FINANCIAL BEHAVIOR OF OKLAHOMA SINGLE STATION RADIO MARKETS IN 1973

By

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PREFACE

The primary objective of this study was to determine the relationship between the various market and station characteristics of selected Oklahoma broadcast markets and the financial behavior of those markets.

The study concerned commercial stations already existing within the selected test markets, as well as the future introduction of a new FM broadcast facility in the market areas. More specifically, this study was concerned with identification of those variables which were strongly correlated to existing and potential economic conditions within these test markets.

The author wishes to express his appreciation to the many people who made a significant contribution to this exploratory study. First, I am indebted to my major adviser, Dr. James W. Rhea, for his valuable assistance throughout this study. Appreciation is also expressed to another committee member, Dr. Walter J. Ward, Chairman of Graduate Studies in Mass Communication, for his guidance, encouragement and assistance.

I am also deeply indebted to Dr. Tom McCoy, a former member of the Oklahoma State University faculty, now an attorney with the Federal Communications Commission, for his encouragement and help in the preparation of material

for this study.

In addition, special thanks goes to those station owners and managers who responded to my request for information concerning the financial condition of their individual stations.

Finally, special appreciation is expressed to my wife, Linda, for her understanding, encouragement and patience during completion of this study.

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IMI - Individual market index (see Equation (1))

K_{pr} - Analytic constant (.0039)

- Potential revenue index

R_{di} - Variable defined by Equation (5)

- Radio dollar index

R_p - Variable defined by Equation (2)

- Potential revenue (dollars)

R_{p+2} - High potential revenue (see Equation (3))

R_{p-2} - Low potential revenue (see Equation (4))

R_t - Variable defined by Equation (7)

- Total radio revenue (dollars)

S_{ra} - Variable defined by Equation (6)

- Share of radio audience

TRS - Total retail sales (dollars)

CHAPTER I

INTRODUCTION

For many years after development of frequency modulation (FM) broadcasting in the latter part of the 1930s, it survived as a second service to amplitude modulation (AM) radio. On May 22, 1940, the Federal Communications Commission (FCC) authorized full commercial FM broadcasting. Today, after nearly 35 years, FM is "taking on a role of importance for the first time in . . . history."[1]

With the development of FM broadcasting came a number of inherent advantages over amplitude modulation (AM). These were:

1. The static-free signal of frequency modulation.

2. Increased audio frequency range of FM allowing for high-fidelity broadcasting.

3. The ability of FM stations to exist quite close to one another in frequency without the mutual interference experienced with AM.

4. The opportunity for a great increase in broadcast competition through large numbers of new stations in a new frequency band.

5. The resulting possibility of a challenge to network control of broadcasting and a diversification of broadcasting services.[2]

Yet with all this going for it, FM radio would have to wait nearly 35 years to develop as a major broadcast service.

A decision by the FCC in 1945 to uproot FM broadcasting from its existing frequency (42-50 mhz) and move it to a higher band, made all existing frequency modulation receivers and transmitters obsolete. In addition, the post-war growth of a new video medium (television) diverted needed attention from this infant of the radio broadcast industry.[3]

Ironically it was another FCC decision in September 1969 that changed the status of FM radio. The new proposal called for nearly all future radio expansion to be put into FM.

> Major reasons cited for the change included the fact that FM was a full-time service whereas AM was increasingly daytime-only service (especially for most new stations), and that FM stations could still be assigned without the interference problems which plagued the addition of almost any AM outlet.[4]

Today, while FM broadcasting is enjoying a greater growth rate than any other time in its brief history, it also is slowly overcoming its economic growing pains. A recent study by the National Association of Broadcasters (NAB), showed that only 43 percent of the 265 stations responding reported profitable operations in 1972. Projected increases in revenues of 11 percent in 1973 meant the typical FM station could break even for the first time in history.[5]

As the NAB study indicates, the economic picture for a majority of FM broadcast stations has been marginal. The ability to withstand adverse economic conditions is based on two standards that effect all broadcast stations:

> 1. Declining income cannot be countered by equivalent reductions in expenses, as it can in many other businesses; as a licensed medium, broadcasting has to comply with minimal engineering standards, maintain a minimum schedule of operations, and otherwise meet externally imposed standards not required of nonregulated business.
>
> 2. A losing station is slow to die: a broadcast license represents in a sense a kind of lottery ticket -- success may always be just around the corner, if only the right formula can be found. Therefore, failing stations tend to hang on long past the point of no return; someone nearly always turns up to risk investing just a little more money or time on the chance that the license will finally pay off.[6]

Economic success, therefore, becomes increasingly dependent upon accurate evaluation of market conditions. This is especially true with FM expansion into new markets, where competition with an existing station could raise a question of economic injury. Precedent established for future Commission action on this matter is found in Carroll Broadcasting Co. v. FCC:

> The Appeals Court has held that the Commission must give existing stations an opportunity to present proof of such alleged (economic) injury -- not because the FCC has a duty to protect the commercial interests of licensees, but because it must consider whether increased competition will "spell diminution or destruction of service," to the detriment of the public interest.[7]

The proper evaluation of current market conditions is necessary for future FM growth, if not for the pure economics involved, then for the judicial considerations outlined above. This study hopes to shed some light on select financial indices within small broadcast markets to assist the existing licensee, and possibly new applicants, in evaluating economic conditions within a particular market.

Purpose of the Study

This study attempts to investigate relationships between the characteristics of selected Oklahoma small markets and the existing AM broadcast station therein, and the possible introduction of an FM broadcast station into each of the markets.

It is anticipated that this study provides a base upon which an additional body of knowledge about the economic criteria for future growth of broadcasting can be formulated.

Several related, but fundamental, measurement and analysis tools were utilized, with the following objectives in mind:

1. To establish the amount of average potential radio revenue in a market as a function of total retail sales.
2. To determine how economically viable select small markets within Oklahoma are, through the study of financial, market and existing station data.
3. To project these findings as a factor of the dependent and independent variables, in order to indicate the probable economic viability of the test market to the introduction of an FM broadcast station.
4. To identify individual variables and groups of variables which merit more detailed analysis in larger market situations.

Scope of the Study

This study has some specific limitations which should be brought out at this time: first, because of the investigative nature of this study, there should be no application of the findings contained in this research to additional markets without further testing in larger markets with more observations. The universe of this research remains single station markets in Oklahoma.

Second, this study does not intend to define the overall "success" of any radio station or market. This study is solely concerned with the relationship of select market and station variables to existing economic conditions.

Third, this study is primarily quantitative in nature, and in no way accounts for all the qualitative aspects of some of the variables included.

Finally, being a preliminary investigation, this study is descriptive in nature. That is, the study describes existing covariations, but does not, for the most part, attempt to test hypothetical relationships among these variables.

Hopefully, where this study reveals significant interaction between market, station and economic variables within the test markets, station owners will use this information to improve their service to the public. At the same time, it is anticipated this study will assist future growth of broadcasting in Oklahoma through the critical examination

of existing economic conditions and the future application of significant data to varying market conditions.

Terminology

The following terms used in this study may require some additional classification:

1. Financial Efficiency Index. A station's income reported as a percentage of its revenue constitutes the station's financial efficiency index.
2. National-Regional Revenue. All national and regional revenue generated by a station, to include network revenue, constitutes a station's national-regional revenue.
3. Personal Income. A term similar to the Department of Commerce term "disposable personal income," and listed in some sources as "consumer spendable income."
4. Potential Revenue Index. A constant ($K_{pr} = .0039$) used to determine the average potential radio revenue in each test market as a percentage, or index of total retail sales.
5. Radio-Dollar Index. A station's total revenue reported as a percentage of the potential radio revenue available in the test market.
6. Test Market. A county in Oklahoma, under 100,000 population, that as of January 1, 1974, had only one AM broadcast station on-the-air, with no

other radio competition, but one or more available FM frequencies as allocated by the FCC, and listed in the table of assignments during 1973.

7. Total Net Income. A station's profit or loss, listed in some sources as "income," or "profit."

FOOTNOTES

[1]Christopher H. Sterling, "Decade of Development: FM Radio in the 1960s," Journalism Quarterly, XLIIX (1971), p. 222.

[2]Lawrence D. Longley, "The FM Shift in 1945," Journal of Broadcasting, XII (1968), p. 353.

[3]Ibid., p. 354.

[4]Sterling, pp. 229-230.

[5]"The Rites of Passage Are All Over For FM Radio: It's Out On Its Own," Broadcasting, XXCV (September 24, 1973), p. 33.

[6]Sydney W. Head, Broadcasting in America (2nd ed., Boston, 1972), pp. 334-335.

[7]Ibid., p. 335.

CHAPTER II

REVIEW OF LITERATURE

History of FM Broadcasting

From the beginning, there has been a constant search for better ways of utilizing radio as a means of communication. Prior to 1930, a number of high-powered amplitude modulated transmitters were developed, and we were introduced to the superheterodyne receiver. While communication engineers have found a number of ways to improve the sensitivity and selectivity of amplitude modulated radio, the problems of man-made and natural static still exist. In order to prevent the inherent static-noise problems of AM transmission from interfering with reception, an alternate method of sending signals, unresponsive to amplitude variations, was needed.[1]

From a scientific standpoint, the alternating-current sine wave can be changed in only three ways: (1) through amplitude, or strength; (2) in frequency; and (3) in phase.[2] Since the limitations of amplitude modulation were already known, the choice was ultimately narrowed to frequency modulation (FM).

> From the first patent on FM radio (1905) through years of criticizing FM as a useless side-product of AM radio transmission, the story of FM to about

> 1930 is basically one of little interest and thus no progress. Only after Edwin Howard Armstrong's intensive developmental work of 1928-34 did a workable system of FM radio arise. Only after the 1934-36 struggle by Armstrong for industry and government recognition did FM get even a limited chance to prove itself. And only after the pioneer stations of 1937-39 went on the air and showed the feasibility of FM in practice did the system get a full Federal Communications Commission (FCC) hearing (1940) and approval for commercial operation.[3]

After monitoring a number of experimental FM broadcast stations, the Federal Communications Commission granted a hearing and issued a report, May 20, 1940, on frequency modulation.

> Frequency modulation is highly developed. It is ready to move forward on a broad scale and on a full commercial basis. On that point there is complete agreement amongst the engineers of both the manufacturing and the broadcasting industries. A substantiated demand for FM (frequency modulation) transmitting stations for full operation exists today. A comparable public demand for receiving sets is predicted. It can be expected, therefore, that this advancement in the broadcast art will create employment for thousands of persons in the manufacturing, installation, and maintenance of transmitting and receiving equipment and the programming of such stations.[4]

The new popularity of FM radio may have been well-founded, but it would not last long. The Federal Communications Commission granted FM radio full commercial status as a result of the hearing and "the first construction permits for commercial high frequency (FM) broadcast stations were issued by the Commission on October 31, 1940."[5] Less than two years later, FM radio would receive its first in a series of setbacks.

> After a year of planning but limited growth, FM expansion was stopped in early 1942 because of lack of wartime material priorities. About 45 FM stations operated by the end of the war, with their limited hours of programming being received on some 400,000 FM receivers made before the wartime freeze. Although plans were made for postwar expansion, this time can best be seen as a prolonged hiatus in FM growth.[6]

It is interesting to note that during the war years (1941-45), not one FM station ceased broadcasting activity even with the extreme shortage of replacement equipment, loss of personnel, and limited number of FM receivers distributed across the country. The only new broadcast stations authorized during this period were those previously on-the-air as experimental stations. No new construction permits for new FM stations were granted under the wartime freeze, even though there was extensive interest in this new medium.[7]

The second major setback for FM radio came in 1945, as the FCC considered the possibility of reestablishing FM in the frequencies between 88 and 108 megacycles, thereby making transmitters and receivers in the 42-50 megacycle range obsolete.[8]

> The most confusing and controversial years in FM development were marked first by the FCC General Allocation Hearings that, among other topics, delved into the possibility of atmospheric interference on the then FM band of 42-50 MHz. With the end of the wartime freeze on radio station and receiver production in mid-1945, the FCC had to act rapidly if changes in spectrum or standards were to be made before resumed civilian production perpetuated things as they were. Forced by events and pressures (including those from promoters of television) to forgo projected propagation research, the FCC ordered FM up into the 88-108 MHz band in June of 1945. That ruling brought forth petitions for reversal, and two Congressional

> investigations, but the decision stood amidst a controversy which lasted for years.[9]

The result of the FM shift in 1945 was that during the next few crucial years television was allowed to flourish while the development of FM broadcasting was delayed.

> The great expansion of FM anticipated in the late 1940's failed to materialize; there was instead, a slow decline in number of FM stations coupled with an extremely small sale of FM sets into the 1950's.[10]

Immediately after the reestablishment of FM radio to the higher band, it became evident the FCC's policy favored development of post-war television. In 1944, a former legal counsel for CBS, Paul Porter, became chairman of the FCC. However, in 1940, while Porter was still with CBS, he made the statement:

> If there is a conflict, as there appears to be in the allocation problem with respect to television and frequency modulation, it is the opinion of the Columbia Broadcasting System that preference should be given to the new public service of television rather than an additional system of aural broadcasting.[11]

In the race for public acceptance, it was clear that not only did television promoters have the edge when dealing with the FCC, they also had most to gain from technical and economic standpoints. While television enjoyed its rising popularity, many potential broadcasters sat out the confusion surrounding the 1945 frequency shift. This lack of support added to FM's postwar decline.

Evidence of FM radio's reduction in popularity is well documented by the FCC. Yet, the official position of the Commission during the years 1949 through 1956 was one of

cautious optimism. Table I provides a more dramatic picture:

TABLE I

COMMERCIAL FM BROADCASTING
FROM 1949 TO 1956

Year	Licensed	CP's On Air*	Total
1949	377	360	737
1950	493	198	691
1951	534	115	649
1952	582	47	629
1953	551	29	580
1954	529	24	553
1955	525	15	540
1956	519	11	530

*CP's On Air: Number of stations authorized to operate with a construction permit (CP).

Source: Twenty-second Annual Report of the FCC (Washington, 1956), p. 119.

As the table indicates, the number of on-the-air stations began to drop in 1950 and 1951, from 691 to 649, hitting a low of 530 stations in 1956. The Commission made a passing note of the reduction in 1950, by explaining:

> Although the number of FM broadcast stations on the air decreased by 46 during the year, leaving a total of 691 in operation as of June 30, 1950, the number of licensed FM stations increased from 377 to 493.[12]

Seven pages later in the same report, the Commission finally

concluded that for the most part, the reduction was probably due to "economic problems and uncertainties occasioned by the rapid growth of television and the limited number of satisfactory FM receivers which have been purchased and placed in use."[13]

The problems of FM radio continued until the late 1950s, when the introduction of stereo recordings and a new interest in cultural music helped increase FM audiences.

> The late 1950's brought conditions for fundamental change in FM's fortunes as expansion in AM and TV leveled off (due to competition and spectrum saturation in urban areas), and broadcaster attention was free for application to underdeveloped FM. The development of FM stereo, increased program variety, and availability of cheaper FM portable receivers all contributed to FM's growth in broadcaster, audience, and advertiser acceptance.[14]

This period (1958-69), recognized as the "Decade of Development,"[15] was so important to the advancement of FM radio that perhaps it deserves additional explanation.

By 1959, the demand for stereo had increased to the point that the FCC requested industry opinions on FM stereo feasibility. Two years later, on April 19, 1961, the FCC finally approved a stereo system developed jointly by Zenith and General Electric that would allow for stereo transmission and the optional use of a sub-channel carrier. The Subsidiary Communications Authorization (SCA), established by the FCC in 1955, allowed use of this special carrier for music services, such as background music in stores. There is little doubt that many broadcasters were attracted to FM radio by the additional revenue available through use

of the SCA carrier.[16] With the development of FM stereo, FM broadcasting finally was beginning to achieve the stability and growth expected of it 15 years earlier.

In mid-1964, the Federal Communications Commission issued an order requiring FM stations in markets over 100,000 population to broadcast independent of any AM station at least 50 percent of the time by August of 1965. After a two-and-one-half month delay, the order finally took effect on October 15, 1965.[17] There is little doubt the FCC order was aimed at assisting FM radio to develop itself independent of AM radio while increasing the diversification of programming within these large markets. The non-duplication rule would later play a major role in giving FM radio an individual identity, and helping increase FM audiences.

> If one were to attempt to pick a given date when FM achieved mass status, some year in the 1965-70 period is a likely choice. During that time, the program non-duplication rule went into effect and caused major changes, stereo programming was offered by more than a third of the nation's FM stations, the first nation-wide FM network went into operation, FM receiver sales passed the 20 million mark showing FM was assuming more audience attraction, and hundreds of new stations went on the air each year.[18]

As FM radio moved into the 1970s, it became one of the fastest growing media in the broadcast industry. This new independence from sister AM radio is brought out by the fact that, "in many markets, FM stations now cite their rank in the over-all radio spectrum. It was not so long ago that they dared only claim a high rank among the other FM's in their market."[19]

Development continued with the introduction of four-channel, quadraphonic sound. While the FCC has yet to set standards for four-channel broadcasting, it appears to be just a matter of time before either the matrix, or discrete method receives the official nod from the Commission. The major difference between the two methods is, with "the matrix system four signals are picked up, encoded into two, and decoded back to four signals at the receiver. The discrete method is a 'pure' four-channel system."[20]

While the popularity of FM was increasing, the National Association of FM Broadcasters (NAFMB) warned of a number of problem areas still needing attention. In addition to a new standard for quadraphonic broadcasting, the NAFMB expressed concern over:

> 1. FM origination by cable systems. NAFMB plans to petition the FCC to halt the practice, whereby a CATV system originates programming on an FM frequency. That frequency is carried by wire and the transmission can be received through a special hookup to an FM receiver tuned to that frequency. It is regarded as an usurpation of FM spectrum space. NAFMB points out that cable systems are selling time at low rates on their FM originations.
>
> 2. Subsidiary communications authorizations (SCA'S). Background-music service operators have petitioned the FCC to rule that FM's must decrease their modulation to 90%. The use of SCA's (the sideband of an FM frequency) reduces the modulation of an FM station by 10% and is seen by background-music operators as the reason some FM stations do not lease their SCA's for background music. (If modulation is reduced anyway, they believe FM stations will lease the SCA's.) It is NAFMB's position that many FM's do not lease their SCA's because of whistling-type interference with the FM signal, not because of the 10% modulation reduction.

3. Underdevelopment of the medium. Many FM channels are not being used to their potential. NAFMB believes that, especially in small markets, FM's are only a simulcast of the AM because owners do not want to risk the investment in separate programming, talent, and facilities that an independently run FM would require.

4. Signal derailing. Devices capable of switching off an FM station being played in a store or other public place, automatically inserting prerecorded local advertisements and switching the station back on, are causing a ripple of worry.

5. All-channel radio. NAFMB is hopeful that Senator John O. Pastore's (D-R.I.) Communications Subcommittee will schedule hearings on Senator Frank Moss's (D-Utah) S. 585, requiring that all radio sets, except those retailing for less than $15, be capable of receiving both AM and FM broadcasts. A similar bill (H.R. 8266) has been offered in the House by Representative Lionel Van Deerlin (D-Calif.) and Clarence Brown (R-Ohio).[21]

Looking ahead, neither the NAFMB protest over FM origination by cable systems nor the background-music service operators' petition to the FCC to rule that FM's must decrease their modulation to 90 percent, have arrived at a hearing date on the Commission docket.[22] The all-channel radio bills received immediate attention by the 93rd Congress in 1974, with action expected sometime in 1975. While leadership on both sides of the Capitol gave indications they would attempt to complete the legislation before the 93rd Congress adjourned, a House-Senate conference, called in late 1974 to combine the two bills, postponed action to allow the 94th Congress to decide the issue.[23] While final legislation had not been passed by the time this study was published, most circles felt it was imminent.

The major difference between the bills rests with the fact that the Senate version, unlike the House bill, did not limit itself to motor vehicle radios, and excluded radios that cost less than $15. As FM radio approached it's 35th anniversary, there was little doubt the second service of 1940 was the independent growth service of today.[24]

Related Studies

Previous studies in the area of broadcast economics have been either inconclusive, erroding in validity with passage of time, or exclusive of FM station growth.

In 1971, Levin published a study which examined the pattern of new station entry during the period 1939-50. The results are listed in Table II, page 19.

Analysis of the Levine study suggests that construction of new stations during the period 1945-48, would tend to correlate with the previous time period, 1939-45. Along these same lines, the pattern of declines during the period 1945-48, correlates positively with the pattern of new construction during that same period. Finally, the pattern of new construction during the period 1948-50 correlates positively with the change in per station income during the preceding time period, 1945-48.

Rank-order techniques used by Levin suggest that AM station entry during a current time period (T_0) depends somewhat on the rate of change of per station income during the preceding time period (T_{-1}), which in turn decreases per

station income during the current period. Based on a revised profit picture, a new pattern of station entry would emerge during the next time period (T_{+1}).

TABLE II

CORRELATION OF NEW AM STATION ENTRY AND PER STATION INCOME IN COMMUNITIES OVER 50,000 POPULATION BETWEEN 1939 AND 1950

	Stations On-The-Air		
	1939-45	1945-48	1948-50
Per Station Income			
1939-45	.10	.38	
1945-48		-.66	.49
1948-50			-.10

Source: Harvey J. Levin, The Invisible Resource: Use and Regulation of the Radio Spectrum (Baltimore, 1971).

Unfortunately, the Levin study was conducted in communities of 50,000 people and over, and deals solely with AM stations. Since the 1940s, the regulatory policies of the FCC have changed to limit the growth of AM while allowing FM to become an independent growth medium. Today, while there may still be a positive correlation between per station income and new station construction, changes in

FCC policy have a significant impact on the Levine research. Further attempts to explain variance with one financial variable, per station income, and new station entry under current FCC policy would seem a waste of time.

Another problem area in the Levin research seems to be the significance of the findings. While all correlations are significant at the .05 level of reliability, the highest correlation (rho = .49) accounts for only 25 percent of the variance (rho^2 = .24). This would indicate there are a number of unexplained factors that contribute to the pattern of new station entry within any given market. These unexplained factors were not discussed in the Levin study.

In 1966, Wagner published a study which attempted to find a relationship between the characteristics and growth of the broadcast industry. The Wagner study briefly touched on some factors, which for 30 years (1936-66), have influenced the growth patterns of broadcasting. In conclusion, Wagner stated:

> Competition between media has always been intense, but the growth of broadcasting has made it more so in the past 30 years. The data reviewed in this study suggest that this competition is now in a period of intensification, and as further growth becomes more difficult to achieve, other factors, such as skill of management and efficiency in operation, more and more will provide the formula for success.[25]

Late in 1966, Saunders and Till took the first quantitative look at some of the unexplained correlations of the financial behavior of broadcasting stations. Their results, sampled from 2,082 AM stations in 1964, are listed in

Table III, page 22. While the Saunders-Till study is perhaps the most exhaustive national research of its kind to date, the authors are cognizant of the limitations of their research. For example, the authors state in the last chapter of their study, "As is typical in preliminary studies of this type, the conclusions are necessarily limited, and the recommendations are rather extensive."[26]

One area where the Saunders-Till research was valuable was to eliminate a number of variables that are unrelated or reflections of more meaningful measures of the financial behavior of a radio station. Recommendations in the Saunders-Till study include:

> 1. With the exception of the four variables mentioned above (term of ownership, per-capita effective buying power, per-household effective buying power, and market quality index), each independent variable employed in this study should be examined in detail using more sophisticated methodology to specify the direct effects of each variable.
>
> 2. The correlation matrices resulting from this analysis should be used as raw data for studies using factor analytic and multiple regression techniques. From such analyses it might be possible to develop formulas to predict the profitability of broadcasting stations from their known characteristics.
>
> 3. Further research regarding relationships between the programming practices of broadcasting stations and the financial behavior of these stations should be conducted.
>
> 4. Detailed investigation should be conducted to determine the optimum competitive situation in markets of varying characteristics. From such studies it might be possible to define the maximum amount of broadcasting service that might be expected by various kinds of communities, and what kinds of economic returns

TABLE III

CORRELATES OF THE FINANCIAL BEHAVIOR OF AM RADIO STATIONS IN 1964

Sample: N=536	Network Revenue	National Revenue	Local Revenue	Total Revenue	Total Expense	Income	Financial Efficiency Index
STATION CHARACTERISTICS							
No. Years on Air	.35	.34	.47	.44	.48	.25	.10
MARKET CHARACTERISTICS							
Population	.33	.51	.55	.58	.62	.34	.00
Households	.33	.51	.55	.58	.62	.34	.00
Retail Sales	.32	.50	.54	.57	.62	.34	.00
Personal Income	.32	.50	.55	.57	.62	.34	.01
Per Household Eff. Buying Power	.13	.21	.30	.27	.31	.13	-.04

Source: James G. Saunders and Arthur R. Till, An Investigation of Possible Correlates of the Financial Behavior of Broadcasting Stations (Athens, 1966), pp. 14-15.

> might be anticipated by broadcasters providing these services.
>
> 5. Trend analysis should be employed as a device for identifying and measuring changes in the economic structure of broadcasting. Such an analysis would have to be based on an annual compliation and analysis of data such as these. Further, it is suggested that additional variables be added to this proposed analysis as they appear potentially meaningful. With the approval of the Federal Communications Commission, the Center would be pleased to undertake such a continuing project.[27]

None of the previously mentioned studies on the financial indices of radio broadcasting has attempted to explain the variance of correlates of financial behavior of broadcasting stations, nor were any data applied to the future growth of broadcasting. With no scientifically based data generated to explain the future growth of radio, this study becomes exploratory in nature. As a preliminary to hypothesis-testing in scientific research, the author sought to discover significant variables in a field situation, relations among the variables, and to lay the groundwork for future testing of hypotheses.

FOOTNOTES

[1]Robert L. Shrader, Electronic Communication (New York, 1967), p. 404.

[2]Ibid.

[3]Christopher H. Sterling, "Second Service: Some Keys to the Development of FM Broadcasting," Journal of Broadcasting, XV (1971), p. 182.

[4]"The Evolution of FM Radio: 1935-1940," Journal of Broadcasting, V (1961), p. 142.

[5]"The Evolution of FM Radio: 1941-1946," Journal of Broadcasting, V (1961), p. 299.

[6]Sterling, Journal of Broadcasting, XV, p. 182.

[7]"The Evolution of FM Radio: 1941-1946," Journal of Broadcasting, V (1961), pp. 303-310.

[8]Ibid, p. 309.

[9]Sterling, Journal of Broadcasting, XV, p. 182.

[10]Lawrence D. Longley, "The FM Shift in 1945," Journal of Broadcasting, XII (1968), p. 360.

[11]Ibid.

[12]"The Evolution of FM Radio: 1947-1950," Journal of Broadcasting, VI (1962), p. 217.

[13]Longley, p. 360.

[14]Sterling, Journal of Broadcasting, XV, p. 183.

[15]Christopher H. Sterling, "Decade of Development: FM Radio in the 1960s," Journalism Quarterly, XLIIX (1971), pp. 222-230.

[16]Ibid, pp. 223-224.

[17]Ibid, p. 225

[18]Ibid, p. 230.

[19]"The Rites of Passage Are All Over for FM Radio; It's Out On Its Own," Broadcasting, XXCV (September 24, 1973), p. 31.

[20]Ibid, p. 33.

[21]Ibid, pp. 32-33.

[22]Telephone interview with Tom McCoy, attorney for Transfer and Renewal Branch, Federal Communications Commission, Washington, D. C.

[23]"House Committee Votes Out Bill for Car AM-FM," Broadcasting, XXCVII (August 26, 1974), p. 25.

[24]Sterling, Journalism Quarterly, XLIIX, p. 230.

[25]Paul H. Wagner, "Changing Growth Patterns In Broadcasting," Journal of Broadcasting, X (1966), p. 337.

[26]James G. Saunders and Arthur R. Till, An Investigation of Possible Correlates of the Financial Behavior of Broadcasting Stations, Report No. 1, Ohio University Center for Research Broadcast Management and Economics (Athens, 1966), p. 31.

[27]Ibid, pp. 32-33.

CHAPTER III

METHODOLOGY

Data pertaining to financial variables were obtained by questionnaire from the test market stations with the approval of respective managements (See Appendix A). Data relating to the other variables were compiled from various published sources, including the U. S. Bureau of Census, Federal Communications Commission, and Standard Rate and Data Service, Incorporated.

This study employed a relatively large number of variables, based on recommendation and findings of Saunders in 1966. A few new variables, not included in the Saunders study, also were introduced. The following is a list of variables employed in this study:

1. Existing Station Characteristics - Audience Share.
2. Market Characteristics - Population, Households, Average Potential Revenue, and Personal Income.
3. Financial Characteristics - National-Regional Revenue, Local Revenue, Total Revenue, Total Expense, Total Net Income, Radio-Dollar Index, and Financial Efficiency Index.

In addition, one other variable, new station entry, was

introduced to examine the relationships between dependent and independent variables when a new FM station is added to the test markets.

Selection of Sample

As of January 1, 1974, there were 11 markets that fell within the established criteria for inclusion in this study. Criteria for test markets were:

1. Any county in Oklahoma that had a population of 100,000 or less based on 1970 Census data, which had one or more commercial FM frequency allocations within the legal boundaries and not assigned to on-the-air stations as of January 1, 1974.
2. That the county have only one commercial standard broadcast (AM) station on-the-air with no additional commercial radio competition based within the same county, and for which data relating to the variables listed above were available.

Of the 11 existing AM stations within the selected test markets, only one station owner refused to provide the author with requested financial information concerning his station during the 1973 calendar year. Of the remaining 10 stations surveyed as part of this study, all but one owner indicated a continued interest in this study and requested a market evaluation after all variable relationships were analyzed.

In addition to primary selection of test markets, other samples were drawn for this study. Utilizing a table of

random numbers, 30 markets were selected from the top 300 markets in the United States, based on 1972 population estimates. Published Federal Communications Commission data on total broadcast revenue for the 30 sampled markets were used to establish a relationship with total retail sales for those same markets in 1972. The result was that a new variable, potential radio revenue, became a function of total retail sales (See Table IV).

Finally, a telephone random sample utilizing a table of random numbers was drawn to determine percentage of homes delivered by the Oklahoma AM broadcast stations. Of the 10 markets retained for this study, four were selected as being homogeneous of the discarded six markets, yet heterogeneous of one another based on market, station and financial characteristics. A telephone work sheet was developed (see Appendix B) for use in the telephone survey. At least 75 calls were attempted per daypart the sampled station was on-the-air. Each listing selected was limited to three call-backs. Replacement was limited to one listing directly above or below the listing selected at random, thus allowing three chances for the obtaining of a suitable respondent per random selection.

Analysis of Data

The variables for each of the 10 test markets were punched on data processing cards. The cards were then read into the Oklahoma State University's IBM-360 computer system,

and the data were tabulated and treated according to various Statistical Analysis System (SAS) and Biomedical (BMD) computer programs.

Coefficients of correlation were computed to describe the degree and direction of relationships between each of the financial (dependent) variables and each of the independent variables.

With pairs of continuous variables, the Pearson product-moment coefficient of correlation (r) was used. For comparisons involving one continuous variable and one discrete variable, such as new station entry, the point-biserial coefficient of correlation (r_{pb}) was used.

For this study, correlations which did not achieve a level of $\pm$ .20 were considered negligible; correlations between $\pm$ .20 and $\pm$ .40 were considered definite, but small; correlations between $\pm$ .40 and $\pm$ .70 were termed moderate, but substantial; and correlations between $\pm$ .70 and $\pm$ .90 were considered high and marked. Correlations above $\pm$ .90 were termed very dependable.

Elementary Linkage Analysis

After variables were intercorrelated, elementary linkage analysis, a method of clustering either people, items or any objects, was in order. Unlike other methods of clustering, linkage analysis does not depend on the arbitrary determination of a lower limit for admission to a cluster. Elementary linkage analysis defines the linkage

as the largest index of association which a variable has with a composite of all the characteristics of the members of a cluster. Therefore, the lower limit of associations which is used in building the clusters is determined by the data exclusively.

Louis L. McQuitty, while at the University of Illinois, investigated the differences between elementary linkage analysis and more conventional methods of factor analysis. The primary advantages of linkage analysis are its speed, objectivity, and its provision for investigating a particular theoretical position.

> Data are sometimes so interrelated that the difference in theory does not express itself in empirical results; linkage analysis sometimes yields results very similar to, or even identical with, those of rotated factor-analytic solutions.[1]

Continuation of the linkage analysis to determine typal relevancies, which are sometimes closely analogous to factor loadings, is not necessary. In 1957, when McQuitty investigated the similar properties of linkage analysis and factor analysis, computer programs were not available to relieve the experimenter from the laborious task of running factor analysis by hand.

McQuitty pointed out, that while Cattell recognized that cluster methods are valuable in reducing the endless variety of tests and ratings to a comparative small number of representative variables, he preferred to perform factor analysis on the reduced set of variables. Cattell went on to state that some investigators prefer a reduction into

clusters only or into both clusters and factors.[2] Given the "sometimes analogous" properties of linkage analysis, the author prefers the reduction to both clusters and factors.

Factor Analysis

The primary objective of factor analysis is to assist the researcher to identify the dimensions, or factors, behind the tested measures. As only one form of multivariate analysis, it is used to analyze multiple measures of "N" individuals. Perhaps a better way of explaining it would be to say that it is a method of finding "k" underlying variables, or factors, from "n" sets of measures, "k" being less than "n".

Fred N. Kerlinger considers factor analysis one of the two most important tools of the researcher (the other being multiple regression). In discussing the numerous advantages of factor analysis, Kerlinger points out:

> Factor analysis serves the cause of scientific parsimony. It reduces the multiplicity of tests and measures to greater simplicity. It tells us, in effect, what tests or measures belong together -- which ones virtually measure the same thing, in other words, and how much they do so. It thus reduces the number of variables with which the scientist must cope. It also (hopefully) helps the scientist to locate and identify unities or fundamental properties underlying tests and measures.[3]

While simply stated, factor analysis is an invaluable tool of the researcher, it also may be misleading. There are numerous different methods of factor analyzing a correlation matrix, and the uncritical use of a factor analysis

program can lead to misleading results. Great care must be exercised in the selection and use of factor analytic programs.

In the Statistical Analysis System (SAS) program utilized in this study, the technique of principal components analysis is used to aid in the determination of an appropriate number of factors. A factor loadings matrix is produced and printed, and that matrix then undergoes a rigid orthogonal rotation based on Kaiser's varimax criterion.[4]

Principal component methodology originated with Pearson as a means of fitting planes by orthogonal least squares, and was later proposed by Hotelling for the purpose of analyzing correlation structures. Donald F. Morrison, while associate professor of statistics at the University of Pennsylvania, stated, "One important use of the principal-component technique is that of summarizing most of the variation in a multivariate system in fewer variables."[5]

Morrison summarized principal-component technique in the following manner:

> Principal-component analysis is equivalent to a factorization of S (the real symmetric matrix) into the product of a matrix L and its transpose. This is also the purpose of factor analysis, wherein "factorization" of a matrix has precisely that algebraic meaning. However, in component analysis this factorization is unique, for the component coefficients have been chosen to partition the total variance orthogonally into successively smaller portions, and if the portions are distinct, only one set of coefficient vectors will accomplish this purpose. This uniqueness of component coefficients is frequently overlooked by some investigators, who subject every component matrix to a series of postmultiplications by orthogonal matrices to

> see which transformed set of weights has the simplest subject-matter interpretation. While the ability of the vectors to generate the original matrix S is unimpaired, their components no longer have the maximum-variance property.[6]

Kaiser proposed, as a measure of simple structure, the sum of the variances of the squared loadings within each column of the factor matrix. Following the rotation to a simple structure, each loading is multiplied by the square root of its respective communality to restore its proper dimensionality. While Kaiser labeled this the normal varimax, it is more commonly called Kaiser's varimax criterion.[7]

Multiple Regression Analysis

Another important tool of the researcher, according to Kerlinger, is multiple regression analysis. A method of multivariate analysis, multiple regression allows the researcher to study the collective and separate contributions of two or more independent variables to the variation of a dependent variable. As such, the two large purposes of multiple regression analysis are prediction and explanation, where prediction is really a special case of explanation.[8]

Kerlinger recognized the immediate advantage of using multiple regression analysis after the identification of factors by some factor analytic method:

> The point of the whole procedure is a scientific measurement one. The researcher reduces a larger number of a priori variables to a smaller number of presumably underlying variables or factors. These factors can then be used as independent variables in controlled studies of the determinants of phenomena.[9]

The output of the Biomedical (BMD) multiple regression package used in this study is designed to supply regression weights (b) which serve as a means to identify the relative contribution of independent variables to a dependent variable. Therefore, the sample regression coefficient, or weight (b), becomes the estimate of the population[10]

Both analysis tools, factor analysis and multiple regression, were used to reduce the number of dependent and independent variables while studying the contribution of the market variables to variations in a select dependent financial variable.

Factor analysis is helpful where, as in this case, linear relationships exist among dependent and independent variables alike. Once the variables are separated into major groups, or clusters, factor analysis is used to identify the underlying variables for each group. In most cases, where linear relationships do exist, a reduction in the number of variables used to describe covariations is possible.

Once this reduction is complete, multiple regression analysis is used to assist in the prediction of a select dependent variable, such as total radio revenue, when only the independent variables may be known. This is accomplished by using the regression coefficients to generate a formula that will estimate the select dependent financial variable.

FOOTNOTES

[1]Louis L. McQuitty, "Elementary Linkage Analysis for Isolating Orthogonal and Oblique Types and Typal Relevancies," Educational and Psychological Measurement, XVII (1957), p. 207.

[2]Ibid, pp. 208-209.

[3]Fred N. Kerlinger, Foundations of Behavioral Research (New York, 1973), p. 659.

[4]Jolayne Service, A User's Guide to the Statistical Analysis System (Raleigh, 1972), p. 201.

[5]Donald F. Morrison, Multivariate Statistical Methods (New York, 1967), p. 228.

[6]Ibid, p. 227.

[7]H. F. Kaiser, "The Varimax Criterion for Analytic Rotation in Factor Analysis," Psychometrika, XXIII (1958), pp. 187-200.

[8]Fred N. Kerlinger and Elazar J. Pedhazur, Multiple Regression in Behavioral Research (New York, 1973), p. 4.

[9]Ibid, pp. 364-365.

[10]W. J. Dixon, BMD: Biomedical Computer Programs (Berkeley, 1970), pp. 15-21.

CHAPTER IV

RESULTS

Introduction of Potential Revenue

Prior to the initial construction of a correlation matrix, additional variables need to be generated and tested. In order to weigh the economic strength of an existing station, parameters must be established. In this case, it became necessary to examine the economic viability of the station against some measure of potential revenue.

To generate such a variable, it is first necessary to select an index of relative market strength, and then examine it's relationship to existing revenue data. One well-known barometer of market activity is the variable total retail sales. The other criterion variable, revenue data of the top 300 radio markets in 1972, is published by the Federal Communications Commission. Therefore, it is possible to establish a relationship between total retail sales (TRS) and the new financial variable, total radio revenue (R_t) within each respective sample market.

A random sample (N=30) of the top 300 markets was studied in light of internal properties inherent to the largest markets. Factors such as number of stations per market, and in turn the corresponding increase in competition,

suggest that total revenue in these markets is nearly identical to the total potential revenue available. In select cases, total radio revenue will exceed potential revenue at the expense of some other medium. Likewise, in some markets, the inverse would be true. However, given the theory behind randomization, those markets exceeding the potential revenue available would tend to cancel those markets generating less revenue.

The correlation coefficient between total retail sales and total radio revenue ($r = .95$), indicates a relationship that is positive, strong and very dependable. In addition, the coefficient is significant at the .001 level, with over 90 percent of the common variance accounted for ($r^2 = .91$). Total retail sales and total radio revenue show a greater than chance relationship 999 times in 1,000.

Table IV, page 38, indicates the individual market index (IMI), or in other words, the percentage of total retail sales assumed by the variable total radio revenue, for all 30 sample markets.

$$\text{Individual Market Index (IMI)} = \frac{TRS}{R_t} \times 100 \qquad (1)$$

Given the nearly one-to-one linear relationship of the two criterion variables, total retail sales and total radio revenue, it is possible to project these findings to other markets with the generation of a constant. By testing for the standard error of the mean (SE_M), where $M = .3963$, one

TABLE IV

GENERATION OF POTENTIAL REVENUE INDEX

Individual Market Index (IMI)	Dev. from Mean	Dev. Squared
.275	-.121	.014641
.112	-.284	.080656
.350	-.046	.002116
.345	-.051	.002601
.419	.023	.000529
.165	-.231	.053361
.275	-.121	.014641
.413	.017	.000289
.352	-.044	.001936
.431	.035	.001225
.807	.411	.168921
.405	.009	.000081
.426	.030	.000900
.367	-.029	.000841
.279	-.117	.013689
.463	.067	.004489
.457	.061	.003721
.247	-.149	.022201
.453	.057	.003249
.218	-.178	.031684
.468	.072	.005184
.462	.066	.004356
.415	.019	.000361
.425	.029	.000841
.310	-.086	.007396
.430	.034	.001156
.464	.068	.004624
.645	.249	.062001
.472	.076	.005776
.539	.143	.020449
11.889		.533915
(.3963)		

With a mean equal to .3963, and a standard error of the mean equal to .0243, one can be 95 percent confident that if all stations were included in this study, the average potential revenue index would fall between .3476 and .4450 percent of total retail sales.

can be 95 percent confident that if all 300 markets were included in this study, the new variable, average potential revenue index (K_{pr}), would fall between .3476 and .4450 percent of the variable total retail sales. By using the new constant (K_{pr}= .0039) in a single station market, where N = 1, it is possible to generate a dollar-figure for average potential revenue (R_p) available.

$$\text{Average Potential Revenue } (R_p) = \frac{\text{TRS} \times K_{pr}}{N} \qquad (2)$$

If the potential revenue index (K_{pr}) is a measure of normality, then the potential revenue theory may be expanded to include the two outer parameters, high and low potential revenue expectation.

Statistically, over 95 percent of the radio markets in the United States could be expected to fall within the high and low potential revenue parameters. While utilization of both the high and low potential revenue parameters is outside the scope of this study, consider the possibility of expressing the parameters in the following forms

$$\text{High Potential Revenue } (R_{p+2}) = \frac{\text{TRS} \times (K_{pr} + 2SE_M)}{N} \qquad (3)$$

and

$$\text{Low Potential Revenue } (R_{p-2}) = \frac{\text{TRS} \times (K_{pr} - 2SE_M)}{N}. \qquad (4)$$

The application of the potential revenue index (K_{pr}) to a single station market also allows a new index of revenue assumption to be generated. The new variable, radio-dollar index (R_{di}), is the percentage of average potential revenue assumed by the existing station.

$$\text{Radio-Dollar Index } (R_{di}) = \frac{R_p}{R_t} \qquad (5)$$

In retrospect, it is now possible to generate a dollar figure for average potential revenue in each test market, and at the same time calculate the percentage of assumption by the existing station.

Introduction of Audience Influence

In the 1964 study by Saunders, the relationship between audience demographics and the dependent financial variables was not studied. In this study, before sampling the entire population, a small sample (N = 4) was drawn to observe the relationship of share of radio audience (S_{ra}) and the dependent variables without the inherent problems of a telephone coincidental survey in each of the 10 test markets.

In each of the four sample markets, a share of radio audience (S_{ra}) figure was generated on the existing four stations using data from a telephone coincidental survey in each individual market.

$$\text{Share of Radio Audience } (S_{ra}) = \frac{\text{Station Mentions}}{\text{Listening to Radio}} \qquad (6)$$

The four sample markets were selected as being homogeneous of the total population, yet heterogeneous of one another with respect to station, market and financial characteristics. Table V, page 42, indicates the relationship of the share of radio audience (S_{ra}) and the financial variables.

Correlation coefficients between S_{ra} and the dependent variables were small to moderate, with little common variance explained. As indicated in Table V on page 42, none of the correlations was significant at the .05 level of confidence.

With the results inconclusive, the decision to drop the variable from further study was based on two factors:

1. Had the share of radio audience (S_{ra}) variable been generated in all 10 markets, it is likely the significance level would increase, as the degrees of freedom (df) increase, but the coefficients may not have increased enough to explain a large amount of variance.
2. In single-station small markets, station owners normally do not generate audience demographics, do not sell advertising based on audience data, and local advertisers do not buy radio time based on audience demographics.

The decision to drop the variable from further study in no way suggests that a relationship does not exist between audience data and the financial variables, only that the

TABLE V

RELATIONSHIP BETWEEN AUDIENCE SHARE AND FINANCIAL CHARACTERISTICS

	National-Regional Revenue	Local Revenue	Total Revenue	Total Expense	Radio-Dollar Index
Audience Share	.48	.19	.24	.15	-.34
Significance Level	(.5116)	(.7922)	(.7460)	(.8366)	(.6506)
Population	.03	.91	.87	.70	-.60
Households	-.34	.71	.65	.41	-.82
Total Retail Sales	.02	.93	.90	.74	-.55
Personal Income	.40	.97	.98	.98	-.01

The highest correlation between audience share and the dependent variables, r = .48, in the sample of four markets would occur through random sample fluctuation more than 50 times in 100. Audience share and the dependent variables would show a greater than chance relationship only 48 times in 100.

data generated on the sample of four markets did not warrant the additional cost involved in sampling the remaining six markets.

Relationships Between Market and Financial Characteristics

Using essentially the same variables considered by Saunders in 1964, a correlation matrix was generated to show the relationship of market variables to the dependent or financial variables. Table VI, page 44, indicates relationships which range from positive, with a moderate to very dependable correlation, to negative with a moderate to marked relation. Only in the case of one variable, financial efficiency index, was the correlation negligible.

Table III on page 22 showed how the coefficients generated by the author correspond to the Saunders study. Using only identical independent and dependent variables, generated by both studies, the correlation coefficient between Saunders in 1964, and the author in 1973, was $r = .72$, significant at the .0005 level of confidence.

The fact the Saunders' study in 1964 includes data from both large and small markets throughout the United States, while this study is concerned only with single station small markets in Oklahoma, is in itself significant. The correlation coefficient between the two studies shows a marked relation, with slightly over 50 percent of the variance accounted for ($r^2 = .51$). By simply using the 40 coefficients

TABLE VI

CORRELATES OF THE FINANCIAL BEHAVIOR OF SELECT OKLAHOMA AM RADIO STATIONS IN 1973

	National-Regional Revenue	Local Revenue	Total Revenue	Total Expense	Income	Financial Efficiency Index	Radio-Dollar Index
Population	.71	.80	.82	.79	.66	.06	-.72
Households	.68	.77	.79	.75	.64	.06	-.75
Potential Revenue*	.77	.90	.92	.88	.72	.05	-.72
Personal Income	.72	.88	.89	.87	.66	.04	-.67

*Potential revenue is a function of total retail sales.

Excluding the two indices, correlations between market and financial variables in the sample of 10 markets would occur through random sample fluctuation less than 5 times in 100. Market and financial variables would show greater than chance relationship 95 times in 100.

generated by the four independent, and five similar dependent variables, it is possible to analyze the differences between the relationships of the two studies.

TABLE VII

ANALYSIS OF VARIANCE BETWEEN YADON AND SAUNDERS STUDIES

Source	df	Sum of Squares	Mean Squares	F-Ratio
Between Study Groups	1	6,934	6,934	1.66 (N.S.*)
Within (Error) Variance	38	158,211	4,163	
Total	39	165,145		

*Not significant at the .05 level

As indicated in Table VII, there is no significant difference between the Saunders and Yadon studies. An F-ratio as small as 1.66 would occur by chance more than five times in 100. Neither the Saunders nor Yadon study displayed significantly more correlation among the selected variables than did the other.

Finally, because average potential revenue is a function of the total retail sales variable, both variables need not be listed within the same matrix. Since average potential

revenue allows for a more discrete examination of the dependent variables, total retail sales will be dropped from use.

Identification of Clusters

In order to identify individual clusters of variables, the 11 market and financial variables (see page 26) were used to generate an R-matrix. Table VIII, page 47, reveals the relationship of the variables, one to another, in matrix form.

Coefficients of correlation within the matrix range from negative with a marked relation, to positive and very dependable. In order to classify the variables into groups, or clusters, McQuitty's elementary linkage analysis was used.

Elementary linkage analysis defines the linkage as the largest index of association which a variable has with a composite of all the characteristics of the members of a cluster. Therefore, the largest coefficient in each column of the matrix is selected as the index of association.

Analysis of the R-matrix reveals that there are two independent clusters. First, the primary cluster, or first cluster formed using the coefficients within the matrix, has four variables closely linked together. These variables are potential revenue, personal income, population and household. To further classify this group is relatively easy since all four variables are market characteristics.

The secondary cluster, or second cluster formed using the coefficients within the matrix, incorporates the

TABLE VIII

R-MATRIX OF FINANCIAL AND MARKET CHARACTERISTICS IN 1973

	National-Regional Revenue	Local Revenue	Total Revenue	Total Expense	Total Income	Potential Revenue	Financial Efficiency Index	Radio-Dollar Index	Population	Households	Personal Income
National-Regional Revenue	-	728	814	742	798	770	210	-286	711	683	725
Local Revenue	728	-	990	984	689	907	-004	-511	808	774	884
Total Revenue	814	990	-	980	741	920	037	-489	825	790	892
Total Expense	742	984	980	-	593	888	-152	-515	792	756	870
Total Income	798	689	741	593	-	724	664	-236	660	640	666
Potential Revenue	770	907	920	888	724	-	055	-729	950	942	967
Financial Efficiency Index	210	-004	037	-152	664	055	-	287	067	066	047
Radio-Dollar Index	-286	-511	-489	-515	-236	-729	287	-	-726	-755	-673
Population	711	808	825	792	660	950	067	-726	-	996	978
Households	683	774	790	756	640	942	066	-755	996	-	966
Personal Income	725	884	892	870	666	967	047	-673	978	966	-

remaining seven variables. These are total expense, local revenue, total revenue, national-regional revenue, total income and the two indices, financial efficiency index and radio dollar index. Once again, further classification of the cluster is simple, for all variables within the second group are members of the original financial characteristic grouping.

In order to examine the two clusters more closely, a linkage diagram can be generated to show the strength and direction of the internal relationships.

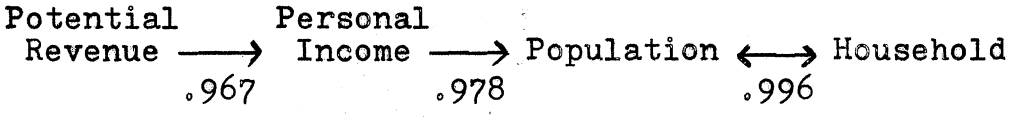

Figure 1. Linkage of Market Characteristics in Cluster One

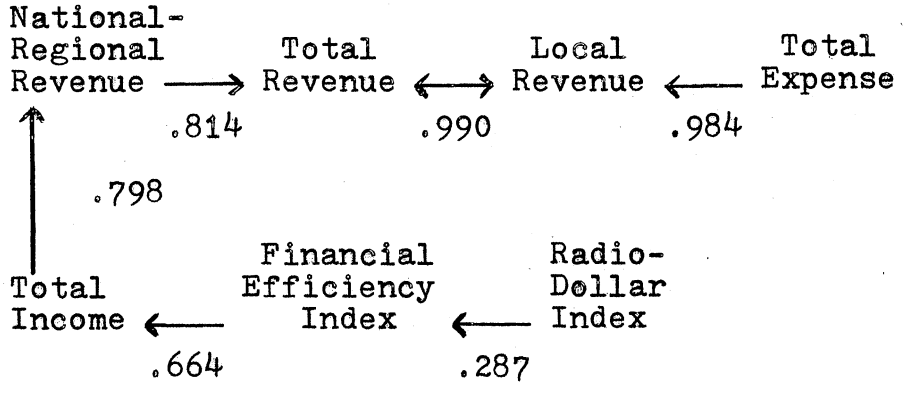

Figure 2. Linkage of Financial Characteristics in Cluster Two

Examination of the first cluster (Figure 1) shows that the variables population and household form a reciprocal pair of variables, each linked one to the other at .996. Further analysis of cluster one indicates that the variable personal income is linked to population at .978, and is more closely associated with the population variable than with potential revenue. Finally, potential revenue is linked to personal income at .967.

Analysis of the second cluster (Figure 2) is done in essentially the same manner. The variables total revenue and local revenue form a reciprocal pair, linked at .990. The remaining variables are linked in a similar fashion to cluster one.

In order to analyze the data further, submatrices are generated for each cluster. In other words, the four variables of cluster one (potential revenue, population, personal income and household) become a new 4 X 4 R-matrix. In the same manner, the seven variables of the second cluster now become a new 7 X 7 R-matrix (See Tables IX and X, pages 50 and 51).

Factor Loadings

Using the principal components method of factor analysis with varimax rotation, it is possible to reduce each cluster to one or more variables which would be descriptive of the entire cluster as a whole.

TABLE IX

SUBMATRIX OF VARIABLES GROUPED IN CLUSTER ONE

	Potential Revenue	Population	Households	Personal Income
Potential Revenue	-	950	942	967
Population	950	-	996	978
Households	942	996	-	966
Personal Income	967	978	966	-

By establishing an arbitrary limit for entry into the factor matrix (V = .5), it is possible to analyze the first cluster. As might be indicated by looking at the first cluster, no rotation was possible due to the extremely high correlation of the variables within the matrix. With the first variable, potential revenue, explaining over 97 percent of the variance within the matrix, all four factor loadings were retained, and no rotation was made. All four variables together accounted for 99 percent of the variance. What this indicates is that any single member, or variable of the first cluster, can do as good a job of explaining the variance of the matrix as any other variable.

TABLE X

SUBMATRIX OF VARIABLES GROUPED IN CLUSTER TWO

	National-Regional Revenue	Local Revenue	Total Revenue	Total Expense	Total Income	Financial Efficiency Index	Radio-Dollar Index
National-Regional Revenue	-	728	814	742	798	210	-286
Local Revenue	728	-	990	984	689	004	-511
Total Revenue	814	990	-	980	741	037	-489
Total Expense	742	984	980	-	593	-152	-515
Total Income	798	689	741	593	-	664	-236
Financial Efficiency Index	210	-004	037	-152	664	-	287
Radio-Dollar Index	-286	-511	-489	-515	-236	287	-

In the second cluster, the same arbitrary entry limit was established (V = .5). Due to the wide variance involved in cluster two, factor rotation was possible, and three select factors appeared. These factors are presented in Table XI.

TABLE XI

CLUSTER TWO ROTATED FACTOR MATRIX

Variable	Factor 1	Factor 2	Factor 3
National-Regional Revenue	.84272	.31597	-.05351
Local Revenue	.93548	.05303	-.27791
Total Revenue	.95867	.10717	-.24603
Total Expense	.95636	-.09049	-.25249
Total Income	.65717	.73742	-.13692
Financial Efficiency Index	-.03928	.97476	.16886
Radio-Dollar Index	-.28596	.11008	.94947
Variance Explained	58.58	24.25	17.17

Looking at the three factors of the second cluster, a number of factor loadings appear. In the first factor, the linear dependency of the first four variables is evident. It is doubtful that all four variables are needed, nor is it advisable to retain them. Therefore, only two factor

loadings, total revenue and total expense, are selected out of the first factor.

The second and third factors are easier to analyze, with only one factor loading each. In the second factor, financial efficiency index appears. In the third factor, radio-dollar index best describes the variance.

Referring back to the original R-matrix, it is possible to interpret the factor analytic results with little trouble. First, through cluster analysis, market and financial characteristics are grouped independent of one another. This is not to say that there is no relationship between the financial and market variables, only that they are indices of two different characteristics.

With principal component analysis, it is possible to select the best variable, or group of variables to describe each cluster. In the first cluster, where no rotation was possible, any one market variable will describe the market characteristics.

In the second cluster, at least four variables appear to describe the three factors. In the first factor, because of the linear dependency, two factor loadings are selected to describe the primary financial characteristics of an existing ratio station. The second and third factors have factor loadings which are indices of efficiency and assumption of potential revenue available.

Through factor analysis, the number of criterion variables has been reduced from 11 to five. Therefore, in

Oklahoma small markets, future analyses may be accomplished with one market variable, and four select financial variables.

Regression Coefficients

Using five variables to analyze a market may be simple, but it obviously is not practical. First, the number of independent variables has been reduced to one. Second, the financial characteristics of a single station market are not normally available.

Saunders recommended predicting profitability of a station from known characteristics. However, this is nearly impossible, given the different ways broadcasters calculate total net income, or profit. What may be possible, however, is to predict total radio revenue from known characteristics.

Close examination of the relationships between market and financial variables, using a factor analytic technique, indicates that any one of the four market variables would adequately represent all the market characteristics. It did not, however, explain what any given combination could do in predicting a select dependent variable. While any single market variable may account for a majority of the variance within the first cluster, it does not suggest that some combination of the four market variables could not be used to explain more variance (r^2) in predicting total revenue.

Using the forward selection procedure of multiple regression analysis, three out of the four market variables met the required .5 significance level for entry into the regression model. The variables, potential revenue, households and population, account for more than 97 percent of the variance of the dependent variable total revenue.

Table XII indicates the analysis of variance between the regression coefficients, or b values, and the variables within the regression model.

TABLE XII

ANALYSIS OF VARIANCE OF REGRESSION MODEL

Source	df	Sum of Squares	Mean Square	F-Ratio
Regression	3	23594369590	7864789863	79.59 ($p < .0002$)
Error	6	592865133	98810855	
TOTAL	9	24187234724		

Probability of chance occurrence less than .0002.

Referring to Table XII, the F-ratio of 79.59 between the two dimensions was significant at the .0002 level. This implies that differences as large as those obtained between

the regression coefficients and the stepwise fit of market characteristics to total revenue, would be expected to occur by chance less than one time in 5,000.

The three-variable model, potential revenue, population and households, is the best combination of variables found by the maximum common variance improvement procedure to describe the dependent total radio revenue. Table XIII indicates the final stage of regression analysis, the assigning of regression coefficients, or b values.

TABLE XIII

REGRESSION COEFFICIENTS OF MARKET VARIABLES PREDICTING THE DEPENDENT TOTAL RADIO REVENUE

Source	df	F-Ratio	b Values
Potential Revenue	1	207.36 ($p < .0001$)	0.6502
Households	1	12.79 ($p < .0118$)	-67.5202
Population	1	18.62 ($p < .0055$)	22.1980
Mean			53248.5685

Prediction of the dependent variable, total revenue, is now possible through utilization of the regression weights

for the three independent variables, and the mean, in a weighted equation. Consider the possibility of expressing total radio revenue (R_t) as a function of the independent variables where

$$R_t = 53248.57 + (.65 \times \text{Potential Revenue}) + (-67.53 \times \text{Households}) + (22.2 \times \text{Population}). \quad (7)$$

Application of the regression formula for total radio revenue within a small market in Oklahoma should provide a reasonable estimate of economic activity when the financial variables of the existing station are unknown. Utilization of the formula outside Oklahoma carries with it the assumption there are no regional differences between small market stations in Oklahoma and other geographic areas of the country.

Analysis of New Station Entry

Given the 10 test markets, the dependable coefficients of correlation between the financial and market variables suggests that a strong, positive relationship exists among the market characteristics and financial characteristics of an existing station. The next question becomes: which of the characteristics account for a majority of the variance when a new station is added to individual markets?

Table XIV, lists the correlation coefficients for the 11 market and financial variables, and the discrete variable, new station entry. The point-biserial (r_{bp}) coefficients range from positive with a marked relation, to negative and moderate. Data from the market and financial characteristics during 1973 were correlated against construction permits for FM stations within the select markets during 1974.

TABLE XIV

CORRELATIONS BETWEEN ELEVEN INDICES AND NEW STATION ENTRY DURING 1974

Variable	Correlation Coefficient
National-Regional Revenue	.43
Local Revenue	.63
Total Revenue	.62
Total Expense	.61
Total Net Income	.45
Potential Revenue	.74
Financial Efficiency Index	.06
Radio-Dollar Index	-.59
Population	.74
Households	.73
Personal Income	.77

Analysis of Table XIV lends support to previously generated data. The four largest coefficients belong to the four market variables, potential revenue, population, households and personal income. The market variable personal

income accounts for more than 59 percent of the variance alone. As with the primary and secondary clusters (see pages 50 and 51), the second highest coefficients belong to financial variables.

While further analysis of new station entry is beyond the scope of this study, it would seem safe to say that the market characteristics, while accounting for a majority of the variance, would end up within the primary factor should some factor analytic method with orthogonal rotation be employed.

Referring back to the Levin study, the largest correlation between per station income and new station entry (rho = .49) suggests a great deal of unexplained variance. On the same hand, total income in this study correlated with new station entry at a moderate level (r_{pb} = .45). As suggested by the Levin study, and established in this study, financial characteristics of an existing station do not explain a majority of the variance with new station entry. This study went one step further, however, and did identify the market characteristics which do account for nearly 60 percent of the variance.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The 1966 Saunders and Till study of the possible correlates of the financial behavior of broadcasting stations, maintained that a majority of the independent variables included in the study correlate meaningfully with the dependent variables and warrant further investigation. In this study, unless otherwise stated, independent variables include: population, households, potential revenue and personal income. Likewise, the dependent variables refer to: national-regional revenue, local revenue, total revenue, total income, radio-dollar index and financial efficiency index.

The purpose of this exploratory study was to help determine which dependent and independent variables were the best possible indices of financial and market characteristics in single station markets within Oklahoma, and which of these variables account for a majority of the variance between the two groups. Another purpose of this study was to see how closely the relationships between dependent and independent variables in single station Oklahoma markets correspond to the national probability sample utilized by Saunders and Till.

In addition, it may be possible to develop a formula, through multiple regression techniques, to predict the total radio revenue assumed by an existing station within a single station market when only the market characteristics are known.

Finally, using the Levin study as a model (see page 18), it may be possible to account for a majority of variance when a new station is added to an existing single station market.

The problem of determining existing stations' financial characteristics without the assistance of the Federal Communications Commission was approached by interviewing the station owners within the 10 selected test markets (see Appendix D). The 10 owners supplied financial information about their stations during the 1973 calendar year from their FCC Annual Financial Report (Form 324). Data were collected for each of the dependent variables, except the two indices, which were generated later by the author.

The owners' financial data for the existing stations and the market characteristics were correlated to produce an 11 X 11 variable R-matrix. Correlations between identical variables utilized by both the author and Saunders were statistically analyzed by means of factor analysis of variance to find where significant differences and similarities existed between the two studies. The elapsed time of nine years, and the difference in market size made no significant difference in the relationship between market and financial characteristics.

Differences did appear in the strength of relationships between the two studies. Correlations between dependent and independent variables in the author's study were consistantly stronger than those of Saunders in 1966. This may suggest there are differences, such as number of radio stations per market, relative market size, audience share and regional location, which were unaccounted for in the Saunders study, but play a part in the relationship between dependent and independent variables.

Further analysis between market and economic characteristics of the test markets reveal that two clusters of variables appear. First, all four independent variables: population, number of households, potential revenue and personal income, show a nearly identical relationship with the dependent financial variables. They correlate positively and indicate a negligible to very dependable relationship with each dependent variable except radio-dollar index.

A second cluster of variables appeared to describe the dependent financial variables. National-regional revenue, local revenue, total revenue, total expense, financial efficiency index and radio-dollar index show a nearly identical relationship with the independent variables and a varied covariation among themselves. With the exception of the two indices, these variables correlated positively and with a marked to very dependable relationship.

Factor analysis with varimax rotation was used to test for similarities within each select cluster. In the market

characteristic cluster, recognized by both the author and Saunders, no rotation was possible due to the high degree of covariation between the independent variables. Utilization of the four independent variables therefore may no longer be necessary, with any one independent variable able to describe the variance of the market cluster, as well as any one of the remaining three independent variables.

Another interesting aspect of this part of the study was the factor analysis of the second cluster of dependent variables. While Saunders did not analyze the relationship among the dependent variables, he did suggest that radio is primarily a local advertising vehicle. Through factor analysis, three factors appeared from the second cluster. The first factor contained four factor loadings which display a high degree of covariation and linear dependency. The four factor loadings, national-regional revenue, local revenue, total revenue and total expense, were so interrelated that any one, or perhaps two variables would explain a majority of variance within the first factor. Based on strength of the factor loadings, the author would select either local revenue or total revenue, plus the variable total expense.

Factor loadings in the second and third factors of the second cluster, financial efficiency index and radio-dollar index, are measures of internal and external efficiency and assumption of available revenue. With factor analysis, it is possible to suggest that further analysis of relationships

between the market and financial characteristics of a single station market may be accomplished with a maximum of one independent variable and four dependent variables.

Through multiple regression it becomes possible to predict a dependent variable with some combination of independent variables. In this case, the dependent variable is total radio revenue, rather than total net income, or profitability, as Saunders suggested. The author found that various methods of calculating profit used by existing station owners made the regression to total net income meaningless. On the other hand, total radio revenue is not determined by depreciation schedules and different broadcast expense formulae.

By looking for the maximum explained variance in total radio revenue, three independent variables were selected which account for more than 97 percent of the common variance. Potential revenue, households and population were judged the best possible combination of independent variables in predicting total radio revenue in a small market. A formula was generated to represent the dependent variable when financial characteristics of a single station market are unknown.

Finally, a new variable, new station entry, was added to the original 11 dependent and independent variables. With markets which did not add an FM station during 1974 coded 0, and markets that did add a new station coded 1, point biserial coefficients of correlation between this new

variable and the original 11 market and financial variables fall in the positive moderate to marked relation range, with the exception of the two indices, radio-dollar index and financial efficiency index. The four market variables produced correlations which were highly positive with a marked relation to the new variable. Personal income, alone, accounted for more than 50 percent of the variance with the new station entry variable. On the other hand, financial variables produced correlation coefficients which fell within the moderately negative to positive substantial range.

Conclusions

This study indicated that all the independent variables correlated meaningfully with the financial variables. Based on the national probability sample of Saunders, and this study, it is a relatively safe assumption that the four independent variables (population, potential revenue, households and personal income) would continue to show a positive marked to very dependable relationship with a majority of the financial variables, if this study were repeated in other markets. Only those variables indicating efficiency or assumption of potential revenue (financial efficiency index and radio-dollar index) show a consistent negative or negligible relationship with the four independent variables.

The negative relationship between the independent market variables and the dependent radio-dollar index was expected. This suggests that the larger the single station

market gets, the less likely the existing station is to assume the potential revenue available. On the same hand, one could expect that once the distance between the total radio revenue assumed by the existing station and the potential radio revenue available became great enough, the market would become viable for new station entry. This would warrant further study.

The negligible relationship between the independent variables and the dependent financial efficiency index is consistent with the Saunders study. While profits tend to increase along with relative market size, the relationship between total radio revenue and total net income (profit) remains fairly static. This may be due in large degree to the fact that expenses tend to increase at a near-linear rate with relative market size. The fact that there is a negligible relationship suggests that profit may be more dependent upon station management than market characteristics.

Covariations between dependent variables and independent variables alike suggest that linear relationships exist. For example, the four independent market characteristics were so highly related that no rotation was possible with factor analytic techniques. Any one market variable, population, potential revenue, households or personal income, may be selected to describe the over-all covariation of market characteristics to financial dependent variables.

Likewise, the number of dependent variables may be reduced in number. The linear relationship that exists between national-regional revenue, local revenue, total revenue, total expense and total income, suggests that any one, or possibly two variables could explain adequately the variance of this group. In addition, strength of the factor loadings would tend to support the contention by Saunders that radio is primarily a local advertising vehicle. This especially is true of the smaller markets where, as in this study, local revenue may account for more than 90 percent of total revenue.

The two indices, financial efficiency index and radio-dollar index are separate factors. While neither index explains a great deal of variance in the financial characteristics of existing stations, they nevertheless should be retained in future studies. Together, the indices account for more than 40 percent of the variance of the second cluster.

Examination of market and financial characteristics of any given market is contingent on the availability of the financial information of the existing station. This especially is true of the smaller markets, where financial data are not published by the FCC. It is possible, however, to predict the total radio revenue of an existing station, within a single station market, when the financial characteristics are unknown.

While one market variable may account for a majority of common variance with a given dependent variable, such as total radio revenue, it is possible to maximize this common variance by using some combination of the four known independent variables. In this case, three market variables may be combined to account for more than 97 percent of the variance in common with total radio revenue. Potential revenue, households and population provide the best possible prediction of total radio revenue when the financial characteristics of an existing station are unknown. Through multiple regression, a formula has been generated utilizing the three variables, plus a constant, to predict total radio revenue. Regional differences may make the formula invalid beyond the southwest, and the formula does not account for competition, making it questionable for use in other than single station markets. Expansion of the formula would warrant further investigation.

The Levin study suggested that per station income played a significant part in the entry of a new station to a market. However, even with his largest correlation (rho = .49), the coefficient of determination (rho^2 = .24) indicates that a great deal of common variance remains unexplained.

By entering the discrete variable, new station entry, into the original 11 X 11 R-matrix, the new coefficient of correlation now accounts for a majority of the unexplained variance. The market variable personal income accounts for nearly 60 percent of the variance with new station entry.

This would suggest that the market variables have more variance in common with new station entry than do financial variables of the existing station. Market characteristics show a positive marked relationship with new station entry.

Recommendations

Based on the findings of this study, the author recommends that single station markets be evaluated in the future using only one market variable and four financial variables. Where the financial characteristics of an existing station are unknown, the author recommends the utilization of his formula for predicting total radio revenue within single station markets.

This exploratory study indicated that audience data influence on the dependent variables was inconclusive. It is therefore recommended that further study be made of the relationship between audience data and the financial characteristics of markets where such information is readily available. Such a detailed investigation is recommended and seems to be necessary to describe optimum competitive standards between stations in markets of varying characteristics, and in different regions of the country.

Using multiple regression and discriminate analysis techniques, formulae may be developed to analyze existing markets and potential new markets. These formulae may be utilized to expand existing service, and initiate new service to communities throughout the United States.

Finally, it is recommended that new variables, such as audience share, number of stations per market, regional location and relative market size, be added to future analysis as they become meaningful.

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APPENDIXES

APPENDIX A

FINANCIAL QUESTIONNAIRE

MARKET: _____

QUESTIONNAIRE

1. My National plus Regional revenue for 1973 was:

$_____.

2. My Local revenue for 1973 was:

$_____.

3. My Total revenue for 1973 was:

$_____.

(NOTE: Line 1 plus Line 2 should equal total revenue.)

4. My Total Expense for 1973 was:

$_____.

The undersigned provides this financial data for radio station _____ in 1973 with the understanding that this information is confidential and will not be released by Oklahoma State University. With this understanding in mind, the undersigned provides this information to assist in continuing broadcast research.

_____

(Owner/Manager - _____)

( ) Please send me the analysis of my market activity when completed by the IBM-360 computer.

APPENDIX B

TELEPHONE COINCIDENTAL WORK SHEET

TELEPHONE SURVEY

WORKSHEET

STARTING TIME: ____________

MARKET: ____________________ Survey Conducted ___/___/ 74

Daypart: ( ) 6 A.M. - 10 A.M. ( ) 10 A.M. - 3 P.M.

( ) 3 P.M. - 7 P.M. ( ) 7 P.M. - MIDNIGHT

Call Number	Page Number	No Answer	Listening to Radio?			Frequency MHz - KHz	Age of Respondent					Sex	
			Yes	Station	No		18-24	25-34	35-49	50+	Teens 12-17	M	F

APPENDIX C

LETTER FROM THE FEDERAL COMMUNICATIONS COMMISSION

FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

January 31, 1975

IN REPLY REFER TO:

Mr. Robert Yadon
Graduate Assistant
Department of Radio-Television-Film
School of Journalism-Broadcasting
Oklahoma State University
Stillwater, Oklahoma 74074

Dear Mr. Yadon:

Of the ten single station markets in the state of Oklahoma that are included in your study for the calendar year 1973, only three Frequency Modulation frequencies that were listed in the Federal Communications Commission Table of Assignments, pursuant to Rule 73.202, were assigned to licensees during the calendar year 1974. Those three markets were as follows:

Woodward, Oklahoma

Miami, Oklahoma

Ardmore, Oklahoma

Sincerely yours,

Thomas McCoy

Thomas McCoy
Attorney-Advisor
Broadcast Bureau

APPENDIX D

LIST OF CONTRIBUTING STATIONS

CONTRIBUTING STATIONS

The author is indebted to the following station owners and personnel for their unselfish participation in this study:

Mr. Lynn Martin
Radio Station KALV
Alva, Oklahoma

Mr. Joe Tilton
Radio Station KADS
Elk City, Oklahoma

Mr. Roy Floyd
Radio Station KTAT
Frederick, Oklahoma

Mr. T. M. Rayburn
Radio Station KGYN
Guymon, Oklahoma

Mr. Wayne Fuchs
Radio Station KTJS
Hobart, Oklahoma

Mrs. Leeta Henson
Radio Station KIHN
Hugo, Oklahoma

Mr. Hal Cochran
Radio Station KMAD
Madill, Oklahoma

Mr. K. C. Jeffries
Radio Station KGLC
Miami, Oklahoma

Mr. Bill Lauderdale
Radio Station KVSO
Ardmore, Oklahoma

Mr. Ed Ryan
Radio Station KSIW
Woodward, Oklahoma

VITA

Robert Earl Yadon

Candidate for the Degree of

Master of Science

Thesis: FINANCIAL BEHAVIOR OF OKLAHOMA SINGLE STATION RADIO MARKETS IN 1973

Major Field: Mass Communication

Biographical:

Personal Data: Born in Chicago, Illinois, August 26, 1947, the son of Dr. and Mrs. R. B. Yadon, Jr.

Education: Graduated from Mount Prospect High School, Mount Prospect, Illinois, in May, 1965; attended Northern Illinois University, DeKalb, Illinois, 1965-66; attended William Rainey Harper College, Palatine, Illinois, 1968-70; received Bachelor of Arts degree in Speech and Sociology from Northwestern Oklahoma State University in 1973; completed requirements for the Master of Science degree in Mass Communications at Oklahoma State University in May, 1975.

Professional Experience and Organizations: Managing Editor, Halcyon Magazine, 1968-70; Managing Editor, Woodward County Journal, 1971-72; Sports Editor, Woodward Daily Press, 1972; Sports Editor, Alva Review-Courier, 1972-73; Production Assistant, Educational Television Services (OSU), Summer, 1973; News Editor, KOSU-FM, 1974-75; graduate teaching assistant for the School of Journalism and Broadcasting, 1973-75; and member of the Association for Education in Journalism.