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Predicting Intrinsic Value of NCAA Division I Men's Basketball Coaching Salaries

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Men's head basketball coaches at NCAA Division I programs commonly earn hundreds of thousands or even millions of dollars each year, and are commonly paid three or four times as much as their university presidents, yet these wages are currently not rigorously analyzed prior to making hiring choices. Regression modeling reveals that basketball program revenue predicts the vast majority of compensation levels, apart from lifetime successes in NCAA tournaments, each coach's ratings percentage index (RPI), and lifetime winning percentage. Athletics directors therefore need a tool whereby intrinsic value of their head coaches can be assessed. This study remedies an identified gap in the literature by extending estimates of intrinsic valuation to coaches' contracts, increasing labor market efficiency. Predicted salaries of contemporary coaches are compared to actual salaries, noting differences.

Keywords: Intrinsic value, wages, salaries, coaches, college basketball

A *USA Today* (Berkowitz, Upton, & Durkin, 2012) database showed the average head coach of a team participating in that year's National Collegiate Athletic Association (NCAA) Division I Men's Basketball Tournament was paid more than $1.4 million annually. These coaches are among the highest paid employees at their respective institutions, second perhaps only to the schools' head football coaches. By comparison, the highest paid university presidents earn less than $400,000 on average (Strauss, 2014). For those at certain institutions, the head men's basketball coach earns more wages than any paid public employee in the entire corresponding state.

While their salaries are large, elite men's basketball coaches also oversee programs generating significant revenue. According to Rishe (2011), more than 60 Division I men's basketball programs produce at least $6 million in annual revenues, with many well over $20 million. These revenue sources represent direct cash infusion and exclude economic impacts experienced by host communities. Revenue sources include ticket sales, donations, conference television contracts, and corporate sponsorship (Mahony & DeSchriver, 2008). If, over a period of time, a coach develops and maintains a highly successful program which generates improved levels of revenue, it can be argued he should be fiscally rewarded for his role in generating that income. Yet, what of new hires at large schools, whose value contribution and success is yet to be proven there? Are these coaches worth the massive contracts they commonly receive from lucrative programs, merely because the programs are earning significant revenues?

Upon identifying the top candidate for the position of head men's basketball coach at an American university, the dilemma faced by administrators is that of compensation. What is the appropriate pay for the school's head men's basketball coach? Is it really three-to-four times that of the university President? Many administrators rely on the market price as a key criterion; however, what if the market is inefficient? Intrinsic valuation can determine what compensation level is in accord with market data, and we employ intrinsic valuation techniques in this study to provide guidance.

Presently, we consider market data and relevant literature, and apply multiple regression analysis to develop a formula for predicting annual compensation for head coaches of men's college basketball programs across America. Upon examining the literature, we have identified key attributes which may impact coaching salaries. Factors significantly impacting compensation levels are identified, then market values of salaries are predicted and compared with actual salaries.

Literature Review

NCAA men's basketball coaches are paid well because teams generate revenue from several sources, including ticket sales, donations, sponsorship, merchandise sales, youth camps, and media rights – which continue to increase as world media markets continue to expand (Gratton & Solberg, 2007). Several researchers, including Pope and Pope (2014) and Baker (2008) note strong performing teams can also positively impact the number of college applications to a school. Further, Pugh (2013) found that appearances in NCAA Division I men's basketball or football national title games have resulted in enrollment increases of four or five percent. While Tsitsos and Nixon (2012) suggested that hiring well-compensated coaches does

not always equate to winning, nearly all collegiate athletics scholars agree on the existence of an "arms race" in major American college sports. One result of this "arms race" is that the schools often base coach compensation in part on how peer or competitor institutions compensate their coaches (Hirko, Suggs, & Orleans, 2013). Schools with large athletic budgets typically pay their coaches larger salaries, and those with smaller budgets are constantly playing catch up (Perko, 2009).

The pattern of trying to match competitors' compensation levels has produced an unsustainable trajectory for many NCAA Division I programs, resulting in many athletic departments utilizing student fees and (unearned) institutional funds to balance athletic budgets (Denhart & Ridpath, 2011; Perko, 2009; Tsitsos & Nixon 2012). Farmer and Pecorino (2010) even argued some athletic departments utilize these often unsustainable high salaries for men's basketball and football coaches as a strategy to prevent those coaches from working at rival schools.

The justifications for exorbitant coaching salaries are many. Media attention has recently turned to the question of whether such high coaching costs are justifiable in terms of market exposure arising from team successes. A recent *USA Today* article (Berkowitz & Schnaars, 2013) highlighted the existence of a discrepancy in guaranteed football coaching compensation *per win* during the fall 2013 season: at one extreme, several schools paid over $1 million in guaranteed compensation per win; while, at the lower end, some coaches received less than $50 thousand per win. While wins and losses may not be the only means for judging effective coaches within NCAA Division I athletics, it is typically used as the ultimate measuring stick for job performance. Many programs offer clauses within contracts in order to incentivize the attainment of certain outcomes, those clauses typically focus on athletic performance instead of academic performance (Wilson & Burke, 2013).

In addition to determining pay relative to on-court performance, athletic directors have other motivations for determining the accurate market value of coaching salaries. As Karcher (2012) pointed out, many athletic directors make hiring and firing decisions with coaches who are currently under contract. As such, it is wise for them to determine the correct dollar amounts for contract buy-outs (the decision by school administrators to purchase the remaining years of a coach's contract and ask him to leave the institution) and breach of contract clauses or opt-outs (a decision by a coach to take another job while still under contract and pay the employer what remains on the previous contract) when negotiating.

Factors Impacting Salary for Coaches

These reasons indicate a need for determining intrinsic values for NCAA Division I men's basketball coaches. In order to determine appropriate compensation, factors most impacting current salary levels must be determined. The literature provides several examples of relevant factors potentially impacting salary levels. For example, Inoue, Plehn-Dujowich, Kent, and Swanson (2012) conducted a study to examine coaching compensation of head football coaches at major schools. Control variables in their regression model to predict salary included: (a) career winning percentage, (b) coach's age, (c) prior experience as head coach, (d) tenure as coach at current institution, (e) coaching at alma mater, (f) home stadium capacity, (g) type of research university, (h) BCS affiliation, (i) urban school, (j) public school, (k) race of coach, and (l) first year at school. The researchers' model explained 77% of the variance in coaches' salaries with winning percentage, stadium capacity, BCS affiliation, and urban campus designation. In

his work determining variables impacting coach salary, Humphreys (2000) used (a) coaching experience, (b) career winning percentage, (c) athletic department revenues, and (d) other institution demographics such as enrollment, public school status, urban school status, and Historically Black College or University status.

Fizel and D'itri (1996), meanwhile, examined coaching efficiency of Division I men's basketball coaches, arguing that hiring decisions for coaches are too often based strictly on winning percentage. In their study, a basketball production function formula was established which incorporated both a measure of production talent (players) available and the strength of opponents. The authors argued both measures are critical when evaluating how efficient a coach is at generating victories. According to the study, efficient coaches can do more with less talent or win more games against stronger opponents than inefficient coaches. To measure the level of talent with which a coach works, Fizel and D'itri utilized a recruiting and talent ranking system developed by basketball scout Clark Francis that assigns a numerical value to every player in college basketball. Similarly, Karcher (2012) suggested athletic administrators examine contracts of coaches who compete against similar talent and are coaching at similar institutions.

Considering the literature specifically addressing coaching performance and consequent salaries, we assessed the performance of men's college head basketball coaches by examining past wins and losses, prior ranking performance, experience, and academic progress rate. Due to the significance of the NCAA tournament held each March, we also added a scaled NCAA tournament performance measure. Additionally, we considered program revenue as a firm performance measure.

Intrinsic Valuation of Coaching Salaries

Understanding the predicted value of what coaching contracts should be is our first step in this study, to assist athletic directors in making offers to prospective coaches. Intrinsic valuation has been used before within the context of college athletics. Brewer, Pedersen, Lim, and Clerkin (2011) conducted valuations of NCAA Division I Football Bowl Subdivision programs to determine accurate depictions of those departments based on financial principles of firm valuation. The Brewer et al. (2011) methodology values each program intrinsically as an investment of its respective institution, considering fundamental economic information including the sport-specific cash flows accruing to the athletic department and university, as well as risks seen in the industry and general economy. We use intrinsic valuation techniques to ascertain predicted values of salaries based upon predictor variables previously identified in the literature, and reconfirmed in this study. In a prior study, revenues – as opposed to some level of cash flow or earnings - were shown to be highly associated with program valuation (Brewer & Pedersen, 2013a).

The amount of revenue brought in by NCAA Division I athletic departments is readily available to the public through the U.S. Department of Education's Equity in Athletics Database. Brewer & Pedersen (2013b) described a method for adjusting this data to estimate total program-specific revenues and expenses, which we apply in the present study to gain understanding of the basis of basketball program revenues. Specifically, program revenues were estimated by summing the pro rata percentage of non-allocated revenues with those revenues directly attributed to men's basketball, as reported on the annual, private and proprietary NCAA Financial Reports (Winthrop Intelligence, 2013), or from the EADA cutting tool (U.S.

Department of Education, 2013). The pro rata percentage of non-allocated revenues was established by assessing the fraction of total allocated revenues within each athletic department that comprised men's basketball operations, and multiplying this fraction by the non-allocated revenues. This product was estimated to reflect revenues arising from men's basketball. No adjustments were made for intangible value attributions such as goodwill to the university, the "Flutie Effect," differential state appropriations, or other indirect revenues arising from sport presence.

Intrinsic value is defined as "valuation determined by applying data inputs to a valuation theory or model. The resulting value is comparable to the prevailing market price," (Downes & Goodman, 1998). A common goal of using intrinsic value is to assist buyers and sellers in transacting assets at appropriate prices, which is our present goal. While market value represents the price at which informed sellers and buyers are willing to exchange an asset (Pratt, 2007), intrinsic value generally refers to a fair price using fundamental information pertaining to the subject asset. Intrinsic value is calculated using fundamental analysis to determine discrepancies between the market price and the true price arising from an analytical model fueled by relevant economic data. Intrinsic value indications offer transparency allowing counterparties to make deals at efficient price points. As Pratt (2007) describes, intrinsic value and market value are intertwined, with the intrinsic value informing participants as to the reasonable price range.

Market Efficiency

The second aspect of our study compares pricing results to reported coaches' salaries to examine market efficiency. The importance of this issue is highlighted by the fact that coaching contracts stipulate millions of dollars of university cash flow every year, wherein any inefficiency in the amounts would thus waste significant sums of money at many schools, each year. According to the efficient market hypothesis, markets incorporate all available information into prices, quickly respond to new information, and are consistent with fundamentals (Bodie, Kane, & Marcus, 2011). While the debate of whether and to what extent markets are actually efficient is marked with much controversy, the literature does support the efficient market hypothesis as providing a strong foundation for general understanding of price movements in asset markets (Beechey, Gruen, & Vickery, 2000). Particularly relevant to our study is the efficient market maxim stating that markets respond quickly to new information. Our intrinsic valuation approach provides athletic directors immediate information about the value of their investments in college coaches, enabling the reduction of pay structure inconsistencies within the coaching market.

Research Questions

RQ1: What intrinsic valuation model would accurately predict compensation levels for NCAA Division I men's basketball coaches?

RQ2: What are the most relevant factors in determining NCAA Division I head men's basketball coaches' salaries?

RQ3: Can such a model (a) reveal instances of inefficiencies in the labor market for NCAA Division I head men's basketball coaches (i.e., instances where a particular coach may have been

paid an inappropriate amount)?, and (b) provide guidance for determining more economically efficient coaching salary levels going forward?

To answer these questions, we first analyzed relevant coach and institution variables to determine which are actually significant in the intrinsic value assessment of coaches' compensation. We then incorporated these variables into a model for predicting fair market compensation levels.

Methods

Financial data about programs and on-court performance data about coaches was provided by Winthrop Intelligence, LLC's *Win AD Databases* (Coaches and Financials). We also used additional sport-related financial information from the U.S. Department of Education's Equity in Athletics Data Analysis (2013) reports. Through these two data sources, we examined compensation levels of 193 NCAA Division I men's basketball head coaches as of 2013. In predicting head coach annual salary, we considered eight (8) predictor variables, including seven (7) from relevant literature and an eighth (8^{th}) variable which considers the importance of success in the NCAA tournament. All right-hand-side variables are lagged one year prior to salary to align prior performance with consequent pay. Variables are described below.

Lifetime NCAA Success

For each coach identified in the Winthrop (2013) database, all NCAA Men's Basketball Tournament (i.e., March Madness) appearances and wins were tabulated. According to historical performance for each coach, a numerical score was assigned denoting cumulative tournament successes. Scaled points were allocated to each coach reflecting a continuum of increasing empirical market evidence as teams moved deeper into the tournaments over the careers of each coach, as follows: Nielsen (2012) published a study outlining the viewership of NCAA March Madness games that year, by round. Viewership numbers have been converted into numerical scores for each round by dividing each successive viewership number by the base round, which occurred on or before the first weekend of March Madness. Viewership numbers for the play-in games and the round of 64 (featuring 36 total games) were treated equally and combined because viewership numbers for these games were very similar (Nielsen, 2012). Furthermore, the national champion scaled points value was estimated by using a best fit curve (exponential trend; R-square 0.98) to forecast the number hypothetically following the championship game. Justification for this estimate arises from knowing that each year, the national champion benefits from further and sustained media exposure across multiple venues, versus the runner-up. All points were assigned with indefinite shelf life without discounting the time value of winning. See Table 1 for viewership numbers by round and the corresponding empirical scores.

Table 1

Lifetime NCAA Success

Round	Viewership	Scaled points
First 4	7,968,000	10.00
Field of 64	56,316,000	10.00
Field of 32	75,812,000	26.53
Sweet 16	85,712,000	60.00
Elite 8	91,429,000	128.00
Final 4	97,127,000	271.96
Title Game	101,948,000	570.92
Champion	-	1,170.96

Note: Source of scaled points for all rounds except championship game, *Nielson* (2012). Points for championship round was calculated by best-fit estimation.

WLO – "Win-Loss-Overall"

The "win-loss-overall" variable includes all wins and all losses recorded as a head coach at any NCAA Division I program.

WLC – "Win-Loss-Conference"

The "win-loss-conference" variable includes all wins and losses in conference play, for all teams coached as a head coach, with all conference wins coalesced.

APR – "Academic Progress Rate"

The "academic progress rate" is the average lifetime number for each head coach overall. APR reflects the team's average college credit accrual per player, and their collective graduation rate.

RPI – "Rating Percentage Index"

The "rating percentage index" is the season-end score for the coach's school. Data was retrieved from *CBS Sports'* Strength of Schedule database (CBS Sports, 2014). Developed in 1981, RPI comprises a team's winning percentage (25%), its opponents' winning percentage (50%), and the winning percentage of those opponents' opponents (25%) (Johnson, 2009). The opponents' winning percentage and the winning percentage of those opponents' opponents both comprise the strength of schedule (SOS). Thus, the strength of schedule accounts for 75% of the RPI calculation. Two thirds of RPI is comprised of opponents' winning percentage while one third of RPI reflects opponents' opponents' winning percentage.

RPI Rankings

The RPI ranking reflects the season-end ranking for the coach's school, lagging one year behind program revenues and compensation numbers. Data was retrieved from *CBS Sports'* Strength of Schedule database (CBS Sports, 2014).

Experience

Experience reflects the total number of years in the Head Coach position. Of the 193 coaches, the minimum experience seen was three (3) years, while the most experienced head coach had accrued thirty-eight (38) years on the bench. Experience as an assistant or associate head coach was excluded from our analysis, both in terms of the "experience" variable, as well as the other variables.

Program Revenue

Program revenue for each specific sport is not reported directly and thus has been approximated. The estimate was made using the method detailed in Brewer & Pedersen (2013b), as described previously.

Current Head Coach Compensation (Response Variable)

The current salary included the number taken from the NCAA Financial Reports describing "head coach total pay for (men's basketball) in (2011-2012)." Therefore, the "current head coach compensation" is a comprehensive annual number reflecting money actually paid to the coach as a result of his service as Head Coach.

The Models

To control for heteroskedasticity, logarithmic transformations were made to all variables and considered for possible inclusion in the model. We then tested a total of sixteen variables – the eight original in addition to the seven transformed variables – for inclusion in the model predicting the logarithmic transformation of the output variable, Current Salary. Ultimately, the selected model included four predictor variables: the natural logarithm of revenue, the natural logarithm of RPI, the natural logarithm of experience, and the natural logarithm of Lifetime NCAA Success. The selected model is useful in predicting variance in salary as shown by its high coefficient of determination (adjusted R-square = 0.8572), and the model has an infinitesimal significance F-value, while normalizing the dispersion of residuals. Multicollinearity did not pose a significant issue in the model, as the tolerance levels for each variable were well above the common 0.1 and 0.2 thresholds (Snee, 1977). Additionally, the scatterplot of residuals against predicted values revealed a much more reasonable variance distribution. Statistics for the model are displayed in Table 3:

Table 3

Model Summary

Variable	*B*	*SE B*
log_rev	0.7497*	0.0398
log_rpi	3.4833*	0.7840
log_exp	0.2486*	0.0506
log_NCAA	0.0374*	0.0122
_cons	-0.6428	0.5204

Note: Adj. $R^2 = 0.86$. N = 193. * p< .01

The selected model shows that the natural logarithm of coaches' salary is predicted by

0.7497 x LN(Revenue) +
0.0374 x LN(Lifetime NCAA Success + 1) +
3.4833 x LN(RPI + 1) +
0.2486 x LN(Experience) -
0.6428

Therefore, coaches' salary is given by:

$$e^{0.7497xLN(Revenue)+0.0374xLN(Lifetime\ NCAA\ Success+1)+3.4833xLN(RPI+1)+0.2486xLN(Experience)-0.6428}$$

Results

After selection of a final model, we analyzed the results in order to answer our third research question: Can such a model reveal instances of potential inefficiencies in the labor market for NCAA Division I head men's basketball coaches? A market is said to be efficient if, within the context of trading, the buyers and sellers of the market have had access to relevant market information and had the capacity to digest that information appropriately up to the point any transaction occurs. Theoretically, this results in low variance around a predicted outcome, $\hat{y}$, such that the variance is purely unbiased around the estimate (Fama, 1970). In high volume trading markets such as stock markets, any market inefficiencies would likely dissipate quickly as market participants discover truth about the assets, and thus market values converge upon fundamental values. Coaching salaries, however, are contracted relatively infrequently versus stock trades, and thus coaching salaries pricing inefficiencies are less likely to be eliminated quickly. We therefore hypothesize that many such inefficiencies are likely to exist in the market for NCAA Division I head men's basketball coaches.

We compared the 193 data points (i.e., actual coaches' compensation) to the 193 predicted values from our model. We found that 99 coaches are currently being paid amounts higher than is predicted from our model, and 94 are being paid amounts lower than predicted. Of course, there is a range of reasonable compensation that might be described by $\hat{y}$, plus or minus some fraction of $\hat{y}$. To identify potential inefficiencies, we turn our attention to those instances where the actual compensation differs from what our model predicts, and to what extent differences exist. We ranked the differences in actual compensation and predicted compensation, and took note of the cases where these differences were largest. These differences

resulted in the most overpaid coaches (see Table 4) and the most underpaid coaches (see Table 5).

Table 4

10 Most Overpaid Coaches, 2012

Coach	School	Actual Salary	Predicted salary	Nominal difference	Percentage difference
Bob Thomason	Pacific	230,633	61,364	169,269	275.84%
Billy Donovan	Florida	4,346,790	1,804,475	2,542,315	140.89%
Buzz Williams	Marquette	2,819,947	1,304,904	1,515,043	116.10%
Craig Robinson	Oregon State	1,058,046	493,669	564,377	114.32%
Jeff Lebo	East Carolina	644,132	310,236	333,896	107.63%
Tony Barbee	Auburn	1,790,515	892,302	898,213	100.66%
Mark Fox	Georgia	1,579,800	811,087	768,713	94.78%
Tom Izzo	Michigan State	4,503,641	2,463,442	2,040,199	82.82%
Trent Johnson	Louisiana State	1,392,040	781,328	610,712	78.16%
Tod Kowalczyk	Toledo	502,360	282,581	219,779	77.78%

Table 5

10 Most Underpaid Coaches, 2012

Coach	School	Actual salary	Predicted salary	Nominal difference	Percentage difference
Dick Hunsaker	Utah Valley	163,323	482,265	(318,942)	-66.13%
Scott Nagy	South Dakota State	126,750	365,006	(238,256)	-65.27%
Chris Mack	Xavier	471,842	1,182,439	(710,597)	-60.10%
Blaine Taylor	Old Dominion	272,160	662,576	(390,416)	-58.92%
Eddie Biedenbach	North Carolina-Asheville	122,250	296,280	(174,030)	-58.74%
Brooks Thompson	Texas San Antonio	175,493	408,526	(233,033)	-57.04%
Jim Larranaga	Miami (Florida)	675,000	1,479,241	(804,241)	-54.37%
John Brady	Arkansas State	125,040	250,426	(125,386)	-50.07%
Doug Wojcik	College of Charleston	348,773	695,586	(346,813)	-49.86%
Cuonzo Martin	Tennessee	800,000	1,452,839	(652,839)	-44.94%

The importance of the compensation levels contracted with the coaches is underscored by noting the annual amounts of these compensations. The overall highest paid coaches in men's college basketball (2012) fall in order as follows in Table 6:

Discussion

The wide range of values seen in the sizes of the annual compensation packages and in the differences from actual compensation levels versus predicted levels indicates that millions of dollars are inefficiently being exchanged each year across the NCAA in men's basketball, between head coaches and athletic departments. This high variation suggests an opportunity to

improve efficiency by communicating to athletics directors what factors drive annual head coach salary levels of men's college basketball programs. In this way, future salaries can be established using the established information, such as those salaries predicted by the model presented in this study.

One of the key results to note from our study is that the size of basketball program revenue for each school was the most significant predictor of coaches' salaries. In each model tested, Program Revenue explains by far the most variance in coaches' salaries. Interestingly, this implies that the single strongest predictor of coach compensation is neither that individual coach's past experience nor his on-court performance (as might be expected, or desired), but simply the availability of funds at the hiring institution's athletic department.

As a concrete example, consider the case of Sean Miller, with the seventh-highest predicted compensation level in our study. Although Miller has enjoyed considerable regular season and conference success while at Xavier and Arizona, without any Final Four appearances, it is arguable that Miller may not possess the level of career success shared by many of the other elite coaches on the list above (Table 4). We noted that according to a recent report from the *Wall Street Journal,* the Arizona's men's basketball program is one of the five most financially valuable college basketball programs in the U.S., reflecting our model's relatively high predicted compensation level for Miller. In essence, programs having strong revenues and cash flow commonly support handsomely compensated head coaches, apart from – and regardless of - other factors, which begins a new discussion about the meaning of market efficiency. When a market does what is supposed to yet certain stakeholders are not part of the process, then is the market really efficient? For instance, do donors and other supporters really have the power to remove an overpaid coach by proxy vote, analogous to the CEO's of public corporations? Clearly, in college athletics, the governance is different than that of public corporations, leaving much of the human capital power in the hands of the athletic directors without a standardized governance structure available for calling the contracts on overpaid and underperforming coaches.

In essence, paying a program leader according to the program's ability to pay, rather than the leader's ability to lead - suggests another form of market inefficiency. The goal of a given college fan base, board of trustees, student body, administration, and faculty would be to maximize market exposure and brand value of a given university. The means to achieve this goal through men's basketball is ostensibly to win important games fairly, with high achieving student-athletes, whose behavior is commendable and whose collective academic performance is strong. Nonetheless, the goal is to win. However, our findings suggest academic performance is not associated with the level of compensation of the head coach, and on-court performance explains a lower proportion of the variance in salaries. Importantly, an area of future investigation could inquire as to the importance of a program's unique on-court history as well as collective historical academic and career outcomes measures for the student-athletes, as to whether they are associated with its respective current capacity to produce revenues. Yet, as for the individual head coach, no such connections appear to consistently exist. Rather, it is the size of the program, measured in dollars, that consistently explains the salary of the head coach.

In addition to checking for presence of market inefficiency, the model has been developed to suggest an appropriate salary level for head coaches who are hired at a given institution, based on current market trends and standards including the heavy market focus on program revenues. For example, we look at two vacancies filled in spring 2012 at UCLA and the University of Minnesota. At UCLA, some of the suggested candidates initially included Steve

Alford (New Mexico), Brad Stevens (Butler), and Josh Pastner (Memphis). Alford was hired for the position, while Shaka Smart (Virginia Commonwealth), Buzz Williams (Marquette), and Fred Hoiberg (Iowa State) were initially considered to be candidates at Minnesota. Ultimately, Richard Pitino, who was previously the head coach at Florida International University for a period of exactly one year, was hired to lead the Golden Gophers' program for a sum in excess of $1.2 million. Clearly the large salary is not a consequence of Mr. Pitino's experience, having only coached for one year, and as such having amassed an inconsequential historical track record of on-court performance. Moreover, we have all witnessed the anecdotal coaching disappointments of other legendary coaches sons: Bob Knight and Pat Knight; Ray Meyer and Joey Meyer, etc. We used our model to predict intrinsic values of compensation for the candidates for the head coach position at UCLA and Minnesota, as shown below:

Table 7

Intrinsic Value for Head Coaching Vacancies

Coach	Hiring school	Predicted salary
Steve Alford (selected)	UCLA	1,978,265
Brad Stevens	UCLA	1,744,761
Josh Pastner	UCLA	1,423,503
Richard Pitino (selected)	Minnesota	N/A
Shaka Smart	Minnesota	1,479,904
Buzz Williams	Minnesota	1,621,857
Fred Hoiberg	Minnesota	1,115,964

Table 7 illustrates how our model can improve efficiency in the market for Division I basketball coaches by reducing variance. While we suggest further improving the coach contracting process by addressing the appropriateness of tying coaching salaries to program revenues rather than to coaching success predictors, our model provides key insight in how to begin the process of establishing appropriate level of compensation for a head men's basketball coach.

Limitations

By creating prediction levels of acceptable values, a certain amount of statistical noise and variation within a predicted interval range would be warranted. We have not provided such a range in this study. While intangible factors play a significant part in the hiring of a coach, we assert knowing the fair market compensation level for a given coach—within the context of that head coaching position—helps shape the intangibles of hiring and offering compensation at or near intrinsic value levels. Finally, while our model focuses on all predictive elements of compensation, including program revenues, it is designed to prevent athletic directors from unnecessarily overpaying unproven coaches without proven track records.

Conclusions

Our first research question asked whether a model could be developed to accurately determine appropriate compensation levels for NCAA Division I men's basketball coaches. We developed several models to answer this question, finally selecting the following as the most suitable to the purpose:

$$e^{0.7497xLN(Revenue)+0.0374xLN(Lifetime\ NCAA\ Success+1)+3.4833xLN(RPI+1)+0.2486xLN(Experience)-0.6428}$$

In answering research question two, we found the most relevant factors predictive of head men's basketball coaches' salaries derived from both coach and institution characteristics: namely, the institution's Program Revenues, the coach's Lifetime NCAA Success history, and the coach's RPI rating.

The third research question asked whether the model could be used to identify inefficiencies in the labor market for Division I men's basketball coaches, and whether the model could be used in future hiring situations to reduce economic inefficiency. We posited a method of identifying such inefficiencies by finding those situations where a coach is compensated comparatively highly above or below prediction levels. This method of identifying inconsistencies serves as a starting point for considering whether current compensation levels are above or below what is justifiable given the value of a particular coach to his respective institution. Our tool can help athletic directors decide what compensation level is reasonable and fair, in accord with market data, in accord with the missions of visions of the respective institutions, and in concert with the likely predicted performance of a given coach.

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Table 2

Summary Statistics

Variable	Obs	Mean	Std. dev.	Min	Max	Description	Source
wlo	193	0.56	0.11	0.18	0.82	Win percentage for coach's career	Winthrop Intelligence, 2013
wlc	193	0.55	0.14	0.15	0.91	Conference win percentage for coach's career	Winthrop Intelligence, 2013
apr	193	926.16	65.85	332.29	999.17	Average academic progress rate for coach's career	Winthrop Intelligence, 2013
experience	193	14.11	7.65	3.00	38.00	Total years of experience in head coach position	Winthrop Intelligence, 2013
rev	193	7,361,195	7,936,383	230,633	54,400,000	Adjusted revenues for the coach's current program	Winthrop Intelligence 2013; EADA, 2013
rpi	193	0.51	0.07	0.35	0.69	Season-end score for the coach's school	CBS Sports, 2014
rpi_rank	193	152.8	98.30	1	342	Season-end ranking for the coach's school	CBS Sports, 2014
NCAA	193	1,879	5,019	0	36,853	Lifetime NCAA success score, based on viewership in each round	Winthrop Intelligence, 2013
salary	193	821,746	970,699	86,464	5,248,000	Head coach total pay for the 2011-2012 season	Winthrop Intelligence, 2013

Table 6

25 Highest Paid Coaches, 2012

Rank	Coach	School	Actual salary	Predicted salary	Deviance	Above/Below	Program rev.	RPI	Lifetime NCAA	Experience
1	Rick Pitino	Louisville	5,248,000	5,241,457	6,543	Above	54,434,684	0.59	4,624	27
2	John Calipari	Kentucky	4,878,772	3,742,708	1,136,064	Above	28,891,940	0.67	17,186	21
3	Mike Krzyzewski	Duke	4,693,119	4,207,545	485,574	Above	26,865,732	0.66	36,853	38
4	Tom Izzo	Michigan State	4,503,641	2,463,442	2,040,199	Above	20,698,264	0.60	19,450	18
5	Bill Self	Kansas	4,446,215	4,240,874	205,341	Above	35,153,109	0.69	17,104	16
6	Billy Donovan	Florida	4,346,790	1,804,475	2,542,315	Above	14,403,910	0.57	24,102	19
7	Rick Barnes	Texas	3,300,000	2,604,028	695,972	Above	21,478,466	0.60	3,581	26
8	Buzz Williams	Marquette	2,819,947	1,304,904	1,515,043	Above	16,189,717	0.58	540	6
9	Bobby Huggins	West Virginia	2,617,904	2,420,464	197,440	Above	16,461,694	0.66	2,311	28
10	Tom Crean	Indiana	2,570,577	2,032,628	537,949	Above	29,350,751	0.47	1,922	14
11	Lon Kruger	Oklahoma	2,329,737	1,345,478	984,259	Above	11,846,390	0.52	310	32
12	Tubby Smith	Minnesota	2,286,792	2,287,889	-1,097	Below	21,637,340	0.57	1,860	22
13	Mark Turgeon	Maryland	2,234,863	2,556,680	-321,817	Below	27,616,018	0.61	320	15
14	Thad Matta	Ohio State	2,230,000	2,329,374	-99,374	Below	21,893,457	0.61	6,848	13
15	Sean Miller	Arizona	2,218,506	2,223,560	-5,054	Below	30,339,831	0.54	2,230	9
16	Ben Howland	UCLA	2,216,899	1,820,078	396,821	Above	18,292,733	0.52	7,850	19
17	Jay Wright	Villanova	2,111,872	1,395,565	716,307	Above	9,778,256	0.63	2,822	19
18	Lorenzo Romar	Washington	2,088,293	1,489,841	598,452	Above	13,032,298	0.59	840	17
19	Anthony Grant	Alabama	1,934,369	1,275,374	658,995	Above	14,514,728	0.54	13,494	7
20	Tony Bennett	Virginia	1,934,253	1,657,382	276,871	Above	23,666,489	0.52	2,182	7
21	Kevin Stallings	Vanderbilt	1,922,671	1,361,313	561,358	Above	10,542,207	0.61	600	20
22	Bo Ryan	Wisconsin	1,911,130	2,216,057	-304,927	Below	21,344,598	0.61	1,710	14
23	John Thompson	Georgetown	1,872,691	1,581,493	291,198	Above	13,015,207	0.64	2,021	13
24	John Beilein	Michigan	1,866,025	1,275,833	590,192	Above	11,933,437	0.52	1,000	22
25	Matt Painter	Purdue	1,857,703	1,783,396	74,307	Above	18,581,944	0.62	939	9