

# **A VALUE-ADDED APPROACH TO SELECTING UNDERGRADUATE BUSINESS ADMINISTRATION PROGRAMS**

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## **ABSTRACT**

Although there are numerous studies that rank undergraduate colleges and universities, the selection of the "best" undergraduate program is a formidable task for prospective students. This study uses a Data Envelopment Analysis (DEA), a linear-programming based tool, to evaluate undergraduate business administration programs. The DEA model connects costs (inputs) with benefits (outputs) to evaluate the value-added by undergraduate programs. The findings of this study should assist prospective students in selecting business programs that have the best value.

## **INTRODUCTION**

Each year students, employers, faculty, and administrators eagerly anticipate the results of the latest rankings of colleges and universities. The most notable studies are those conducted by *Bloomberg/BusinessWeek* (BW) and *U.S. News & World Report* (USN&WR). In selecting a college or university students and parents are concerned with the value of education and employment opportunities in light of rising tuitions. Faculty and administrators are also concerned with the value of the educational experience as they seek to attract students and justify tuition increases to parents. Most of the research focus has been on undergraduate colleges and universities as a whole and not on specific undergraduate programs. However, for students a major determinant in their choice of a college or university is the quality and value of their intended program of study. For many students their choice of study is business administration. This study seeks to fill a gap in our knowledge by evaluating undergraduate business programs based on value added to students.

One approach for evaluating undergraduate business programs are commonly used methods for ranking colleges, universities and MBA programs. For example, the rankings of MBA programs are frequently based on weighted scores of selected attributes/measures. A problem with using weighted scores is that the scores rely on arbitrary weightings. In addition, some of the selected attributes are derived from subjective survey responses of graduates, recruiters, and peers. As a consequence, academics, employers, and prospective students often question the value of business school rankings [5] [8] [12]. Nevertheless, students, employers, and educators closely watch these rankings.

The purpose of this effort is to use a value-added approach to determine the relative value of selected undergraduate business programs. We followed the approach used by [14] in evaluating MBA programs. Tracy and Waldfogels' used a methodology that ranked MBA programs by using data on the labor market performance of each program's graduates. The authors regressed starting salaries on measures of student quality and derived the salary residual as a measure of program value added. Their study identified several high-quality programs that were not ranked by either BW or USN&WR because these programs did not attract higher tier students. However, our methodology differs in that we use *data envelopment analysis* (DEA) to connect student quality and cost (i.e., inputs) with employment and graduate school placement, starting salaries, and satisfaction (i.e., outputs) to evaluate value added by individual undergraduate programs. DEA does not require a set of preassigned weights for inputs and outputs and, therefore, overcomes the deficiency that subjective weights introduce. In addition, DEA is an extreme method that compares an individual undergraduate program with a peer group of only the best or most efficient undergraduate programs on the basis of the input and output attributes that DEA identifies.

## MEASURES OF PROGRAM VALUE

The *Bloomberg Businessweek* undergraduate business rankings provide data input for this effort. These rankings are based on measures of student satisfaction, postgraduation outcomes, and academic quality. A description of these measures follows:

**Student Survey:** BW asked more than 86,000 graduating seniors at those schools to complete a 50-question survey on everything from the quality of teaching to recreational facilities. Overall, 28,377 students responded to the survey, a response rate of 33 percent. The results of the 2011 student survey [1] are then combined with the results of two previous student surveys, from 2010 and 2009, to arrive at a student survey score for each school. The 2011 survey supplies 50 percent of the score; the two previous surveys supply 25 percent each. Schools with low response rates were not included in the rankings.

**Recruiter Survey:** 775 corporate recruiters for companies that hire thousands of business majors each year were surveyed as to which programs turn out the best graduates, and which schools have the most innovative curricula and most effective career services. In the end, 246 recruiters responded, a response rate of about 32 percent. The results of the 2011 recruiter survey are then combined with the results of two previous recruiter surveys, from 2010 and 2009, to calculate a recruiter survey score for each school. The 2011 survey supplies 50 percent of the score; the two previous surveys supply 25 percent each.

**Starting Salaries:** To learn which schools' students land the best-paying jobs, we asked each institution to tell us the median starting salary for their most recent graduating class.

**Feeder Schools:** A composite of 2006, 2008, and 2010 MBA surveys was made to create a "feeder school" measure showing which schools send the most grads to the 35 top MBA programs identified in previous *Bloomberg Businessweek* rankings.

**Academic Quality:** A composite of academic quality was created from five equally weighted measures. From the schools themselves, we obtained average SAT scores, the ratio of full-time students to faculty, and average class size. The 2011 student survey supplied the percentage of business majors with internships and the hours students spend every week on schoolwork.

In developing the overall rankings, the student survey score counts for 30 percent of the final ranking, with the recruiter survey score contributing 20 percent. Starting salaries and the MBA feeder school measure contribute 10 percent each. The academic quality measure supplies the remaining 30 percent.

## **DEA METHODOLOGY**

DEA was developed by Charnes et al. [2] to evaluate the performance of multi-input and multi-output production operations. The analytical and computational capacities of DEA are firmly based on mathematical theory. DEA has become an increasingly popular management tool [15] and has been successfully applied as a decision support tool to improve the productivity of bank branches [3] [22] and health maintenance organization services [4] [9], to select mutual funds [11], to evaluate software and software projects [6] [7] and to select the best MBA program [10].

DEA evaluates a production unit called DMU (decision making unit) one at a time and generates an efficiency score for the unit. In this study an undergraduate program is treated as a production unit where inputs are measures of students' quality and other cost-related attributes while outputs are measures of students' market performance. A DMU is said to be efficient if it has an efficiency score of one and inefficient if its efficiency score is less than one. In addition to an efficiency score, DEA identifies input wastes and output deficiencies. The main advantage of DEA is that it does not require pre-assigned weights for inputs and outputs and, thus, overcomes the deficiency introduced by using subjective weights. By doing so, it minimizes the complexity of analysis by simultaneously evaluating the attributes of interest and presenting a single, composite score, referred to as an efficiency score. Moreover, input wastes and output deficiency generated by DEA help to identify the weaknesses and strengths of a particular program.

## **EVALUATION OF UNDERGRADUATE BUSINESS PROGRAMS**

The data set from Bloomberg Online Business Week provides us with two broad categories of attributes: inputs and outputs. Inputs are chosen to reflect the qualities of students and the costs of a program while outputs are chosen to reflect perceived graduates' qualifications.

To measure value-added, we consider mean SAT score and costs as inputs while student ranking, survey ranking, mean starting salaries, MBA feeder school ranking, academic qualification ranking, and job placement grade are outputs. The resulting input/output mix, thus, gives credit to programs that produce graduates with similar student ranking, survey results, mean starting salary, academic ranking, and job placement grade as their peer schools but recruit students with lower average SAT scores and/or charge lower tuition and fees. Stated differently, "inputs" measure the quality of incoming students and the cost of a program while "outputs" measure the quality of a program's graduates as determined by the market and academic qualification. Since student quality is treated as input, DEA distinguishes the quality of a program from the quality of its students and uses a value-added approach to arrive at a true market-based performance evaluation [14]).

Given the input and output data, a computer program that implements the DEA model presented as a linear programming problem is used to evaluate the undergraduate business programs consecutively. DEA compares each undergraduate business program with the other programs to generate an efficiency score for this business program relative to its peer group. DEA also generates input wastes and output deficiencies. In other words, the program generates high efficiency scores for those schools with high

output values and low input values relative to its peers. An efficient undergraduate business program has an efficiency score of 1. An undergraduate business program with an efficiency score of less than 1 is less desirable relative to a reference set of programs with efficiency scores of 1. The DEA selected results and Bloomberg’s ranking are presented in Table 1. The results should help prospective students identify which undergraduate business programs add the most value to their students.

**TABLE 1**

**Bloomberg Rankings vs. DEA Rankings for Selected Programs**

<u>School</u>	<u>Bloomberg Ranking*</u>		<u>DEA Ranking</u>	
	<u>Rank</u>	<u>Index</u>	<u>Rank</u>	<u>Efficiency Score</u>
Virginia (McIntire)-Charlottesville	1	100.0000	1	1.0000
Michigan (Ross)	4	94.4700	1	1.0000
Brigham Young (Marriott)	5	93.1200	1	1.0000
UC-Berkeley (Haas)	6	92.8500	1	1.0000
Villanova	11	83.0000	1	1.0000
Richmond (Robins)	12	82.9200	1	1.0000
North Carolina (Kenan-Flagler)	13	82.6700	1	1.0000
Miami U. (Farmer)	18	79.2600	1	1.0000
Santa Clara (Leavey)	32	68.8500	1	1.0000
Texas Christian (Neeley)	34	67.1500	1	1.0000
James Madison	44	60.6000	1	1.0000
Binghamton	48	58.9800	1	1.0000
Michigan State (Broad)	52	56.6000	1	1.0000
Florida (Warrington)	53	56.0700	1	1.0000
Oklahoma (Price)	81	40.7200	1	1.0000
Rutgers	90	35.1900	1	1.0000
Florida International	98	27.9000	1	1.0000
Notre Dame (Mendoza)	2	97.2900	42	0.9467
MIT (Sloan)	7	92.4100	60	0.9085
USC (Marshall)	21	76.3100	69	0.8888
Pittsburgh	79	41.4700	99	0.7421
Hofstra (Zarb)	97	29.8700	100	0.7382
Belmont	84	39.2800	101	0.7052

\* Data Source: [http://www.businessweek.com/interactive/reports/bs\\_ugrank](http://www.businessweek.com/interactive/reports/bs_ugrank).

As presented in Table 1, DEA’s value-added rankings of undergraduate business programs are quite different from those of the Bloomberg’s rankings. This difference is due partly to the fact that DEA allows flexible weights and treats student quality features such as SAT score as an input. Therefore, if a program accepts students with relatively low SAT score and is able to produce graduates who, upon graduation, are employed with salaries relatively high to other schools or are admitted to a prestigious graduate business program, this program is efficient in terms of value-added. On the contrary, given the

same output values, Bloomberg gives schools higher rankings if they accept students with higher SAT scores.

Specifically, the DEA value-added results in Table 1 indicate that seventeen schools have efficiency scores of one. Of the seventeen schools, only 7 programs have a ranking less than 18, while many programs ranked considerably worse by Bloomberg. For example, Florida International is ranked 98<sup>th</sup> by Bloomberg, Rutgers 90<sup>th</sup>, Oklahoma 81<sup>st</sup>, Florida 53<sup>rd</sup> etc. A closer examination of the data indicates that compared to its peers, Florida International accepts students with lowest average SAT scores while mean starting salary, the placement grade, and other output measure are comparable to its peers. Bloomberg's data also show that both Florida International and Florida have the lowest costs. Detailed data and DEA results show that Rutgers with an efficiency score of one accepts students with low SAT score while mean starting salary is high relative to its peers that include UC-Berkeley (Haas), James Madison, and Michigan (Ross). Both MIT (Sloan) and USC (Marshall) require a high SAT score are deficient in all areas relative to their peers. MIT's peers include Virginia (McIntire), James Madison and Michigan (Ross) while USC's peers include Miami U. (Farmer), North Carolina (Kenan-Flagler) and UC-Berkeley (Haas).

## CONCLUSION

Selecting the undergraduate business program that provides the best value is an important and daunting task for any prospective student. The selection strategy of any prospective student is a personal investment decision about costs, quality, reputation, job placement grade and value-added. Thus, the selection is a multiple criteria decision-making process that matches the student's capabilities and desires with an appropriate undergraduate program.

This study uses the DEA model to evaluate the performance of individual undergraduate business programs relative to their peer group. DEA does not require a set of pre-assigned weights for inputs and outputs and, thus, overcomes the deficiency introduced by using subjective weights. By using non-subjective assessments of undergraduate business programs, DEA can provide students with unbiased guidelines for selection. With numerous undergraduate business programs available, the findings of this study should help students reduce time and cost and improve their selection process. At the same time these findings should help the undergraduate business directors in identifying the strengths and weaknesses of their programs. Moreover, DEA allows a student to compare selected undergraduate business programs based on certain selected attributes. For instance, a student might be interested in programs that add value in their professional qualification. In such case, only outputs or attributes that measure professional qualification will be included in evaluating undergraduate business programs. The input and output mix can be determined based on individual student's objectives and goals and his/her own qualification. Therefore, unimportant criteria can be dropped while additional criteria pertinent to the student can be added to obtain a desired input-output mix.

The findings of this study should assist prospective students in selecting programs that are of the best market value as well as helping deans in identify the strengths and weaknesses of their undergraduate business programs.

## REFERENCES

- [1] Bloomberg/Businessweek, "Best Undergraduate Business Schools 2011," [http://www.businessweek.com/interactive\\_reports/bs\\_ugrank](http://www.businessweek.com/interactive_reports/bs_ugrank). 2010.

- [2] Charnes, A., Cooper, W. W., & Rhodes, E. Measuring the Efficiency of Decision Making Units, *European Journal of Operations Research*, 1979, 2, 429-444.
- [3] Charnes, A., Cooper, W. W., Huang, Z., & Sun, D. B. Polyhedral Cone-Ratio DEA Models with Illustrative Application to Large Commercial Banks, *Journal of Econometrics*, 1990, 46, 73-91.
- [4] Chilingirian, J. & Sherman, H. D. Managing Physician Efficiency and Effectiveness in Providing Hospital Services, *Health Services Management Resources*, 1990, 3(1), 3-15.
- [5] Dichev, I. D. How Good Are business School Rankings? *The Journal of business*, 1999, 72(2), 201-213.
- [6] Fisher, D. M. and Kiang M. Y., Fisher, S. A. & Chi, R. Evaluating Mid-level ERP Software, *Journal of Computer Information Systems*, 2005, 45(1), 38-46.
- [7] Fisher, D. M. & Sun, B. D. Software Evaluation: LAN-based E-mail, *Journal of Computer Information Systems*, 1996, 34(2), 21-25.
- [8] Holbrook, M. B. Gratitude in Graduate business Attitudes: Re-Examining the business, 2004.
- [9] Maniadakis, N. & Thanassoulis, E. Assessing Productivity Changes in UK Hospitals Reflecting Technology and Input Prices, *Applied Economics*, 2000, 32(12), 1575-1589.
- [10] McMullen P. R. Assessment of business Programs via Data Envelopment Analysis, *Journal of business and Management*, 1997, 5(1), 77-91.
- [11] McMullen, P. & Strong, R. Selection of Mutual Funds using Data Envelopment Analysis, *Journal of business and Economic Studies*, 1998, 4(1), 1-12.
- [12] Schatz, M. business Ranking Surveys, *Management Research News*, 1993, 16(7), 15-18.
- [13] Soteriou, A. & Zenios, S. Operations, Quality and Profitability in the Provision of Banking Services, *Management Science*, 1999, 45(9), 1221-1238.
- [14] Tracy, J. and Waldfogel, J. The Best business Schools: A Market-Based Approach, *The Journal of business*, 1997, 70(1), 1-31.
- [15] Trick, M. Data Envelopment Analysis for Consultants, <http://mat.gsia.cmu.edu/dea.html>. Accessed on March 1, 2004.