1986

Navy-funded graduate education: do the Navy and URL officer benefit?

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Monterey, California

THESIS

NAVY-FUNDED GRADUATE EDUCATION:
DO THE NAVY AND URL OFFICER BENEFIT?

Kenneth W. Steiner

June 1986

Thesis Co-Advisors: Kneale T. Marshall
George W. Thomas

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY 2b. DECLASSIFICATION / DOWNGRADING SCHEDULE	3 DISTRIBUTION / AVAILABILITY OF REPORT Approved for public release, Distribution is unlimited
4 PERFORMING ORGANIZATION REPORT NUMBER(S)	5 MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION Naval Postgraduate School 6b OFFICE SYMBOL (If applicable) 54	7a. NAME OF MONITORING ORGANIZATION Naval Postgraduate School
6c. ADDRESS (City, State, and ZIP Code) Monterey, CA 93943-5000	7b. ADDRESS (City, State, and ZIP Code) Monterey, CA 93943-5000
8a. NAME OF FUNDING / SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10 SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO · PROJECT NO · TASK NO · WORK UNIT ACCESSION NO

11 TITLE (Include Security Classification)
NAVY-FUNDED GRADUATE EDUCATION: DO THE NAVY AND URL OFFICER BENEFIT?

12 PERSONAL AUTHOR(S)
STEINER, Kenneth W.

13a TYPE OF REPORT	13b TIME COVERED	14 DATE OF REPORT (Year, Month, Day)	15 PAGE COUNT
Master's Thesis	FROM ______ TO ______	June 1986	112

16 SUPPLEMENTARY NOTATION

17 COSATI CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Marginal Productivity, Statistically Significant, Cohort, Navy Funded, Non Funded, Non Master's

19 ABSTRACT (Continue on reverse if necessary and identify by block number)
This thesis investigates the benefits of investing in graduate education which accrue to both the Navy and the unrestricted line (URL) officer. Using historical data, survivor rates and time in rank between promotions are calculated for three cohort groups (Navy-funded Master's degree, non-Navy funded Master's degree, and non-Master). Statistical models are introduced to determine whether differences in survivor rates and time in rank are significant among the three comparison groups. The results show that differences in survivor rates and time in rank are statistically significant: Navy-funded graduate degree officers tend to stay in service longer and are promoted faster than either self-funded graduate officers or non-Master's degree officers.

20 DISTRIBUTION / AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	21 ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a NAME OF RESPONSIBLE INDIVIDUAL George W. Thomas	22b TELEPHONE (Include Area Code) 408-646-2741 · 22c OFFICE SYMBOL 54Te

DD FORM 1473, 84 MAR · 83 APR edition may be used until exhausted · All other editions are obsolete

SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

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Navy-Funded Graduate Education: Do the Navy and URL Officer Benefit?

by

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Submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
June 1986

ABSTRACT

This thesis investigates the benefits of investing in graduate education which accrue to both the Navy and the unrestricted line (URL) officer. Using historical data, survivor rates and time in rank between promotions are calculated for three cohort groups (Navy-funded Master's degree, non-Navy funded Master's degree, and non-Master). Statistical models are introduced to determine whether differences in survivor rates and time in rank are significant among the three comparison groups. The results show that differences in survivor rates and time in rank are statistically significant: Navy-funded graduate degree officers tend to stay in service longer and are promoted faster than either self-funded graduate officers or non-Master's degree officers.

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I. INTRODUCTION

A. OVERVIEW

Studies using a Human Capital approach to investment in education have indicated that graduate level education is likely to increase the pecuniary and non-pecuniary returns for an individual as compared to that same individual's return if he had elected not to acquire additional education. [Ref.1,2,3]. However, a study by Richard Freeman [Ref.4] stipulates an individual could actually over-invest in education and be worse off in regards to future earnings as a result of demographics, labor supply in the major field of education, and individual personal characteristics.

Historically, the relationship between education and earnings has been well-documented. Figure 1 below presents age/earnings profile for males at five levels of schooling: (1) elementary only, (2) high school graduate, (3) some college, (4) college graduate, and (5) postgraduate education. It is immediately obvious that differences in earnings associated with education tend to widen as workers grow older. In the early years the earnings gap is small. Workers who have gone to college have not had a chance to acquire the work experience of their colleagues who have been working rather than attending college. Later, after they have had a chance to gain experience, their earnings rise much more sharply. [Ref.5, p.271].

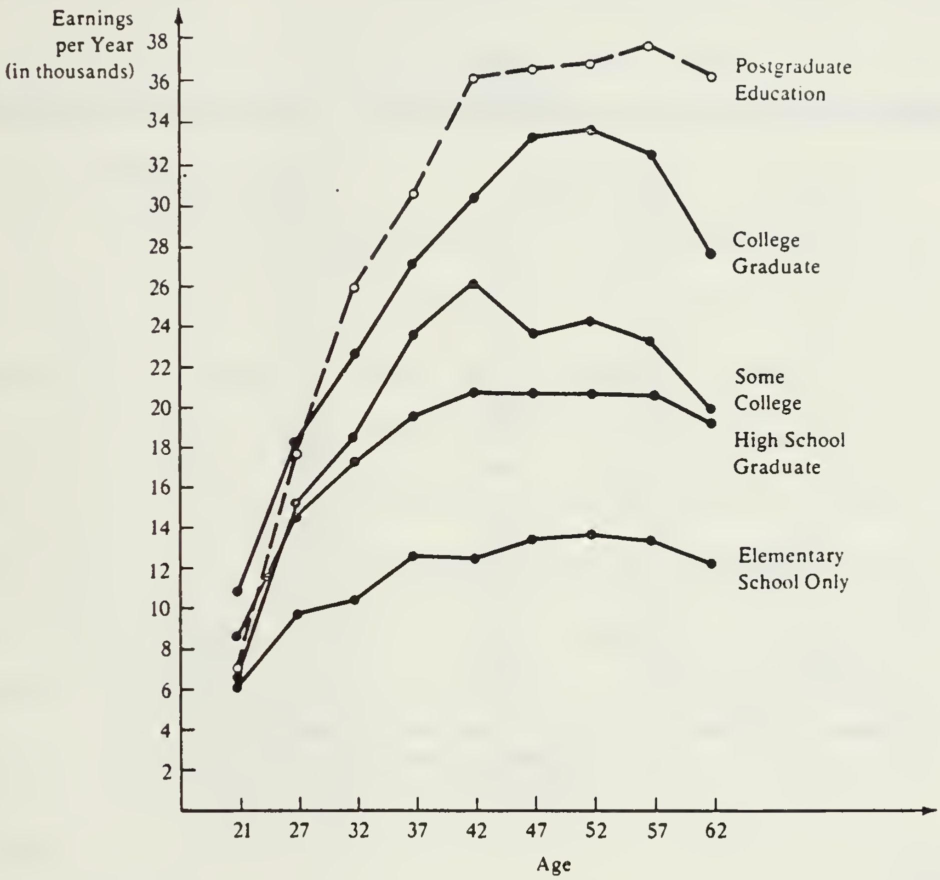

FIGURE 1.
Total Money Earnings (mean), All Males, 1981

A more recent study conducted by American Telephone and Telegraph extending over a 20-year period reveals that managers possessing a college degree advanced to a higher management level than those managers with non-college education. [Ref.6]. As shown in Table I, the typical management level for college graduates after twenty years was level three while the modal management level for non college graduates was two. Only 3% of the non-college sample advanced beyond the third level of management compared to 31% of college graduates.

TABLE I.
MANAGEMENT LEVEL 20 YEARS AFTER ORIGINAL ASSESSMENT

	College		Non-college	
Level*	N	%	N	%
6	3	2	0	0
5	12	9	0	0
4	27	20	4	3
3	64	46	37	29
2	27	20	61	47
1	4	3	27	21
Total	137	100%	129	100%

* Level scale: 1 - initial management entry
6 - vice-presidents of major corporate functions

B. PURPOSE

The purpose of this thesis is to use a human capital perspective to determine: (1) if the Navy benefits by funding Unrestricted Line (URL) Officers in graduate education, and (2) if these URL officers benefit in their Naval careers as compared to those who either self-fund graduate education or do not achieve any graduate education.

Survivor rates and time in rank between promotions are thought to be two important measures for deciding whether the Navy and/or the URL officer benefit by investing in graduate education. Three comparison groups are defined in the study: (1) Navy-funded graduate education, (2) non-Navy funded graduate education, and (3) non-Masters. Differences in the criteria among the three comparison cohorts are statistically tested to determine whether the differences are significant.

The thesis focuses on the unrestricted line corp due to the recent drop in admissions for pilots at the Naval Postgraduate School. Favorable economic conditions have caused a higher separation rate from naval service for this group, largely due to hiring by commercial airlines. The Navy believes it will not be feasible to send the pilots to postgraduate school due to heavy demand in operational billets. The designators of the unrestricted line officers selected for this study are listed below in Table II.

C. OUTLINE OF THE THESIS

Chapter II deals with the background literature of Human Capital Theory and its relationship to the Naval officer as an employee and the Navy as an employer. Chapter III describes the data file and methodologies used in (1) constructing cohort files, (2) calculating the survivor rates and mean time between promotions, and (3) the testing whether the survivor rates and mean times between promotions are significantly different among the following comparison groups: (a) Navy-funded graduate educated URL officers, (b) non-Navy funded graduate educated URL officers, and (c) non-graduate educated URL officers. Chapter IV presents the results and analysis from statistically testing the differences in survivor rates and time in rank among the three comparison groups. Chapter V states the conclusion and suggestions/recommendations are made regarding potential areas for further research.

TABLE II.
UNRESTRICTED LINE DESIGNATORS

110X	General Line Officer
111X	Line officer qualified in Surface Warfare
112X	Line officer qualified in Submarine Warfare
113X	Line officer qualified in Special Warfare
114X	Line officer qualified in Special Operations
130X	Line officer in the aviation community whose rating as pilot or Naval Flight Officer has been terminated
131X	Line officer qualified for duty involving flying as a pilot
132X	Line officer qualified for duty involving flying as a Naval Flight Officer

II. LITERATURE REVIEW

A. OVERVIEW

The purpose of this chapter is to review and summarize studies of the benefits of graduate education. This chapter deals with three basic areas: (1) Human Capital Theory, (2) graduate education decision--viewpoint of URL Navy officers, and (3) graduate education decision--viewpoint of the Navy.

B. HUMAN CAPITAL THEORY

The theory of Human Capital suggests that individuals invest in preparing themselves to be more productive by achieving additional levels of education if the returns are greater than their other opportunities for investment. An example of life cycle investment in education and its effect on an individual's marginal productivity is shown in Figure 2. An individual begins at T_0 with a marginal productivity equivalent to M_0. (Marginal productivity is the relationship of the increase in one's production given one additional unit of input.) As that individual undergoes training (throughout this paper, training is synonymous with education) at T_1 for a period of one year, his marginal product value during the education period falls to zero: the individual is going to school and is not productive at his place of employment.

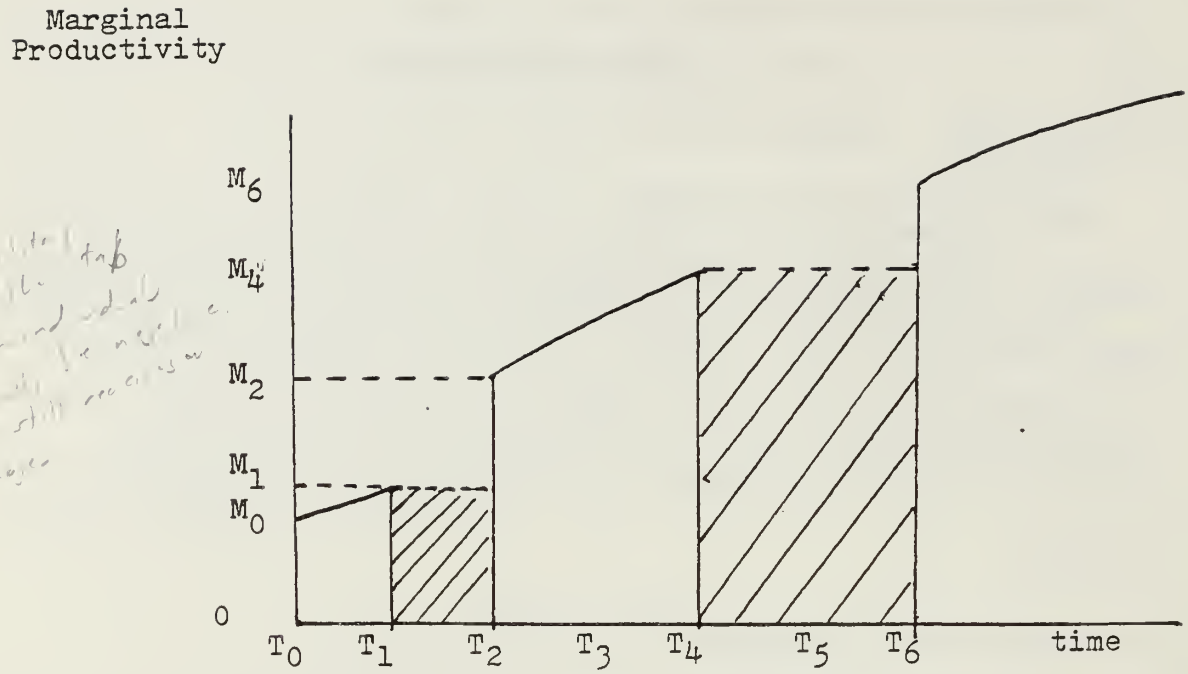

FIGURE 2.
Increasing an Employee's Marginal Productivity through Education

Upon completion of the education period at T_2, the individual's marginal product rises to M_2 and continues to grow with the addition of on-the-job experience over time. If this same individual decides to undergo further education at T_4 for a period of two units of time, his marginal product again falls to zero (which had risen to M_4 while on the job) as the individual attends school. Returning to work after the two unit education period at T_6 results in the individual producing a higher marginal product value (M_6) which increases in future years. This explanation disregards any decline in marginal productivity with regard to education atrophy caused by an increase in age or changes in technology which might cause an individual to become non-productive.

Upon what rationale does the individual base his decision whether to invest in education? An individual decides to invest in education if the rate of return of the investment is worthwhile. An example of the effect of an investment in human capital on the earnings of an employee is given in Figure 3 where there are two income streams, A and B. Income stream A represents income over time if the individual decides not to acquire additional education while B is the income stream which commences upon completion of a Bachelor's degree. (Part-time and summer jobs are omitted in order to keep the methodology simple.)

The income streams are highly correlated with the increase in marginal product shown above in Figure 2. In a competitive equilibrium wages need not equal the value of the marginal product (VMP). All that need hold is that the present value of an employee's VMP over a period of expected job tenure with the firm equal the present value of the wages paid. [Ref.5, p.336].

As shown in Figure 3, the investment in education consists not only of <u>direct costs</u>--tuition, books, etc.--but also the <u>opportunity costs</u>--the income the individual foregoes while attending school. The rate of return to the education investment (r) can be calculated by equating the present value of annual investment costs (C_i) while attending school to the present value of the investment benefits (B_i), which are yearly differences between income stream B and income stream A following the attainment of the degree, all brought back to the decision point, in this case age 18. This rate of return can be calculated as follows:

Solve for r by. . .

$$\text{PV COSTS}_{\text{Education}} = \text{PV BENEFITS}_{\text{Education}} \qquad \text{(Eq. 1)}$$

where. . .

$$\text{PV COSTS}_{\text{Education}} = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \frac{C_4}{(1+r)^4} \qquad \text{(Eq. 2)}$$

and. . .

$$\text{PV BENEFITS}_{\text{Education}} = \frac{B_4}{(1+r)^4} + \frac{B_5}{(1+r)^5} + \ldots + \frac{B_T}{(1+r)^T} \qquad \text{(Eq. 3)}$$

(Note: Not all benefits (B_i) will be positive. There are years in which income stream A will be greater than income stream B until point Z is reached.)

This internal rate of return is then compared to the rates of return for other investment alternatives. If the internal rate of return exceeds the alternative rates of return, the investment will likely be undertaken if the internal-rate-of-return (r) is <u>more</u> than the market rate of borrowing funds (i) required to fund the education.

A study by Paul Taubman estimates rates of return to schooling beyond high school for those who do not go beyond high school and those who do. He estimates a rate of return of 8.0 percent for those who attend college compared to 3.0 percent for those who do not attend college, holding genetic and environmental backgrounds constant via identical twins as the data set. [Ref.7]. While no single study is conclusive by itself, Taubman's results do suggest that earning differentials associated with higher levels of education are due to individuals obtaining additional education.

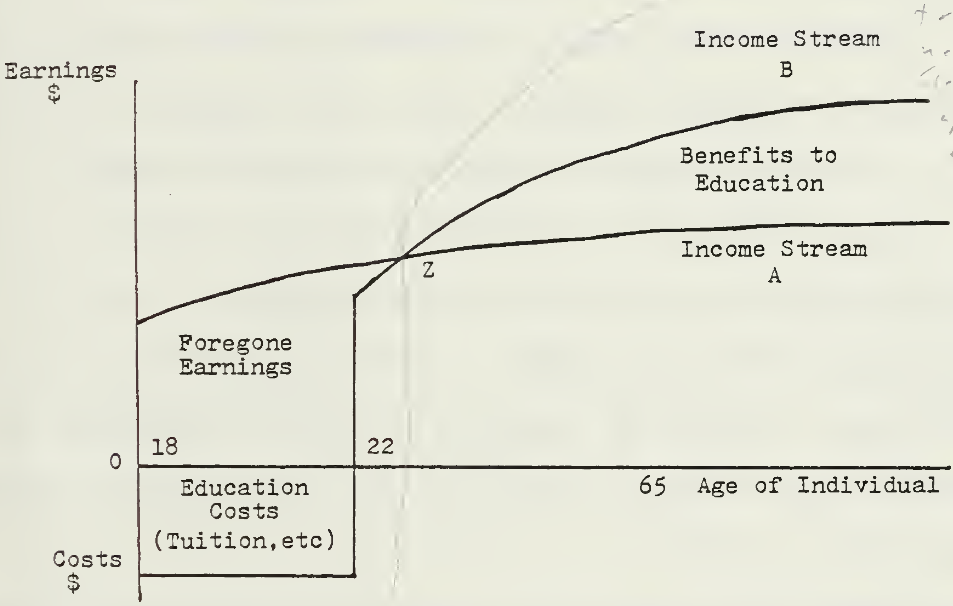

FIGURE 3.
Basic View of Individual whether to
Invest in Education

The individual is not the only one who contemplates investing in education. An employer may consider investing in employee human capital, such as on-the-job training and formal education, in hopes that the increase in an individual's marginal product will in turn increase the profits of the firm.

The decision of an employer to invest in employee human capital is graphically presented in Figure 4. In this particular case, the investment occurs only during the first unit of time in the firm ($T_1 - T_0$). An individual's value of marginal product (VMP_1) is less than the wages paid by $W_0 - W_1$ dollars due to the lack of job experience. Since this is the only period where education takes place and the new value of marginal product (VMP_2) now exceeds the wage rate, an internal rate of return can be calculated by discounting the sum of the benefits ($VMP_2 - W_0$) for the remaining periods in the firm and equating this to the dollars spent by the employer. If the rate of return is greater than alternative rates of return and the market rate of borrowing the funds, the firm will most likely invest in employee human capital.

According to Human Capital Theory, education/training may be dichotomized into two extreme cases: general education and specific education. [Ref.1]. General education is education that increases an individual's marginal productivity to many employers at the same time. A good example of general education is the investment in achieving a Master's in Business Administration (MBA). The courses in the curriculum can be applied to any organization, private or public. An individual who receives general education will increase his VMP for all firms demanding the acquired expertise. Therefore, if the present employer is not willing to increase an employee's old wage to his after-education VMP, the individual receiving the education is better off leaving the present employer and become employed elsewhere. This implies that the costs related to general education would be borne by the individual and not the employer. [Ref.5,p.136]. As seen in Figure 5 the education costs ($W^* - W_1$) are absorbed by the individual but upon completion of the education period (T_n), the employee will benefit from the higher wage (W_4) as he now has a greater marginal product value (VMP_2).

Pure specific education is education in which the employee's value of marginal product is increased for the current employer but not for other employers. An example is the Navy sending an aviation officer to special weapons training and then to ship-board fire fighting school prior to reporting to his sea tour obligation. This additional education increases the officer's value to the Navy, but has no value for other would-be buyers of aviation expertise. Not unless United Airlines plans to purchase floating runways in the Pacific Ocean and invest in anti-terrorist weapons would they offer higher wages to a Navy pilot upon him reaching his end of obligation service (EOS)!

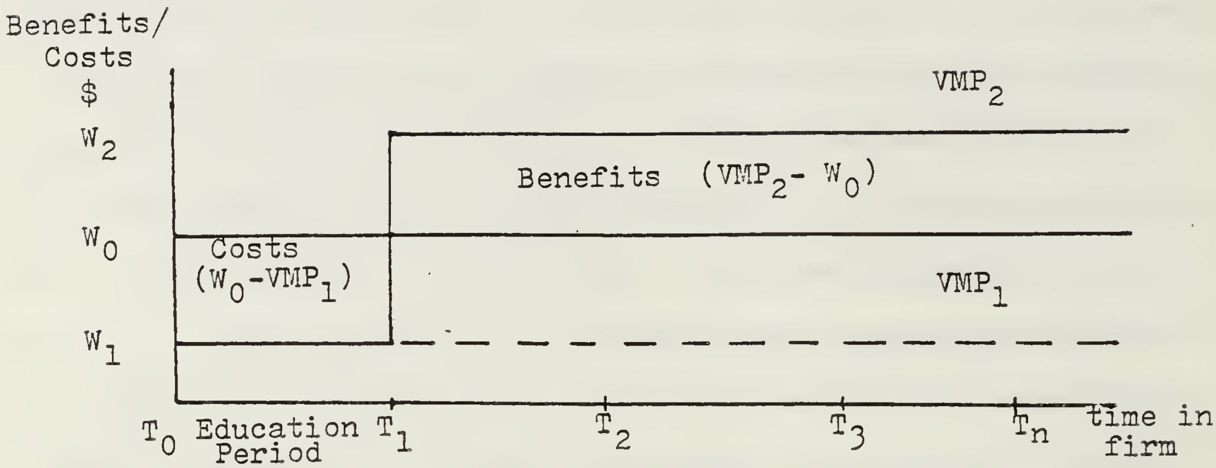

FIGURE 4.
Basic View of Employer whether to
Invest in Education

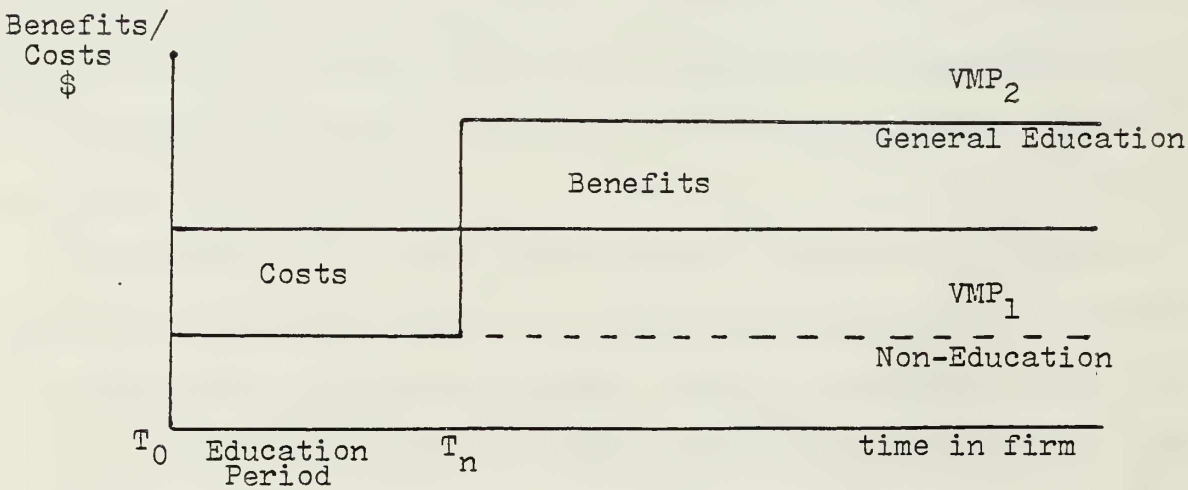

FIGURE 5.
General Education Pay Structure

The cost of investing in specific education is shared by both the employer and employee. If the employer absorbs the entire specific education costs, then upon completion of the education period, the employee's wages would never equate to an amount warranted by general education (since VMP from general education will be higher than specific VMP in all firms). If the individual decides to quit, he would have the same VMP for all other employers as when he initially began work for the former employer. The employer would be out of the cost of the education investment without benefiting from any possible returns. A wise employer will provide an incentive for the individual to remain after the specific education period by offering an increase in wage which is greater that the before-education VMP, but less than wages offered after general education.

An illustration of the above is observed in Figure 6 where an employee who receives specific education is paid a higher initial wage (W_2) than an employee who receives general education (W_1). Upon completion of the education period, the employee who received specific training does not have as high a VMP as the employee who received general training. The specifically educated employee will receive less wages for his VMP than the generally educated employee but these wages will be higher than if the employee did not undergo any education.

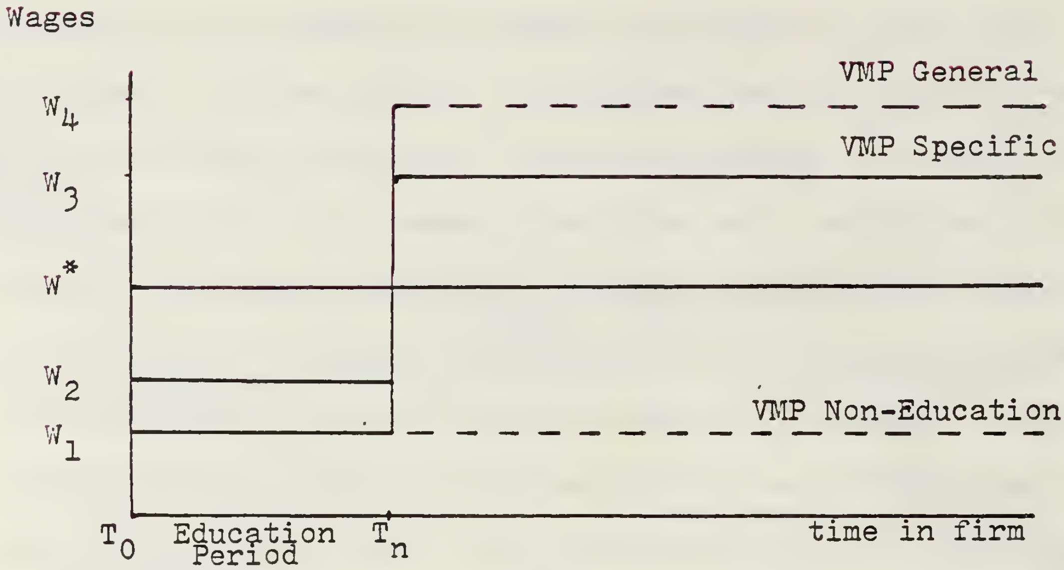

FIGURE 6.
Specific Education Pay Structure

C. GRADUATE EDUCATION DECISION--VIEWPOINT OF URL OFFICER

Prior to an URL Officer deciding whether to invest in graduate education, he must undertake a thorough cost/benefit analysis. Cost/benefit analyses differ depending on how the officer achieves the graduate education, either (1) Navy funded, or (2) non-Navy funded.

1. Navy-funded

a. Benefits

Within the current inventory of Navy Officers, percentage of those attaining graduate education increases with an increase in rank. This suggests that officers with graduate education tend to stay in the Navy longer [Ref.8]. As noted in Chapter I, this is one of the areas to be investigated in this thesis.

A recent study states the chances of promotion for graduate educated officers are 26 percentage points higher for O-3 to O-4, 11 from O-4 to O-5, and 16 from O-5 to O-6. [Ref.8]. (However, there is no distinction in promotion rates between Navy-funded and non-Navy funded officers.) Information on FY-87 Line Captain selectees displayed in Table III below shows that of the URL officers possessing Master degrees eligible for in-zone promotion, there was a 55 % selection rate as compared to a 45 % selection rate for those with Bachelor's degrees. Both data sets contain large numbers to emphasize the statistical difference. [Ref.9].

Benefiting through faster promotion rates by obtaining a graduate degree helps assure that an officer will escape the Defense Officer Personnel Act (DOPMA), which revises the laws governing military promotion and retirement practice. [Ref.10]. The DOPMA is an "up or out" policy which requires officers to leave the service if they are not promoted to higher ranks within a certain time period. If an officer fails to screen for promotion to the next highest rank for two consecutive years, he is subject to an involuntary release from the military. Once an officer attains at least 18 years length-of-service (LOS), the Department of Defense (DOD) will allow the officer to remain on active duty until he achieves the minimum retirement LOS (20 years) before releasing him from service. The recent passage of the Gramm-Rudman balanced budget law will force the Pentagon to discharge thousands from active duty ahead of schedule by enforcing DOPMA. The Air Force alone will release 5200 airmen who are not eligible for re-enlistment up to four and one-half months before their normal end of tour. [Ref.11]. Though these figures apply only to the enlisted ranks, future implications suggests the officer corp could be affected.

TABLE III.
FY - 87 URL CAPTAIN PROMOTION STATISTICS
BY SELECTED CATEGORIES

	ABOVE ZONE		IN ZONE			BELOW ZONE
	ELIG	SEL	ELIG	SEL	%	SEL
I. Education						
a. Less than Bachelors	24	1	11	4	36.4	0
b. Bachelors	253	9	332	148	44.6	8
c. PG (less Masters)	26	0	11	4	36.4	0
d. Masters	177	8	285	156	54.7	11
e. Post Masters	6	0	7	5	71.4	0
f. Doctorate	3	0	4	3	75.0	0

Another benefit from selecting Navy-funded graduate education is the reduction in direct costs, which consists primarily in the purchasing of textbooks ($150/quarter). Negligible opportunity costs occur during the education period as the officer continues to receive his full military compensation. However, sizable opportunity costs do arise _after_ the education period in the form of wages foregone in the civilian sector accrued during the "payback tour" which is discussed in greater length below.

b. Costs

It was argued in section one of this chapter that general education costs are borne by the individual. Formal graduate education at the Naval Postgraduate School is just one type of general education. At the Naval Postgraduate School, officers in the ASW curriculum are attractive resources for the major contractors of the Navy's submarine fleet (eg. Bath Iron Works and General Dynamics) as potential Navy liaison personnel.

Within the Navy one of the costs of funded graduate education takes the form of a payback tour as dictated by DOD Instruction 1520.B. This directive states that ". . .officer personnel who have received fully funded graduate level education will serve: (1) One tour in a validated position as soon as practicable after completion of such education, but not later than a second tour. . . (2) As many subsequent tours in a validated position as requirements and proper career development, including command assignment, will permit. A _minimum_ of two tours is desirable." [Ref.12]. This implies survivor rates for Navy-funded graduate education will be 1.0 for a minimum of two tours, or at least four years since one tour approximates two years of duty. This will be tested further in the thesis.

During the payback tour an officer has opportunity costs in the form of income forgone in the civilian sector. The extended obligation also yields additional costs: (i) loss of additional income generated by the spouse because of the PCS moves, (ii) higher probability in divorce rates, and (iii) a higher annualized cost of leaving [ACOL] upon completion of the obligated service.

(i) Over the past twenty years, there has been an increase of women in the labor force. In 1970, only 30.5 percent of military wives were in the labor force, about 10 percentage points less than for civilian wives. By 1979, both groups showed labor force participation rates of about 50 percent, a 20 percentage point jump for military wives. [Ref.13]. Migration studies show that annual earnings of civilian spouses can be reduced by $1,000 or more when a family moves to follow a principal wage earner to a new job. [Ref.14,p.21]. In 1976 the average earnings of the military spouses who did not have PCS moves were $6,000. By comparison, the average earnings of the military spouse who moved within the continental United States were $3,000, while those military spouses who moved overseas had average income of only $2,125. [Ref.14,p.22].

(ii) A recent study in 1981 showed that even though military and civilian divorce rates are overall virtually about the same, there were significant statistical differences in military divorces caused by "military specific" marital pressures, i.e. PCS moves and temporary duty (TDY). Further implication of the study revealed that married life in the military has complications over and above those in the civilian sector. [Ref.15].

(iii) The Annualized Cost of Leaving (ACOL) model was first proposed by Gotz and McCall. [Ref.16]. In this model individuals compare the present value of the financial cost of leaving over each possible future time horizon of military service with the present value of their yearly taste for service factors over the horizon. Over each possible future horizon, the financial cost of leaving is the present value of the active duty military pay plus the increment in the present value of retirement pay minus the present value of the civilian earnings foregone. The extended obligation of service of approximately four years means the Navy-funded graduate officer will be four years closer to retirement equating a higher present value of retirement benefits. (Currently, there exists a reported eight percent earning gap in military earnings as compared to the civilian sector. As long as an officer's discounted factor is greater than eight percent, an increase in one's financial cost of leaving remains valid.)

Faster promotion rates were earlier stated as a benefit for the officer, but even promotion has its costs. When an officer is selected for promotion and accepts there are minimum years of service within certain ranks in which an officer must serve prior to separating from service. Lcdr's (O-4) and below must serve six months in rank prior to separation while O-5's and above must serve three years in rank prior to separation or retirement. [Ref.17]. There will be opportunity costs during the obligated time in ranks.

2. Non-Navy funded

An officer who attends graduate school by virtue of his own time and expense hopes to realize benefits similar to a Navy-funded graduate officer's. The opportunity exists to be promoted faster and farther than if he didn't have the graduate degree which implies a high probability of escaping the grasp of the DOPMA Act.

The major difference lies in the area of costs. There will be a larger outlay of personal income in order to achieve the graduate degree (tuition and textbooks), but the absence of a payback tour is a major advantage. The non Navy funded officer is under no obligation to extend his commitment to the Navy upon completion of the shore duty during which he received his graduate degree. This allows an increase in the spouse contribution to the family income, a decrease in the annualized cost of leaving, and a decrease in the probability of a divorce. If, however, this officer decides to remain in service, he has several opportunities to separate from service within the four year window his Navy-funded counterpart must adhere to.

D. GRADUATE EDUCATION DECISION--VIEWPOINT OF THE NAVY

The Navy is unlike its civilian competitive counterpart when dealing with personnel and wages. The pay structure under which the Navy operates (increase in pay based on LOS) implies that officers with the same LOS have equal ability and productivity regardless of the different occupation group they may fall under, i.e. doctors, engineers, aviators. Those who agree with this notion argue additional compensation bonuses (flight pay) and faster promotion rates are due to hazards and risks involved in the occupation, and not associated with one's productivity contribution. [Ref.5, pp.219-246]. The area of compensation wage differential is quite sensitive; therefore, this paper takes the stand that pay differentials represent <u>both</u> risk and ability. Ability is stressed when viewing the Navy's decision to invest in graduate education.

The Navy as an employer must also undertake a cost/benefit analysis regarding whether to invest in graduate education.

1. Benefits

A study in 1977 by the Center for Naval Analyses focused on the Navy's procurement of URL officers and its effects on continuation and retention rates throughout their naval careers. [Ref.17]. The results revealed that Naval Academy graduates had higher survivor rates, continuation rates, and larger in-zone promotion rates than any other source of commissioning. This knowledge implies that if the Navy invests in graduate education as it does in sponsoring an undergraduate degree, the same retention benefit will occur.

The Navy views investment in graduate education as a strategic requirement necessary for the Navy to keep pace with changes in management, economic concepts, and engineering technology which blend together in improving the strength and readiness of the naval communities. There are countries other than the United States that feel strongly about investing in advanced education as a strategic requirement. The Soviet Union and West Germany have made significant investments by way of building graduate institutions and recruiting the top professors in various fields. Both countries stipulate an officer must acquire this advanced education if he expects to reach senior levels. [Ref.18]. At the Naval Postgraduate School a world wide representation of international officers can be seen with the majority of these officers coming from Korea, Greece, and Turkey. This implies that the size of a country's naval force does not deter the importance of a graduate officer.

Individuals with Master's degrees are rated higher in administrative skills, intellectual ability, advancement motivation, work involvement, and general effectiveness when compared to non-graduate degree holding individuals according to the 20-year AT&T study completed in 1984. [Ref.6,p.13]. These characteristics are indeed what the Navy desires when determining which officer should be selected to command a squadron, ship, or any shore unit.

2. Costs

There will not be a guaranteed constant and positive internal rate of return to the graduate investment. The DOD directive governing the obligation requirements of funded graduate level education does not imply the Navy will achieve the same internal rates of return from all officers as the payback tour is not dependent upon LOS. An investment in graduate education by the Navy for an officer with a LOS greater than 15, who after completing the education period and the minimum payback obligation is beyond the minimum retirement LOS, surely is not deemed a feasible investment. A study by John T. Warner shows that at LOS 20, yearly continuation rates fall by 62 % and that the majority of personnel at this point of service elect to leave the military service. [Ref.19,Table A3]. Therefore, the Navy must discount the retirement compensation to the year the officer commences graduate schooling and add this cost to the direct costs in order to compute total costs for the investment.

The DOPMA Act has priority over the DOD funded graduate level obligation directive as it is public law. It would appear that officers selected for funded graduate education are the front-runners in their respective year groups and with the addition of a Master's degree will not fail being selected for promotion. There have been instances, though, in which an NPS graduate has failed to screen for promotion and was forced to leave the service before the end of his/her graduate obligation. The Gramm-Rudman Act enhances the enforcement of the DOPMA Act as explained in an earlier section. An earlier separation from naval service prior to the funded graduate level obligation will result in a decrease in the rate of return.

III. METHODOLOGY

A. OVERVIEW

The data file relevant to this thesis is entitled "Officer Master File" (OMF). It was obtained from the Defense Manpower Data Center (DMDC) located in Monterey, California. The file was originally constructed in 1978 and now covers calendar period 1978-1985 through annual updates. The most important limitation of the data file with regard to this study is the lack of a separation code prior to 1978.

Additionally, the OMF data were compared with student records from the Registrar's Office at the Naval Postgraduate School covering the same time period in order to validate the year the graduate degree was achieved for Navy-funded URL officers. This was accomplished by matching social security numbers from both files and reconciling the school's graduation date in the officer's record.

The remainder of this chapter covers three areas associated with the methodologies used in the study. They are the following: (1) relevant elements of the data base for the study, (2) construction of the cohort files, and (3) statistical testing methodologies.

B. RELEVANT ELEMENTS OF THE OMF DATA BASE

The OMF contains a total of 210 information elements for each officer. Table IV below lists the elements relevant to this particular study. Following the table is a brief description of each element and how the element is related to the study.

TABLE IV.
RELEVANT ELEMENTS FROM MASTER FILE

E18	Designator
E41	Gain/Loss Indicator
E76	Separation Program Desig. DOD Loss Code
E83-90	Promotion History Date of Rank
E97-104	Education Information Yr., Sponsor, Major

The designator element (E18) lists the current designator the officer holds. With the focus of the study on URL, a three digit number represents their respective designator, i.e. 111--111X, 112--112X, etc. The numeric code 199 represents "other" URL designators -- 113X, 114X, 116X.

A one-character code which indicates the status of an officer for strength accounting purposes is the gain/loss indicator (E41). A blank signifies an officer is counted for active duty while a "L" indicates an officer separated from the active officer strength for a particular year. This element is essential in the calculation of survivor rates.

The next element of significance is the separation designator Department of Defense (DOD) loss code (E76). This is a three character alpha/numeric code which identifies the reason for an officer's separation from active service. Refer to Table V for a brief description of the relevant loss codes. [Ref.20].

TABLE V.
DOD SEPARATION CODE AND REASON

DDD	Death while on active duty
FBK	Expiration of term of service
JGB	Involunteer release non-selection for promotion
MBK	Completion of required active service
RBD	Volunteer retirement, 20 or more years active service
SBC	Mandatory retirement, attained max. time in grade/service

Other elements in the data file originally thought to be of importance in the study were the Bupers loss code and a separation reason code. A review of these fields found 90 percent of information missing from all loss records.

The promotion history (E83-90) is a six-digit date code showing dates of rank for each grade an officer has held. This information is used to compute total months in rank between promotion. For those officers receiving Master's degrees (Navy-funded/non-Navy funded), the date of the degree is entered in a computer program (SAS) which computes months in rank for each rank after the degree is achieved.

A mean and standard deviation for each rank in each comparison group is computed and statistically compared.

The last element discussed is the education level and sponsor (E97-104). Since the focus of this study is graduate education, the degree of interest is the Master's degree. The sponsor element shows N for Navy funding or a blank for self funded education.

C. CONSTRUCTION OF THE COHORT FILES

As mentioned in a previous section, there are three groups to be studied for comparison: (1) URL Navy-funded Master's degree recipients, (2) URL non-Navy funded Master's degree recipients, and (3) URL officers who have not received a Master's degree. An example of the foundation for constructing each group is shown in Table VI. This table lists the number of Master degree holders by Length of Service (LOS) and Designator (DESIG) for Navy-funded and non-Navy funded graduate education. The LOS range of interest is LOS 3 through LOS 15. This range reflects where a majority of URL officers achieve their graduate education.

All the Navy-funded Master's degree recipients during years 1978-1980 were combined into one Navy-funded Master's file. The non-Navy funded Master's degree recipients during years 1978-1980 were similiarly combined to form one non-Navy funded Master's degree cohort file. Combining the 1978-1980 files has three positive features: (1) larger sample sizes in all cohort files for the testing analysis than found in individual year groups, (2) the years following the constructed files consist of the obligated duty for Navy-funded officers (graduate year +1,+2,+3,+4) in order to test whether the DOD directive is enforced, and (3) an additional year beyond the obligated four years is available to observe if a sudden drop in survivor rates exists for Navy-funded recipients. One negative feature of this approach is the inability to observe survivor rates beyond five years.

The control cohort file for this study is the Navy funded Master's file. Attempts are made to match as close as possible numeric values in each individual matrix cell of this control file when constructing the remaining two cohort files.

A small problem becomes apparent as one compares the 1978-1980 Navy-funded Master's file to the 1978-1980 non Navy funded Master's file (Table VI.) The LOS distribution for the Navy-funded is skewed to the early LOS years as compared to the smoother LOS distribution in the non-Navy funded Master's file. Unable to match the non-Navy funded cohort file with the control cohort file cell-for-cell proves to be a minor problem. The properties of the statistical tests to be applied compensate for the difference in sample size.

Construction of the non-Master's degree file proved more cumbersome. First, several computer runs were used to verify that officers in this group had not received a Master's degree prior to entering the service, nor had they received graduate degrees later in their military careers (beyond LOS 15). Second, the original non-Master file consisted of over 22,000 records. In order to match the characteristics of the control cohort file cell-for-cell, a random generator process was initiated to select non-Master records randomly. These records were stored in a temporary buffer area where they underwent a sequence of logic questions to determine into which cell the records fell. Third, commands to count the records for all cells were formulated to ensure each cell would meet its required size.

D. STATISTICAL TESTING METHODOLOGIES

Two criteria were used to determine whether statistically significant differences among the three comparison groups exist : (1) survivor rates , and (2) time in rank between promotions.

1. Testing Survivor Rates

A survivor rate in cohort analysis is defined as follows: Let n be the original number in a cohort, and let X_i (a random variable) be the number that are still in the system in future period i. Then if $G_i = X_i/n$, G_i is called the survivor rate at year i. The initial survivor rate (G_0) is equal to 1.0 as this is the period where the cohort file is constructed.

TABLE VI.
COMPARISON OF NAVY-FUNDED VS. NON-NAVY FUNDED
1978 - 1980 OFFICER TOTALS

Navy Funded

LOS\DESIG	111	112	131	132	199	Totals
3	0	1	0	0	0	1
4	12	1	0	0	1	14
5	54	5	5	7	11	82
6	40	9	34	37	3	123
7	18	3	24	13	7	65
8	17	3	14	4	6	44
9	21	1	16	1	4	43
10	29	0	14	5	2	50
11	30	1	16	7	5	59
12	18	1	9	2	1	31
13	2	0	5	1	1	9
14	2	0	3	0	0	5
15	3	0	1	0	2	6
Totals	246	25	141	77	43	532

Non-Navy Funded

LOS\DESIG	111	112	131	132	199	Totals
3	2	0	4	1	9	16
4	1	1	8	4	7	21
5	14	2	16	6	10	48
6	28	0	21	34	9	92
7	11	10	29	28	9	87
8	18	4	20	15	5	62
9	13	3	26	16	8	66
10	11	1	11	11	7	41
11	10	1	24	7	9	51
12	13	0	16	5	2	36
13	12	2	7	3	1	25
14	10	2	10	2	1	25
15	5	3	2	4	3	17
Totals	148	29	194	136	80	587

Next, we define a new variable g_i as the probability an individudal survives i years. The probability of the random variable X_i follows a binomial distribution with an expected value equal to $n*g_i$ and an expected variance equal to $n*g_i(1-g_i)$. [Ref.21,p.150]. From this we obtain the following:

Let $G_i = X_i/n$, a random variable as X_i was defined as random variable.

$$E[G_i] = E[X_i/n] = 1/n\ E[X_i] = n*g_i/n = g_i \qquad \text{(Eq.4)}$$

which is an unbiased estimator, and. . .

$$Var[G_i] = Var[X_i/n] = 1/n^2\ Var[X_i] = g_i*(1-g_i)/n \qquad \text{(Eq.5)}$$

Thus, we conclude that G_i is approximately normally distributed. . .

$$G_i \sim N\ (g_i,\ g_i(1-g_i)/n)$$

The hypothesis testing for this study is there is no difference between two population survivor rates in year i (eg. $G_{i1} - G_{i2} = 0$). Hence, the following is observed. . .

$$H_i = G_{i1} - G_{i2} \qquad \text{(Eq.6)}$$

where. . .

$$E[H_i] = E[G_{i1} - G_{i2}] = g_{i1} - g_{i2} \qquad \text{(Eq.7)}$$

and. . .

$$Var[H_i] = g_{i1}(1-g_{i1})/n + g_{i2}(1-g_{i2})/n \qquad \text{(Eq.8)}$$

The Test Statistic becomes. . .

$$z = \frac{G_{i1} - G_{i2}}{\sqrt{\frac{g_{i1}(1-g_{i1})}{n_1} + \frac{g_{i2}(1-g_{i2})}{n_2}}} \qquad \text{(Eq.9)}$$

with. . .

$$E[z] = 0 \quad \text{and} \quad Var[z] = 1, \text{ such that } \quad z = N(0,1) \qquad \text{(Eq.10)}$$

This allows the use of a table of normal curve areas (Z-Table) to determine the value associated with a given level of significance. This value is compared to the test statistic, such that. . .

Reject the hypothesis if $|z| > z_{\alpha/2}$

where alpha (α) represents the level of significance at which the hypothesis is being tested, and $\alpha/2$ represents testing against a two-side alternative. [Ref.21,p.318].

In this study, both X_i and g_i are unknown. X_i is best represented by the actual number who survive in year i. This is annotated by x_i. The best estimator for g_i is $\hat{g}_i$. where $\hat{g}_i = x_i/n$. Calculating the test statistic is accomplished by substituting $\hat{g}_i$ for g_i and then solving for z.

2. Testing Time in Rank between Promotions

The promotions of interest are O-3 to O-4, O-4 to O-5, and O-5 to O-6 for all comparison groups from 1978 through 1985. For both Master's degree files (Navy-funded and non-Navy funded) the promotions to the above mentioned ranks are observed after the achievement of the Master's degree. The objective is to determine if there is a significant difference in promotion rates with or without graduate education. Additionally, a test is conducted to determine whether or not significant differences exist in promotion times for fully funded versus self funded education.

Testing for statistical differences in time in rank is not as complicated as testing proportions. Each promotion category (i) has a sample mean ($\overline{y}_i$) that best estimates the population mean (u_i), and a sample standard deviation (s_i) that best represents the population standard deviation (σ_i) for i = 1,2,3,. . . . The application of the Central Limit Theorem states that for any population, the sampling distribution of the sample sum and of the sample mean are approximately normal if the sample size n_i is sufficiently large ($n_i > 30$). [Ref.21,p.189].

As the sample sizes for the three comparison groups are "sufficiently large" and independent, the following hypothesis test can be applied [Ref.21,p.293]:

$$H_o : u_{11} - u_{12} = 0$$

$$H_a : u_{11} - u_{12} \neq 0$$

with the Test Statistic. . .

$$z = \frac{(\bar{y}_{i1} - \bar{y}_{i2})}{\sqrt{\frac{\sigma_{i1}^2}{n_1} + \frac{\sigma_{i2}^2}{n_2}}} \qquad \text{(Eq. 11)}$$

(Note: If n_i and n_j both exceed 30, σ_{i1}^2 and σ_{i2}^2 may be replaced by s_{i1}^2 and s_{i2}^2, respectively.)

and the rejection region. . .

$$\text{Reject } H_o \text{ if } |z| > z_{\alpha/2}$$

Reference is then made to a normal Z-Table where alpha (α) represents the level of significance at which the hypothesis is being tested, and $\alpha/2$ represents testing against a two-sided alternative.

IV. RESULTS AND ANALYSIS

A. OVERVIEW

This chapter presents the results of the statistical tests applied to the two criteria used in the study--survivor rates and time in rank. These results are explored in order to gain an understanding of why differences among the comparison groups exist.

B. RESULTS OF SURVIVOR RATE TESTING

Tests to determine whether statistical differences exist among comparison groups for each year i were made in every period among all comparison groups. This analysis indicates that URL officers who receive graduate education stay in the Navy longer than URL officers who do not receive graduate education. Additionally, officers who receive Navy-funded graduate education remain in service longer than officers who receive self-funded graduate education. Appendix A summarizes statistical tests for yearly survivor rates among the comparison groups.

The expected number of years of service obtained from a member of a comparison group during a given number of years is approximated by adding the survivor rates (G_i) of that cohort file, excluding year 0, over that period. Table VII lists the survivor rates for all three groups. Adding the survivor rates for Navy-funded graduate recipients indicates that these officers contribute approximately 4.74 years in the 5 year period following the graduate degree. Officers who belong to cohorts non-Navy funded and non-Masters contribute 4.42 and 3.44 years respectively.

TABLE VII.
YEARLY SURVIVOR RATES

GROUP	YR 1	YR 2	YR 3	YR 4	YR 5	TOTAL
NFM	.994	.989	.955	.909	.893	4.74
NONNFM	.928	.911	.881	.861	.835	4.42
NONM	.776	.714	.682	.647	.622	3.44

NFM = Navy-funded Masters
NONNFM = non-Navy funded Masters
NONM = non-Masters

Using data from year 1978 only, survivor rates can be calculated seven years after graduation. Table VIII lists the survivor rates from 1978 data for all comparison groups. Now observe a Navy-funded graduate officer contributes approximately 6.44 years out of the seven following graduation as compared to 5.52 years for non-Navy funded and 4.91 years for non-Masters. If all future survivor rates could be calculated, the length of service after graduation could be determined for any group. Unfortunately, reliable data are not available for groups graduating before 1978 so that complete career patterns cannot be studied. However, the difference in man-years contribution between Navy-funded and non-Navy funded/non-Masters appears to grow the further survivor rates are calculated. The expected length of service after graduation for a Navy-funded officer is longer than the minimum obligation requirement set forth by the DOD funded graduate level directive.

TABLE VIII.
YEARLY SURVIVOR RATES, 1978 DATA

GROUP	YR1	YR2	YR3	YR4	YR5	YR6	YR7	TOTAL
NFM	.988	.988	.963	.902	.878	.866	.854	6.44
NONNFM	.938	.885	.825	.791	.738	.692	.651	5.52
NONM	.896	.804	.734	.678	.633	.588	.572	4.91

An area of further analysis is the calculated survivor rates. Table VII indicates that there exists a large difference in the first year survivor rates. This difference in first year survivor rates is the primary reason why the remaining yearly survivor rates are significant. Observing continuation rates beyond the first year produces evidence for this statement. A continuation rate is defined as g_{i+1}/g_i. This is the probability of an individual surviving to year i+1 given this individual survives to year i. Table IX shows continuation rates for all three comparison groups. Statistical tests reveal no significant difference among the continuation rates for levels of significance .05 and smaller, for years 2 through 5.

TABLE IX.
YEARLY CONTINUATION RATES

GROUP	YR1	YR2	YR3	YR4	YR5
NFM	.994	.995	.966	.952	.982
NONNFM	.928	.982	.967	.977	.970
NONM	.776	.920	.956	.950	.962

A major factor in calculating survivor rates is the number of yearly separations. Table X below displays a summary of yearly separations for the three comparison groups. (Appendix B summarizes separations by designator and LOS among the comparison groups.)

TABLE X.
YEARLY SEPARATIONS

GROUP	N	YR1	YR2	YR3	YR4	YR5	TOTAL
NFM	532	3	3	18	24	9	57
NONNFM	587	42	10	18	12	15	97
NONM	532	119	33	17	19	13	201

Several observations may be drawn from Table X. First, almost all Navy-funded graduate degree recipients remain in service within the prescribed minimum obligation of service dictated by the DOD funded graduate level directive. Further analysis of these officers reveals that 88 percent separated from service due to either expiration of term of service (FBK) or mandatory retirement (RBD). Those separating for reason of mandatory retirement show less than

10 percent failing to select for promotion to higher ranks for LOS 15 and below. (Appendix C summarizes yearly separations by designator and separation reason code among the comparison groups.)

Second, a majority of non-Navy funded graduates separate within the first two years after graduation. These officers are under no additional obligation to remain in the Navy, and so can decide to separate or remain in service.

Third, a significant number of non-Masters separate during year one. These officers are also under no additional obligation to remain in service and decide to separate.

Further research reveals a commonality in year one's large separation figures for non-Navy funded and non-Master URL officers, that being the LOS in which separation occurs. Calculations show 65 percent (77/119) of the non-Masters separated after the first term of obligated service (LOS5/LOS6) with similar results for non-Navy funded cohorts. In the aviation community, thirty-seven non-Masters 131X separated during year one with 65 percent (24/37) categorized LOS5/LOS6.

C. RESULTS OF TIME IN RANK TESTS

The results show one promotion category where a highly statistically significant difference in promotion time exists--LCDR (O-4) to CDR (O-5). In this category, an officer benefits from having a Navy-funded graduate degree over both the self-funded graduate officer and the non-Master officer. The Navy-funded graduate officer is promoted on average nearly two months sooner than the other comparison groups. (Appendix D summarizes the results of the promotion testing results.)

For the promotion category O-3 to O-4, there is one noticeable difference--the number of officers who are promoted. Both the Navy-funded and non-Navy funded graduate officer totals outnumber the non-Master officer by a ratio of two to one. The reason was explained in the previous section. A large number of officers separate in the early LOS years prior to the LOS where eligibility for promotion to O-4 begins.

The results of the statistical tests for promotion category O-5 to O-6 are driven by the small sample sizes for all comparison groups ($n_i < 7$). Statistical testing with such small sample sizes is not considered reliable. Nevertheless, the results show a Navy-funded graduate officer is promoted on average nearly six months sooner than a non-Master officer, and three months sooner than a self-funded graduate officer. This implies an officer with Navy-funded graduate education is promoted faster the farther he pursues a Navy career than either the non-Navy funded or non-Master officer.

Caution should be taken in interpreting these results as causal. The Navy selects URL officers who are frontrunners and high achievers in the Navy to receive Navy-funded graduate education. One of the criteria for selection to receive Navy-funded graduate education is that the officer rank in the top 10 percent of his year group. Thus to be selected to receive Navy-funded graduate education designates that officer as having been a high achiever in the Navy and having high potential for success in the future.

Since the Navy views the Navy-funded graduate officer as one who has the greatest potential for success in the Navy. he therefore has the highest expected return from staying in the Navy. Hence, we may expect these officers to have quicker times to promotion and longer length of total service than their year group peers, independent of the funding of their graduate education.

V. CONCLUSION

A principal concept of Human Capital Theory helps one understand whether a URL officer and/or the Navy should invest in graduate education. This concept observes changes in one's marginal productivity before and after achieving graduate education in order to calculate a rate of return to the education investment. The rate of return from investing in graduate education is then compared with other investment opportunities to decide whether the investment in human capital should be undertaken.

Since we are unable to determine an officer's marginal productivity before and after graduate education in order to calculate a rate of return, other criteria are chosen for the study. Survivor rates and time in rank between promotions are thought to be two important measures for deciding whether a URL officer and/or the Navy benefit by investing in graduate education. Three comparison groups are defined in the study: (1) Navy-funded graduate education cohorts, (2) non-Navy funded graduate education, and (3) non-Masters. Differences in the criteria among the three comparison groups are statistically tested to determine whether the differences are significant. If the differences are significant, two questions are asked: (1) Should investment in graduate education be made?, and if so, (2) How should the investment best be accomplished--Navy funded or self funded?

The results show that the Navy benefits significantly by investing in graduate education. An officer who receives Navy-funded graduate education is estimated to remain in service significantly longer than either the non-Navy funded graduate officer or non-Master officer. In the seven years following graduation a Navy-funded graduate officer contributes on average 6.44 years compared to 5.52 years and 4.91 years for non-Navy funded and non-Masters officers respectively.

The Navy can improve this benefit by monitoring more closely yearly separations. Results show that some officers separate from service prior to the completion of the obligated duty requirement. Separation reason codes show that over eighty percent of these officers claim expiration of term of service.

Large numbers of officers belonging to either non-Navy funded or non-Masters groups separate within two years after receiving the graduate degree. (In the case of non-Masters, the separations occur within the first two years.) These officers are under no additional obligation to remain in service and decide to separate.

The LOS category where the majority of the above separations occurs in the LOS5/LOS6 range. It is found that nearly 65 percent of officers separating fall in this category.

The URL officer benefits from Navy-funded graduate education. The differences in time in rank are significant in the O-4 to O-5 (LCDR--CDR) promotion category between Navy-funded vs. non-Navy funded, and Navy-funded vs. non-Masters. Further results show Navy-funded graduate officers are promoted faster than the other two comparison groups. As the Navy-funded officers advance to the rank of O-6, they can expect to be promoted, on average, six months sooner than non-Master officers.

Caution should be taken in interpreting these results as causal. The Navy selects URL officers who are frontrunners and high achievers in the Navy to receive Navy-funded graduate education. One of the criteria for selection to receive Navy-funded graduate education is that the officer rank in the top 10 percent of his year group. Thus to be selected to receive Navy-funded graduate education designates that officer as having been a high achiever in the Navy and having high potential for success in the future.

Since the Navy views the Navy-funded graduate officer as one who has the greatest potential for success in the Navy, he therefore has the highest expected return from staying in the Navy. Hence, we may expect these officers to have quicker times to promotion and longer length of total service than their year group peers, independent of the funding of their graduate education.

Finally, it is suggested that another data file be found or created so that survivor rates for more years can be calculated. This will result in a better approximation of expected length of service for all three comparison groups. The Navy can then compare the cost of the graduate education investment to the additional years of service contributed. By discounting these future additional years back to the year the investment occurs, the Navy will be able to calculate the "real" worth of the graduate investment.

Also, it is suggested that one search for a method that best measures an officer's marginal productivity before and after graduate education. The two marginal products can be compared to calculate a rate of return. The Navy can then determine whether graduate education is a feasible investment compared to other investment opportunities.

APPENDIX A.

SURVIVOR RATE STATISTICAL TEST RESULTS

1. Survivor Rates

GROUP	N	YR1	YR2	YR3	YR4	YR5
NFM	532	.994	.989	.955	.909	.893
NONNFM	587	.928	.911	.881	.861	.835
NONM	532	.776	.714	.682	.647	.622

NFM = Navy-funded
NONNFM = non-Navy funded
NONM = non-Masters

2. Yearly Testing

a. Year 1:

NFM vs. NONNFM; Z = 5.902

NFM vs. NONM; Z = 11.858

NONNFM vs. NONM; Z = 7.242

α = .10; Z TABLE value for $\alpha/2$ = 1.67
α = .05: Z TABLE value for $\alpha/2$ = 1.96
α = .01; Z TABLE value for $\alpha/2$ = 2.575

b. Year 2:

NFM vs. NONNFM; Z = 6.19

NFM vs. NONM; Z = 13.68

NONNFM vs. NONM; Z = 8.62

c. Year 3:

NFM vs. NONNFM; Z = 4.59

NFM vs. NONM; Z = 12.35

NONNFM vs. NONM; Z = 8.22

d. Year 4: NFM vs. NONNFM; Z = 2.53

NFM vs. NONM; Z = 10.83

NONNFM vs. NONM; Z = 8.50

e. Year 5: NFM vs. NONNFM; Z = 2.85

NFM vs. NONM; Z = 10.87

NONNFM vs. NONM; Z = 8.19

APPENDIX B.

SUMMARY OF COHORT SEPARATIONS

A. NAVY FUNDED

1. Initial Cohort Matrix

TABLE OF LOS_GRDY BY DESIGX

LOS_GRDY DESIGX

FREQUENCY	111	112	131	132	199	TOTAL
3	0	1	0	0	0	1
4	12	1	0	0	1	14
5	54	5	5	7	11	82
6	40	9	34	37	3	123
7	18	3	24	13	7	65
8	17	3	14	4	6	44
9	21	1	16	1	4	43
10	29	0	14	5	2	50
11	30	1	16	7	5	59
12	18	1	9	2	1	31
13	2	0	5	1	1	9
14	2	0	3	0	0	5
15	3	0	1	0	2	6
TOTAL	246	25	141	77	43	532

2. Separations by Designator

a. 111X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 111

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	1	0	1	1	0	3
5	0	0	4	5	1	10
6	0	1	1	5	1	8
7	0	0	1	2	0	3
8	0	0	0	0	0	0
9	0	0	2	0	1	3
10	0	0	0	0	1	1
11	0	1	0	1	0	2
12	0	1	0	0	0	1
13	0	0	0	0	0	0
15	0	0	0	1	0	1
TOTAL	1	3	9	15	4	32

b. 112X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 112

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	1	1
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	1	0	1
7	0	0	0	0	0	0
8	0	0	0	0	1	1
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	1	0	0	1
12	0	0	0	0	0	0
13	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	.	.	1	1	2	4

c. 131X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 131

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	1	1
6	1	0	2	1	0	4
7	0	0	1	1	0	2
8	0	0	1	0	0	1
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	1	0	1	2
12	0	0	0	0	0	0
13	0	0	0	1	0	1
15	0	0	0	1	0	1
TOTAL	1	.	5	4	2	12

d. 132X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 132

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	1	0	1
7	0	0	1	0	0	1
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	1	0	1
13	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	.	.	1	2	.	3

e. 199X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 199

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	1	0	0	1
5	0	0	1	0	0	1
6	0	0	0	1	0	1
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	1	0	0	0	0	1
11	0	0	0	0	0	0
12	0	0	0	1	0	1
13	0	0	0	0	0	0
15	0	0	0	0	1	1
TOTAL	1	.	2	2	1	6

B. NON-NAVY FUNDED

1. Initial Cohort Matrix

TABLE OF LOS_GRDY BY DESIGX

LOS_GRDY / FREQUENCY	DESIGX 111	112	131	132	199	TOTAL
3	2	0	4	1	9	16
4	1	1	8	4	7	21
5	14	2	16	6	10	48
6	28	0	21	34	9	92
7	11	10	29	28	9	87
8	18	4	20	15	5	62
9	13	3	26	16	8	66
10	11	1	11	11	7	41
11	10	1	24	7	9	51
12	13	0	16	5	2	36
13	12	2	7	3	1	25
14	10	2	10	2	1	25
15	5	3	2	4	3	17
TOTAL	148	29	194	136	80	587

2. Separations by Designator

a. 111X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 111

LOS_GRDY / FREQUENCY	GRD_LOSS 1	2	3	4	5	TOTAL
3	1	0	0	0	0	1
4	0	0	0	0	0	0
5	1	1	0	0	1	3
6	2	0	2	0	2	6
7	1	0	0	0	0	1
8	2	2	1	0	0	5
9	2	0	0	0	0	2
10	1	1	0	0	0	2
11	1	0	1	0	0	2
12	0	0	0	0	0	0
13	0	0	1	1	0	2
14	0	0	0	0	2	2
15	0	0	0	0	1	1
TOTAL	11	4	5	1	6	27

b. 112X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 112

LOS_GRDY FREQUENCY	GRD_LOSS 1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	1	0	1	0	0	2
8	0	0	0	0	0	0
9	1	0	0	1	0	2
10	1	0	0	0	0	1
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	1	1
TOTAL	3	.	1	1	1	6

c. 131X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 131

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	1	0	0	1
4	0	1	0	1	0	2
5	3	0	1	0	1	5
6	2	0	0	0	0	2
7	1	0	1	0	0	2
8	2	0	1	1	0	4
9	1	0	0	0	0	1
10	0	0	0	1	0	1
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	1	0	0	0	0	1
14	1	1	0	0	3	5
15	0	0	0	0	0	0
TOTAL	11	2	4	3	4	24

d. 132X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 132

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	1	0	1
6	3	0	1	1	0	5
7	3	1	0	1	0	5
8	1	0	0	1	0	2
9	1	1	1	0	0	3
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	1	0	1	2
14	0	0	0	0	1	1
15	0	0	1	0	1	2
TOTAL	8	2	4	4	3	21

e. 199X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 199

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	1	0	0	0	0	1
5	2	0	0	1	0	3
6	1	0	0	1	0	2
7	1	1	1	0	0	3
8	1	0	0	0	0	1
9	1	0	3	0	0	4
10	1	0	0	0	0	1
11	0	0	0	0	0	0
12	1	0	0	0	0	1
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	1	0	1	1	3
TOTAL	9	2	4	3	1	19

C. NON-MASTERS

1. Initial Cohort Matrix

TABLE OF LOS_GRDY BY DESIGX

LOS_GRDY DESIGX

FREQUENCY	111	112	131	132	199	TOTAL
3	0	1	0	0	0	1
4	12	1	0	0	1	14
5	54	5	5	7	11	82
6	40	9	34	37	3	123
7	18	3	24	13	7	65
8	17	3	14	4	6	44
9	21	1	16	1	4	43
10	29	0	14	5	2	50
11	30	1	16	7	5	59
12	18	1	9	2	1	31
13	2	0	5	1	1	9
14	2	0	3	0	0	5
15	3	0	1	0	2	6
TOTAL	246	25	141	77	43	532

2. Separations by Designator

a. 111X

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 111

LOS_YRS / FREQUENCY	LOS_SEPY 1	2	3	4	5	TOTAL
4	7	1	0	0	0	8
5	20	5	1	2	1	29
6	11	3	1	1	1	17
7	2	1	1	0	2	6
8	4	0	1	1	0	6
9	3	0	2	1	0	6
10	4	3	1	2	0	10
11	2	0	1	1	2	6
12	1	1	0	1	1	4
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	1	1	2
TOTAL	54	14	8	10	8	94

b. 112X

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 112

LOS_YRS LOS_SEPY

FREQUENCY	1	2	3	4	5	TOTAL
4	0	0	0	0	0	0
5	2	0	0	0	0	2
6	1	0	1	0	1	3
7	0	1	0	1	0	2
8	0	1	1	0	0	2
9	0	1	0	0	0	1
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	3	3	2	1	1	10

c. 131X

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 131

LOS_YRS — LOS_SEPY

FREQUENCY	1	2	3	4	5	TOTAL
4	0	0	0	0	0	0
5	3	1	0	0	0	4
6	21	2	0	0	0	23
7	4	3	1	1	0	9
8	2	1	1	0	0	4
9	3	1	0	0	0	4
10	1	0	0	0	0	1
11	1	1	0	0	1	3
12	0	0	0	0	0	0
13	1	0	0	0	0	1
14	1	0	0	0	0	1
15	0	0	1	0	0	1
TOTAL	37	9	3	1	1	51

d. 132X

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 132

LOS_YRS / LOS_SEPY FREQUENCY	1	2	3	4	5	TOTAL
4	0	0	0	0	0	0
5	1	0	1	0	0	2
6	11	3	1	0	1	16
7	1	1	0	1	1	4
8	0	0	1	0	0	1
9	0	0	0	0	0	0
10	2	0	0	0	0	2
11	1	0	0	1	0	2
12	0	0	0	0	1	1
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	16	4	3	2	3	28

e. 199X

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 199

LOS_YRS / FREQUENCY	LOS_SEPY 1	2	3	4	5	TOTAL
4	0	0	1	0	0	1
5	6	1	0	2	0	9
6	1	0	0	0	0	1
7	1	1	0	1	0	3
8	1	0	0	1	0	2
9	0	1	0	0	0	1
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	1	0	1
TOTAL	9	3	1	5	.	18

APPENDIX C.

SUMMARY OF FBK AND RBD SEPARATION REASON CODES

A. FBK

1. Navy-funded

a. 111X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 111 SPD=FBK

LOS_GRDY / FREQUENCY	GRD_LOSS 1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	1	0	1	1	0	3
5	0	0	4	4	1	9
6	0	1	0	4	0	5
7	0	0	1	1	0	2
8	0	0	0	0	0	0
9	0	0	1	0	0	1
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	1	1	7	10	1	20

b. 112X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 112 SPD=FBK

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	1	1
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	.	.	.	.	1	1

c. 131X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 131 SPD=FBK

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	2	1	0	3
7	0	0	1	1	0	2
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	1	0	0	1
12	0	0	0	0	0	0
13	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	.	.	4	2	.	6

d. 132X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 132 SPD=FBK

LOS_GRDY / FREQUENCY	GRD_LOSS 1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	1	0	1
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	.	.	.	1	.	1

e. 199X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 199 SPD=FBK

LOS_GRDY / FREQUENCY	GRD_LOSS 1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	1	0	0	1
5	0	0	0	0	0	0
6	0	0	0	1	0	1
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	1	0	0	0	0	1
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	1	.	1	1	.	3

2. Non-Navy funded

a. 111X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 111 SPD=FBK

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	1	1	0	0	0	2
6	2	0	1	0	0	3
7	1	0	0	0	0	1
8	1	0	0	0	0	1
9	1	0	0	0	0	1
10	1	1	0	0	0	2
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	7	2	1	.	.	10

b. 112X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 112 SPD=FBK

LOS_GRDY / FREQUENCY	GRD_LOSS 1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	1	0	1	0	0	2
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	1	.	1	.	.	2

c. 131X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 131 SPD=FBK

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	1	0	0	1
4	0	1	0	1	0	2
5	1	0	0	0	0	1
6	1	0	0	0	0	1
7	1	0	0	0	0	1
8	2	0	0	0	0	2
9	1	0	0	0	0	1
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	1	0	0	0	0	1
14	0	1	0	0	0	1
15	0	0	0	0	0	0
TOTAL	7	2	1	1	.	11

d. 132X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 132 SPD=FBK

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	2	0	0	1	0	3
7	3	1	0	0	0	4
8	0	0	0	0	0	0
9	1	0	0	0	0	1
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	6	1	.	1	.	8

e. 199X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 199 SPD=FBK

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	1	0	0	0	0	1
6	1	0	0	1	0	2
7	0	1	1	0	0	2
8	1	0	0	0	0	1
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	3	1	1	1	.	6

3. Non-Masters

a. 111X

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 111 SPD=FBK

LOS_YRS LOS_SEPY

FREQUENCY	1	2	3	4	5	TOTAL
4	5	1	0	0	0	6
5	18	5	1	0	0	24
6	9	3	1	1	0	14
7	1	1	0	0	0	2
8	4	0	0	0	0	4
9	2	0	0	0	0	2
10	1	2	1	0	0	4
11	0	0	0	0	0	0
12	1	0	0	0	0	1
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	41	12	3	1	.	57

b. 112X

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 112 SPD=FBK

LOS_YRS LOS_SEPY

FREQUENCY	1	2	3	4	5	TOTAL
4	0	0	0	0	0	0
5	1	0	0	0	0	1
6	1	0	0	0	0	1
7	0	0	0	1	0	1
8	0	1	0	0	0	1
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	2	1	.	1	.	4

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 131 SPD=FBK

LOS_YRS LOS_SEPY

FREQUENCY	1	2	3	4	5	TOTAL
4	0	0	0	0	0	0
5	3	1	0	0	0	4
6	13	1	0	0	0	14
7	4	2	1	0	0	7
8	2	0	0	0	0	2
9	3	0	0	0	0	3
10	0	0	0	0	0	0
11	1	0	0	0	0	1
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	26	4	1	.	.	31

d. 132X

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 132 SPD=FBK

LOS_YRS LOS_SEPY

FREQUENCY	1	2	3	4	5	TOTAL
4	0	0	0	0	0	0
5	1	0	1	0	0	2
6	9	2	0	0	0	11
7	0	0	0	0	0	0
8	0	0	1	0	0	1
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	1	0	0	0	0	1
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	11	2	2	.	.	15

e. 199X

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 199 SPD=FBK

LOS_YRS / FREQUENCY (LOS_SEPY)	1	2	3	4	5	TOTAL
4	0	0	1	0	0	1
5	2	1	0	0	0	3
6	1	0	0	0	0	1
7	1	1	0	0	0	2
8	1	0	0	0	0	1
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	5	2	1	.	.	8

B. RBD

1. Navy-funded

a. 111X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 111 SPD=RBD

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	1	1	2
7	0	0	0	1	0	1
8	0	0	0	0	0	0
9	0	0	1	0	1	2
10	0	0	0	0	1	1
11	0	0	0	1	0	1
12	0	1	0	0	0	1
13	0	0	0	0	0	0
15	0	0	0	1	0	1
TOTAL	.	1	1	4	3	9

b. 112X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 112 SPD=RBD

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	1	1
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	1	0	1
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	1	0	0	1
12	0	0	0	0	0	0
13	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	.	.	1	1	1	3

c. 131X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 131 SPD=RBD

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	1	0	0	1
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	1	1
12	0	0	0	0	0	0
13	0	0	0	1	0	1
15	0	0	0	1	0	1
TOTAL	.	.	1	2	1	4

d. 172X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 132 SPD=RBD

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	1	0	0	1
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	1	0	1
13	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	.	.	1	1	.	2

e. 199X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 199 SPD=RBD

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	1	0	1
13	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	.	.	.	1	.	1

2. Non-Navy funded

a. 111X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 111 SPD=RBD

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	1	1
6	0	0	0	0	2	2
7	0	0	0	0	0	0
8	0	2	1	0	0	3
9	1	0	0	0	0	1
10	0	0	0	0	0	0
11	1	0	0	0	0	1
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	1	1
15	0	0	0	0	0	0
TOTAL	2	2	1	.	4	9

b. 112X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 112 SPD=RBD

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	1	0	0	1	0	2
10	1	0	0	0	0	1
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	1	1
TOTAL	2	.	.	1	1	4

c. 131X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 131 SPD=RBD

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	1	0	1
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	1	0	0	0	3	4
15	0	0	0	0	0	0
TOTAL	1	.	.	1	3	5

d. 132X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 132 SPD=RBD

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	1	0	1
8	0	0	0	0	0	0
9	0	1	1	0	0	2
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	1	0	1	2
14	0	0	0	0	1	1
15	0	0	1	0	1	2
TOTAL	.	1	3	1	3	8

e. 199X

TABLE OF LOS_GRDY BY GRD_LOSS
CONTROLLING FOR DESIGX= 199 SPD=RBD

LOS_GRDY GRD_LOSS

FREQUENCY	1	2	3	4	5	TOTAL
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	2	0	0	2
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	1	0	0	0	1
TOTAL	.	1	2	.	.	3

3. Non-Masters

a. 111X

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 111 SPD=RBD

LOS_YRS LOS_SEPY

FREQUENCY	1	2	3	4	5	TOTAL
4	0	0	0	0	0	0
5	1	0	0	0	1	2
6	0	0	0	0	0	0
7	0	0	0	0	2	2
8	0	0	0	1	0	1
9	0	0	2	1	0	3
10	0	1	0	1	0	2
11	0	0	0	1	1	2
12	0	1	0	1	0	2
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	1	1
TOTAL	1	2	2	5	5	15

b. 112X

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 112 SPD=RBD

LOS_YRS LOS_SEPY

FREQUENCY	1	2	3	4	5	TOTAL
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	1	0	1	2
7	0	1	0	0	0	1
8	0	0	1	0	0	1
9	0	1	0	0	0	1
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	.	2	2	.	1	5

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 131 SPD=RBD

LOS_YRS LOS_SEPY

FREQUENCY	1	2	3	4	5	TOTAL
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	1	0	1
8	0	1	0	0	0	1
9	0	1	0	0	0	1
10	0	0	0	0	0	0
11	0	0	0	0	1	1
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	1	0	0	0	0	1
15	0	0	1	0	0	1
TOTAL	1	2	1	1	1	6

d. 132X

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 132 SPD=RBD

LOS_YRS / FREQUENCY	LOS_SEPY 1	2	3	4	5	TOTAL
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	1	1
7	0	0	0	1	0	1
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	1	0	0	0	0	1
11	0	0	0	1	0	1
12	0	0	0	0	1	1
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
TOTAL	1	.	.	2	2	5

e. 199X

TABLE OF LOS_YRS BY LOS_SEPY
CONTROLLING FOR DESIGX= 199 SPD=RBD

LOS_YRS LOS_SEPY

FREQUENCY	1	2	3	4	5	TOTAL
4	0	0	0	0	0	0
5	0	0	0	1	0	1
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	1	0	1
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	1	0	1
TOTAL	.	.	.	3	.	3

APPENDIX D.

TIME IN RANK STATISTICAL TEST RESULTS

1. LT - LCDR:

GROUP	N	MEAN*	STD. DEV.	VAR.
NFM	331	61.21	3.51	12.31
NONNFM	293	62.02	7.08	50.11
NONM	155	61.62	3.98	15.82

* months

NFM = Navy-funded
NONNFM = non-Navy funded
NONM = non-Master

a. NFM vs. NONNFM; Z = -1.78

b. NFM vs. NONM; Z = -1.10

c. NONNFM vs. NONM; Z = 0.77

α = .10; Z TABLE value for $\alpha/2$ = 1.67
α = .05; Z TABLE value for $\alpha/2$ = 1.96
α = .01; Z TABLE value for $\alpha/2$ = 2.575

2. LCDR - CDR:

GROUP	N	MEAN*	STD. DEV.	VAR.
NFM	198	67.95	4.57	20.88
NONNFM	185	69.59	7.08	50.11
NONM	149	69.93	6.17	38.07

a. NFM vs. NONNFM; Z = -2.67

b. NFM vs. NONM; Z = -3.30

c. NONNFM vs. NONM; Z = -0.47

3. CDR - CAPT:

GROUP	N	MEAN*	STD. DEV.	VAR.
NFM	5	72.01	5.05	25.51
NONNFM	7	75.01	5.83	34.01
NONM	6	77.67	4.37	19.07

a. NFM vs. NONNFM: Z = -0.95

b. NFM vs. NONM: Z = -1.97

c. NONNFM vs. NONM: Z = -0.94

APPENDIX E.

Z - TABLE

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Note: Z-Table above yields only 50% of total probability for normal curve areas.

Step 1. Select level of significant; (α=.10 and $\alpha/2$ = .05)
Step 2. Subtract: .5 - $\alpha/2$; (.5 - .05 = .450)
Step 3. Find above numeric value in body of table
Step 4. Z-Table value: Farthest left column plus top row number associated with Step 3 value: (1.645)

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JAN 23 1996
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