ranking systems, and finally carried out factor analysis so as to identify hidden elements of considered world university ranking systems. It analyzed all the considered ranking systems.

Moreover, Lukman et al. (2010) also introduced a model showing the relationship between research, educational and environmental performances. The author discovered a high correlation with the indices and recorded an insignificant correlation between the low student-to-staff ratio and the graduation rate. As a matter of fact, a university's appearance on the ranking table enhances its reputation due to this. Thus, the schools are driven to make necessary efforts to retain their top-ranking position or get on the ranking table if they are not yet there. Furthermore, there is a probability that the schools would attempt to improve their performance in the aspects considered when selecting indicators to determine a ranking (Rauhvargers 2011). Instead of using teaching and learning, some universities mirror indicators such as outputs of universities for instance Nobel laureates, citations, or research and individual reputation. The salary or position of senior researchers has been used in some ranking processes. Hence, it is easier for highly ranked schools to receive grants, investors' interest, and foreign students.

Rankings can tell an applicant more about a university and also has the capability to influence their decision-making process. Therefore, it can be said to be a tool by which the school advertises itself (Dearden, Grewal, & Lilien, 2014). Educationalists believe that there is a relationship between ranking and the revenue generated as most universities that are highly ranked tend to attract more students and vice-versa. It goes beyond admission and advertising purposes, it can impact the alumni and can be used for recruiting exceptional faculty officers (Shin et al. 2011). Funding

received from alumni (grants) and at times from external sources can be impacted by ranking (Shin et al. 2011).

1.6. Research problem setting and hypothesis development

In the previous sub-chapters, it was established that the ranking system employed by agencies has been criticized by stakeholders in the educational sector (Bookstein et al. 2010; Harvey 2008; Liu and Cheng 2005; Waltman et al. 2012). This is because more than one indicator has been used which does not seem to give a fair and logical result (Marginson 2007). Some schools are ranked using factors that are in their favour hence they are highly placed on the ranking table, this is not the case for some other ones. The researcher is not aware of any previous research that has tried to examine an association between financial indicator and ranking hence there is not much study to refer to in this regard. The aim of this study is to measure the association between university ranking and financial indicator as this is a common tool to all the universities. And it is such that it would not only measure the impact of financial information on university ranking but also understand if a relationship exists or not. The research task for this study is to measure the impact of financial performance indicators on ranking using some of the measures suggested by Kashisaz and Mobaraki (2018).

The hypotheses to be tested are:

H1: There is a relationship between University Ranking and financial performance indicators.

As previous studies that were conducted using non-financial indicators are being criticised, it is ideal to try to get a tool that is general and universally acceptable for this purpose. Financial indicators seem to meet this criterion of general acceptability. The financial position of a school can be determined by how much funding they have per time to meet both short and long-term obligations. As their major sources of funds are generated from tuition, grants from the government, alumni, and other external sources. It is assumed that a highly ranked school with great global recognition in research and development would attract more students from within the country and internationally. This will also influence and attract investment from the government and other stakeholders. Hence, it is assumed that a relationship exists between ranking and financial performance indicators.

H2: Current ratio is positively associated with Ranking.

Current ratio shows the school's ability to meet its short-term financial obligation by comparing its current asset with current liabilities. A detailed explanation on this is presented in the next chapter. A highly ranked school is supposed to attract more attention from stakeholders in that year. This in turn would mean generating more funds through tuition and donation or grants received from other sources. Thus, the ability of the school to pay its immediate debt without having to borrow can be positively associated with ranking.

H3: Contribution ratio has a positive relation with Ranking.

The interest shown in a university as well as decisions made by employers of labour, students, and other external stake holders (nationally and internationally) can be impacted by how the school is ranked on the league table. Hence, it is assumed that the exposure and prestige gained by the school is determined by ranking and this also dictate how much funds are realised from these sources. Thus, it is assumed that a positive relationship exists between ranking and contribution ratio.

Several factors are considered by students when choosing a higher institution of learning to study. Nevertheless, university ranking is a very important one particular for international students. International recognition - institutional and subject ranking is one of the main factors highlighted by most students. In addition to ranking, a few others consider schools where they can get industry experience, graduate employability, cost of studying, availability of scholarship, use of technology, location and weather condition, etc. This leaves students being indecisive and most times they eventually go by university ranking amongst other factors to finally choose a school of study. The objective of ranking tables is numerous. The importance and social impact of International university ranking cannot be overemphasized. Given that the ranking increases and is updated every single year to incorporate more countries and universities (Altbach 2006), and since the subject matter has been measured using various indicators, it is logical to attempt to model university ranking using financial information since all the other studies have been carried out using non-financial metrics.

2. METHODOLOGY AND EMPIRICAL RESEARCH

2.1. Data and Variables

The data for this study is obtained from the financial statements of the universities in the UK. Multiple regression analysis was used to analyze the collected data. Regression analysis is flexible and shows the exact relationship between variables. During the selection process, the author ensured that all the schools are universities in the UK to ensure financial comparability and the data was collected from the audited financial statements of each university for the 2019 accounting period.

Secondly, the selected schools were amongst the list of schools that was evaluated by Times Higher Education in the 2020 annual ranking. Though a previous study established that financial indicators used to evaluate profit-making ventures can also be applied to the higher education services sector (Mulholland 2017) yet the focus was placed on the financial ratios that can be directly used to analyze the university and generally non-profit making organizations (Chabotar 1989). Also, the number of observations for the study is 50. The analyzed data were taken from the financial variable that is required for analyzing the sector under review. The purpose of this research is to determine if a relationship exists between university ranking and some selected financial ratios. The ratios used are those that relate to the financial standing of the school (Chabotar 1989).

Hence current ratio is used to check the financial position of the school. It is calculated by dividing the unrestricted current asset by the unrestricted liability. A current ratio of greater than 1 means the university has more assets than liabilities and can meet its short-term financial obligations. The information about the current asset and liability of the school can be gotten from it. The contribution ratio was also used to show the fund-raising efficiency ratio of the school and its ability to attract funds via tuition (student fees), fees from contracts, and competitive research grants. Total dependence on a particular source is not advised. It is calculated by dividing the total sources of revenues by the total expenditures. Thirdly, the expenditure ratio was evaluated, and

this ratio shows how much cost is incurred from different activities. It can be used to determine the major focus of the university as it shows the allocation of its total revenue to all the competing activities. A higher percentage of the revenue would usually be allocated to an activity of great importance to them. The expenditure ratio is calculated by dividing total expenditures incurred for each program by total expenditures. Public universities in the UK are charitable organisations, not established to make a profit however they still need to have the capability to pay their bills. Therefore, the net operating ratio was used to evaluate the relationship between their expenses and the total revenue and expressed as a percentage. It is calculated by dividing net total revenues by total revenues. Finally, the author examined the university's ability to pay up its debt by measuring the debt ratio. It is a ratio of the total liabilities to the total assets.

Appendix 1 shows the UK National University Ranking for the year 2020.
The Table is the ranking of about 50 UK Universities downloaded from the Times Higher Education website. This ranking league was prepared using the total number of students in the universities, number of students per staff, number of international students, and the ratio of female to male. This research work focuses on using financial ratios to model the same universities; however, another model was conducted which introduces the number of students and percentage of international students (retrieved from Times Higher Education website) in the ranking process. This is to check if the obtained result from the models would differ.

Appendix 2 presents the data set used for the regression model. It is the data (ranking) gathered from Times Higher Education website and used as the dependent variable in the multiple regression analysis. It also shows the financial ratio extracted and calculated from the financial statements of the schools being studied and indicates the numerical national ranking of universities in the UK for the year 2019. The University of Cambridge has been at the very top of the league table from 2017 - 2020, followed closely by the University of Oxford which has been leading other universities in the world for four years in a row since 2017.

2.2. Descriptive Analysis

Table 1 briefly explains the data set used in the Spearman's rank correlation and regression model in terms of the mean, minimum value, maximum value, and standard deviation. The author used multiple regression analysis in this study to evaluate the impact of financial ratios (independent

variable) on national university ranking (dependent variable). The table describes the dependent and independent variables used in the regression analysis. From this analysis, the current ratio for the average UK universities returned a mean of about 1.52, with a standard deviation of 0.82. This value shows that the universities have enough liquid assets to cover their short-term liabilities.

The standard deviation shows there is a variation between the values analyzed and the range of values was also small as the minimum value of the current ratio was 0.2 and the maximum value was 3.78.

The debt ratio gives a mean value of 0.49 and can be used when a university has cash flow problems. This shows that most of the universities analyzed are generating just enough revenue to cover their minimum debt expenses.

The contribution ratio is about 87% and this means the universities have enough funds from various sources to cover their overhead expenses as well as the fixed costs.
The Expenditure ratio is 79% and this indicates the total percentage spent on different programs.
The net profit is -0.11 in the negative direction. This shows that most of the universities evaluated were operating in a deficit. Though universities are not profit-making ventures, however, they still need to be able to pay their bills.
The average number of students and average number of international students in the universities is 17661 and 34% respectively.

Table 1. Descriptive statistics table

Variable	Observation	Mean	Median	Std. Dev.	Minimum	Maximum
Current Ratio	50	1.52	1.32	0.82	0.2	3.78
Debt ratio	50	0.49	0.47	0.15	0.18	0.86
Contribution ratio	50	0.87	0.88	0.11	0.38	1.08
Expenditure ratio	50	0.79	1.00	0.33	0.01	1.08
Net operating ratio	50	-0.11	-0.13	0.18	-0.80	0.77
No of students	50	17661	16602	7500	3226	37038
No of international students %	50	34	34	10	17	71

Source: Generated with Microsoft Excel by author

2.3. Methodology

Multiple linear regression model is applied to model the linear relationship between the dependent variable (ranking) and six independent variables derived from about eleven financial data (Weisberg, 2005) and one non-financial indicator. The variables were evaluated to describe the relationship and determine if the independent variables impact the dependent variable in any way. In addition to that, Spearman´s rank correlational analysis was also applied to check if a relationship does exist between the variables. The regression analysis was used to model the multiple independent variables and to generate a regression equation in which the coefficients define the connection between the individual independent variables and the dependent variable. The equation is also used to make some predictions about the variables. According to (Poole & O' Farrell, 1971), a linear relationship exists between a dependent and independent variable, and each value of X and Y is observed without measurement error. In carrying out the regression analysis, the author made use of Microsoft excel by extracting the relevant dataset from the audited account of the schools.

This general formular for multiple linear regression analyses that was used for this study is:

$y = \beta 0 + \beta 1x1 + \beta 2x2 + \beta 3x3 + \beta 4x4 + \beta 5x5 + \beta 6x6 + \varepsilon$

The variables are defined as:

y = dependent variable

x1= independent variable

x2= independent variable

x3= independent variable

x4= independent variable

x5= independent variable

x6= number of students

β0= y-intercept (parameter)

βn= slope coefficients for each variable (parameter)

∈ = model error

From the regression analysis, we seek to establish a relationship or non-relationship between the dependent and independent variables. The coefficient of multiple determination, the R-squared, coefficients, and P-values are obtained from the multiple regression analysis and can be used to estimate the impact of the predictors in the model. The R squared can be used to explain how dispersed the dependent variable is to the independent variables such that we can calculate the

variance between both variables. In addition to R squared, we can also use the coefficients and P-values of the independent variables to determine the indexes that are most important. P-value gives a detailed explanation of the hypotheses, it is used to check if the null hypothesis should be rejected and if there is a significant relationship with the dependent variable. In this study, a P-value of less than 0.05 is considered significant leading to the rejection of the null hypothesis.

Lastly, Spearman's rank correlation model shows the association between the dependent and independent variables. In this research, the independent variables are the current ratio, debt ratio, contribution ratio, expenditure ratio, net operating ratio, and the number of students and number of international students (non-financial indicator). These financial indicators were extracted from the audited financial statements of the universities directly from their website.

The dependent variable is 'Ranking' and information about the 2020 national university ranking was obtained from the website of Time Higher Education.

Appendix 2 shows the data set used for the multiple regression extracted and calculated from the audited financial statements of the universities for the year 2019. The correlation analysis was also conducted to examine if a relationship exists between the variables and the ranking.

3. RESULTS

This section describes the result of Spearman's rank correlation and multiple regression model. Two models were used to measure the impact of financial indicators on ranking. The first model was conducted using financial indicators only to measure the relationship between ranking and the financial variables. Another model was also used to check if the financial indicators plus two non-financial indicators will return the same result generated when only financial indicators are used on ranking. The dependent variable used is "Ranking" while "Current ratio, Debt ratio, Contribution ratio, Expenditure ratio, and Net operating ratio" are the independent financial variables. Meanwhile, the 'number of students' and 'number of international students' are the non-financial metrics. A total of 50 observations were used for the analysis.

The result of the model where the impact of financial indicators and the non-financial variable on the ranking is checked is presented in this section.

From the Spearman Rank Correlation analysis in table 2 below, the correlation coefficient for the current ratio is -0.63, this value shows there is a negative relationship between the ranked variables of the current ratio and ranking. Thus, an increase in the current ratio is associated with a decrease in ranking and vice versa. Also, the correlation coefficient for debt ratio, contribution ratio, expenditure ratio, net operating ratio, number of students, and number of international students are -0.23, -0.80, -0.63, -0.84, -0.87, -0.86 respectively. This means there is a negative association between the ranked variables of these indicators and the university ranking. The relationship demonstrated by these indicators does not mean they affect ranking directly because correlation does not mean causation. In this case, changes in any of the indicators may cause changes in ranking and vice versa, but the causal relationship is very difficult to prove. However, this result clearly shows that there is an association between the ranked variables of the financial indicators and ranking.

Table 2. Spearman's Rank Correlation analysis

Current ratio	-0.63
Debt ratio	-0.23
Contribution ratio	-0.80
Expenditure ratio	-0.63
Net operating ratio	-0.84
Number of students	-0.87
Number of international students	-0.86

Source: Generated with Microsoft Excel by author

Table 3a Regression Model 1

Variables	Coefficient	P-value
Current ratio	2.52	0.31
Debt ratio	48.50	0.0003
Contribution ratio	8.26	0.64
Expenditure ratio	0.09	0.99
Net operating ratio	-19.57	0.07

N	50
R^2	0.29
Adj. R	0.22
Sig F	0.0065

Table 3b Regression Model 2

Variables	Coefficient	P-value
Current ratio	0.13	0.94
Debt ratio	11.27	0.29
Contribution ratio	4.43	0.73
Expenditure ratio	-1.43	0.74
Net operating ratio	-7.89	0.32
Number of student	-0.0009	0.00004
Number of Int'l student	-0.73	0.00002

N	50
R^2	0.65
Adj. R	0.59
Sig F	0.000000080

Tables 3a and 3b above show the regression statistics. From model 1, the R square for the study is 0.29 and this shows that about 29 % of the variance in ranking can be attributed to the current ratio, debt ratio, contribution ratio, expenditure ratio, and net operating ratio. The adjusted R squared is the value gotten after adjusting the R square for the predictors in the model. It shows the percentage of total variability that has been accounted for by the model. The Adjusted R squared value is 0.22 and this means that the model explains 22% of the variation within the data. The significant F for both models is less than 0.05 hence this is a strong regression model.

After introducing the non-financial indicators in model 2, the R squared is about 65%, this is by how much the change in ranking is driven by the independent variables. The greater the R squared, the better and this means ranking changes much more when financial with non-financial variables are combined and this indicates some predictive power of our regression analysis model. The Adjusted R also increased to 59%.

The regression coefficient shows the contribution of each of the ratios to ranking. The coefficient for model 1 shows there is a negative relationship between ranking and net operating ratio. This negative coefficient implies that as the independent variable increase, the dependent variable decreases and vice versa. In this study, current ratio has a positive coefficient of 2.52. This means for each 1 unit increase in current ratio, ranking also increases by 2.52. Also, for each unit increase in debt ratio, contribution ratio, expenditure ratio, and net operating ratio, ranking goes up by 48.50, 8.26 and 0.09 respectively. These values will be used to generate the regression model equation. Meanwhile, in the Table 3b (model 2), we observe a negative relationship between expenditure ratio, net operating ratio, the two non-financial indicators and ranking while a positive association is observed between the current ratio, debt ratio, and contribution ratio.

The regression equation for model 1 is:
Equation 1 :$Y = -11 + 2.52X1 + 48.50X2 + 8.26X3 + 0.09X4 -19.57X5$

while the equation for model 2 is:
Equation 2 : $Y = 57 + 0.13 X1 + 11.27 X2 + 4.43 X3 -1.43 X4 -7.89 X5 – 0.0009 X6 – 0.73X7$

The hypothesis H1: is such that at least one of the independent variables: X1, X2, X3, X4, X5, X6, X7 is not = 0. Since Sig F < 0.05, we will accept the alternate hypothesis and we will go on to do the individual P value test.

The Regression model 1 brings out the P-value figures for all the indicators and we can confirm from Table 3a that the relationship between ranking and debt ratio is statistically significant. This is because the P-value for the debt ratio is less than 0.05. Enough reason to accept the alternate hypothesis as regards debt ratio has been provided. Hence, we can say that 'There is a relationship between ranking and debt ratio' and so we will fail to reject the alternate hypothesis.
In the meanwhile, the relationship between the current ratio, contribution ratio, and expenditure and net operating ratio is not statistically significant as the significant level for all of these is greater than 0.05.

From the analysis of Regression model, we can make the following conclusions about our hypotheses:

The Regression model 2 shows that all the financial indicators are not statistically significant. The debt ratio is not statistically significant with a P-value of 0.29. However, the number of students and the number of international students are statistically significant with a P-value < 0.05. The independent variables have a P-value that is > 0.05, hence they have no significant linear relationship with ranking. None of the financial indicators have demonstrated a significant relationship with ranking.

However, from the analysis of the regression model 1, the debt ratio is the only indicator that has a positive impact on ranking. This implies that a university with a relatively higher debt ratio will be positioned at the top of the ranking table. In hypothesis testing, we can accept the alternate hypothesis if at least one of the predictors (independent variables) is < 0.05. This implies that there is a useful linear relationship between ranking and at least one of the 5 financial indicators (debt ratio in this case). However, it is not established that all the independent variables are useful. In view of this, we can accept the alternate hypothesis that there is indeed a relationship between UK university ranking and financial information.

CONCLUSION

National University Ranking is a great tool in the hands of major stakeholders in the educational sector. It influences decision and policy-making procedures a great deal. As universities compete amongst themselves to be at the top of the league table so as to have access to government support, external investment, and fame, they are motivated to improve on their administration and academic quality. Hence, it is important that the metrics and techniques that lead to ranking decisions are based on fair practices and procedures to ensure that it is generally acceptable. If this is done, it would be useful to the government, academic institutions, and potential university students. Prior to now, UK universities have been ranked on a certain basis most of which are vague. For instance, ranking schools based on the opinion of an educational administrator about other universities or the number of published articles without considering the value of the article (Altbach 2006). There is a need for a standardized approach to doing this.

This aim of the research work involves modelling university ranking in the UK using a metric that is common and has the same definition in all universities in the UK so as to determine if an association occurs between the variables. The data set of 2020 ranking and financial indicators were analyzed via Spearman rank correlation and regression model. And the impact of these variables on the ranking was measured.

In order to do this analysis, financial data was extracted from the 2019 audited report of 50 universities of repute in the UK. A sample of 50 universities from the 2020 league table of a leading ranking body in the UK was also used. Spearman rank correlation and regression analysis model was done on MS Excel. The dependent variable is ranking while the current ratio, debt ratio, contribution ratio, expenditure ration, and net operating ratio are the independent financial variables. The non-financial indicators are number of students and number of international students.

This study is conducted by building up on the previous research done by (Kashisaz and Mobaraki 2018) using financial knowledge. These hypotheses have been proposed:

H1: There is a relationship between University Ranking and financial performance indicators.
H2: Current ratio is positively associated with Ranking.
H3: Contribution ratio has a positive relationship with Ranking.

From the analysis of the Spearman rank correlation coefficient, the correlation coefficient for the current ratio is -0.63, this value shows there is a negative relationship between the ranked variables of the current ratio and ranking. Thus, an increase in the current ratio is associated with a decrease in ranking and vice versa. Also, the correlation coefficient for debt ratio, contribution ratio, expenditure ratio, net operating ratio, number of students, and number of international students are -0.23, -0.80, -0.63, -0.84, -0.87, -0.86 respectively. We see that there is a strong association between the ranked variables of the financial ratios and university ranking. Hence the study supports that there is an association between the ranked variables of all the financial indicators and ranking supporting the first hypothesis.

The result of the regression model 1 also supported the first hypothesis. It was discovered from the analysis of the variance table, that the debt ratio (with a P-value of -0.0003) is a statistically significant with ranking. The other 4 ratios are not significant. Hence debt ratio can be said to be in close association with ranking. In summary, our regression overall is significant as we can see from the ANOVA table and the amount of variance that was accounted for when the 5 predictors were taken as a group was about 29% of the variance.

The overall regression model is significant, hence P-value < 0.05 and the R square at 0.29 is significantly greater than 0. Therefore, the financial ratios account for 29% of the variance in the ranking. The Regression statistics and ANOVA table assess how well the financial indicators as a group did at predicting the ranking for 2020. Hence, we can accept the first hypothesis which states that there is a relationship between university ranking and financial performance indicators. Moreover, the study also shows that there is a positive relationship between current ratio (with a coefficient of 2.52) and ranking and that contribution ratio (with a coefficient of 8.26) has a positive relationship with ranking.

Thus, this study establishes that there is a relationship between (1) University ranking and financial performance indicators, (2) Current ratio is positively associated with ranking, and (3) Contribution ratio has a positive relationship with ranking. Hence all the hypotheses are strongly supported by the research results.

In conclusion, the spearman rank correlation and the regression model supported the first hypothesis that there is a relationship between university ranking and financial performance indicators while the analysis of the regression model supported the second and third hypotheses, that current ratio is positively associated with ranking and contribution ration has a positive relationship with ranking. All the 3 hypotheses are supported by the results of the research and so the purpose of this thesis which is modelling UK university ranking using financial information has been met.

Finally, financial ratio analysis is one of the great tools for policy and management decision-making. However, there are some other aspects of a university that cannot be quantified via ratio analysis such as reputation, citation, Nobel Laurette, leadership, etc. Hence, non-financial indicators were introduced. Therefore, I would suggest that further studies should be carried out to incorporate financial analysis ratio with more other important non-financial indicators.

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The Audited Financial statements were downloaded from the publicly available schools website.

APPENDICES

Appendix 1. UK National University Ranking, 2020

Table 1. UK National University Ranking, 2020 (Source: THE website)

Rank	Name of University	No of students	No of students per staff	International students (%)	Female: Male ratio
1	University of Cambridge	18,978	10.9	37	47:53
2	University of Oxford	20,664	11.2	41	46:54
3	Imperial College	16,760	11.7	56	38:62
4	University College London (UCL)	32,665	10.6	52	57: 43
5	London School of Economics & Political Science	10,570	12.1	71	53:47
6	University of Edinburg	29,433	12.8	41	60:40
7	Kings college London	26,057	12.5	44	62:38
8	University of Manchester	37,038	14.4	40	53:47
9	University of Warwick	20,599	13.2	41	49:51
10	University of Bristol	21,783	13.6	27	54:46
11	University of Glasgow	25,357	15.4	37	59:41
12	Queen Mary University	17,799	14.1	43	54:46
13	University of Birmingham	29,542	15.5	29	57:43
14	University of Sheffield	26,218	15.0	34	50:50
15	University of Southampton	23,863	13.7	34	53:47
16	University of York	16,058	14.9	24	56:44

17	Durham university	16,963	14.8	30	55:45
18	Lancaster University	12,657	12.5	38	51:49
19	University of Exeter	21,451	17.6	28	54:46
20	University of Sussex	14,978	16.1	39	54:46
21	University of Nottingham	29,699	14.6	29	54:46
22	University of Leeds	30,236	14.2	29	61:39
23	University of Liverpool	23,057	13.8	33	55:45
24	University of Leicester	14,645	14.3	32	53:47
25	University of Aberdeen	12,399	15.7	39	57:43
26	University of East Anglia	15,195	13.9	28	60:40
27	Cardiff University	25,501	13.5	27	59:41
28	University of St Andrews	9,213	12.7	46	58:42
29	University of Dundee	12,122	17.6	22	63:37
30	Newcastle University	22,691	14.1	27	51:49
31	Queen's University Belfast	17,747	17.2	36	55:45
32	University of Reading	14,107	14.9	31	57:43
33	St George's University of London	3,226	14.7	21	62:38
34	University of Bath	13,825	16.4	32	46:54
35	University of Essex	11,923	16.1	39	54:46
36	Heriot-Watt University	9,189	17.2	35	41:59
37	Royal Holloway, University of London	9,503	15.2	36	59:41
38	University of Surrey	13,125	16.0	37	55:45
39	Swansea University	16,445	16.7	23	45:55
40	Anglia Ruskin University ARU	18,022	23.1	30	63:37
41	Birbeck university of London	8,631	15.8	38	54:46
42	Brunel University	10,961	16.3	36	47:53

43	Goldsmiths, University of London	8,486	15.3	35	66:34
44	University of Kent	17,754	20	31	53:47
45	Loughborough University	14,749	14.3	25	40:60
46	Northumbria University	21,811	17.5	17	55:45
47	University of Stirling	9,250	15.8	23	63:37
48	Aberystwyth University	6,866	16.2	19	49:51
49	Bangor University	9,590	16.3	23	58:42
50	Bournemouth University	13,692	17.1	18	55:45

Source: Downloaded from the website of THE

Appendix 2. Data set used for the multiple regression extracted and calculated from the audited financial statement of the universities for the year 2019 and from the website of Times Higher Education website 2020

Table 2.
Source: From the official websites of the schools and ranking retrieved from the website of the Times Higher Education (THE)

			CR	DR	CR	ER	NOR	NOS	NOIS
S/N	Names of the university	Ranking	Current ratio	Debt ratio	Contribution ratio	Expenditure ratio	Net Operating ratio	No of Students	No of int'l Students
1	University of Cambridge	1	1.43	0.32	0.96	1.08	0.05	18,978	37
2	University of Oxford	2	1.46	0.29	0.93	0.87	0.03	20,664	41
3	Imperial College	3	1.03	0.31	0.96	1.00	-0.03	16,760	56
4	University College London	4	0.95	0.18	0.89	0.31	0.11	32,665	52
5	London School of Economics & Political Science	5	0.83	0.35	1.02	1.00	0.04	10,570	71
6	University of Edinburg	6	1.57	0.34	0.89	0.31	-0.08	29,433	41
7	Kings' college London	7	0.20	0.41	0.52	1.00	-0.80	26,057	44
8	University of Manchester	8	0.94	0.34	0.92	0.33	-0.07	37,038	40
9	University of Warwick	9	1.27	0.78	0.90	1.00	-0.11	20,599	41
10	University of Bristol	10	2.36	0.39	0.91	1.03	-0.10	21,783	27
11	University of Glasgow	11	1.11	0.34	0.91	0.33	-0.10	25,357	37
12	Queen Mary University of London	12	2.10	0.44	0.92	1.00	-0.13	17,799	43
13	University of Birmingham	13	0.93	0.29	0.86	1.00	-0.16	29,542	29
14	University Sheffield	14	1.02	0.34	0.87	0.27	-0.15	26,218	34
15	University of Southampton	15	3.60	0.61	0.38	1.00	0.77	23,863	34

16	University York	16	2.22	0.54	0.86	1.00	-0.16	16,058	24
17	Durham university	17	2.16	0.57	0.84	0.28	-0.13	16,963	30
18	Lancaster University	18	1.30	0.51	0.90	1.00	-0.11	12,657	38
19	University of Exeter	19	1.64	0.47	0.86	1.00	-0.16	21,451	28
20	University of Sussex	20	3.78	0.44	0.94	1.00	-0.06	14,978	39
21	University of Nottingham	21	0.48	0.47	0.88	1.01	-0.12	29,699	29
22	University of Leeds	22	1.76	0.43	0.89	1.00	-0.12	30,236	29
23	University of Liverpool	23	1.35	0.37	0.90	0.01	-0.09	23,057	33
24	University of Leicester	24	1.14	0.84	0.87	1.00	-0.13	14,645	32
25	University of Aberdeen	25	0.89	0.49	0.84	0.26	-0.19	12,399	39
26	University of East Anglia	26	1.01	0.46	0.83	1.00	-0.20	15,195	28
27	Cardiff University	27	3.04	0.47	0.83	1.00	-0.22	25,501	27
28	University of Andrews	28	1.11	0.42	0.90	1.00	-0.09	9,213	46
29	University of Dundee	29	0.68	0.47	0.82	0.30	-0.21	12,122	22
30	Newcastle University	30	0.70	0.35	1.08	1.00	0.08	22,691	27
31	Queens University Belfast	31	2.52	0.55	1.02	0.34	-0.16	17,747	36
32	University of Reading	32	0.60	0.64	0.81	1.00	-0.20	14,107	31
33	St Georges University of London	33	0.69	0.67	0.90	0.30	0.11	3,226	21
34	University Bath	34	3.48	0.42	0.87	1.00	-0.13	13,825	32
35	University of Essex	35	1.63	0.51	0.86	1.04	-0.15	11,923	39
36	Henriot - Watt University	36	1.71	0.80	0.93	0.36	0.07	9,189	35
37	Royal Holloway University of London	37	1.20	0.45	0.84	0.28	-0.20	9,503	36
38	University of Surrey	38	0.92	0.52	0.85	1.00	-0.18	13,125	37
39	Swansea University	39	2.86	0.63	0.89	1.00	-0.12	16,445	23
40	Anglia Ruskin University ARU	40	0.55	0.86	0.98	0.35	-0.02	18,022	30
41	Birbeck University of London	41	2.33	0.49	0.79	1.00	-0.25	8,631	38
42	Brunel University	42	1.36	0.63	0.88	1.00	-0.14	10,961	36
43	Goldsmiths University of London	43	1.52	0.60	0.83	1.00	-0.20	8,486	35

44	University of Kent	44	1.01	0.41	0.82	0.28	-0.23	17,754	31
45	Loughborough University	45	1.38	0.51	0.88	1.00	-0.14	14,749	25
46	Northumbria University	46	1.23	0.65	0.94	1.00	-0.06	21,811	17
47	University of Stirling	47	2.50	0.37	0.80	1.00	-0.25	9,250	23
48	Aberystwyth University	48	1.30	0.57	0.79	1.00	-0.25	6,866	19
49	Bangor University	49	1.77	0.38	0.88	1.00	-0.14	9,590	23
50	Bournemouth University	50	1.34	0.77	0.98	1.00	-0.02	13,692	18

Appendix 3. Data set used for the Graphical representation

Years	University of Oxford	University of Cambridge	Imperial College	University college, London	London School of Economics	University of Warwick	Durham University	University of Exeter	University of Birmingham	Lancaster University
2015	1	1	4	9	5	8	6	7	15	12
2016	2	1	3	10	9	6	5	7	17	11
2017	2	1	5	6	8	7	4	9	16	9
2018	2	1	4	7	11	9	5	14	15	6
2019	2	1	4	8	9	10	6	12	14	6
2020	2	1	3	4	5	9	17	19	13	18

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