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Investment Alternatives For The Career Officer

Tim M. Furst

INVESTMENT ALTERNATIVES FOR THE CAREER OFFICER

by

Tim M. Furst

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APPROVAL PAGE

This independent study submitted by Tim M. Furst in partial fulfillment of the requirements for the Degree of Master of Business Administration from the University of North Dakota is hereby approved by the Faculty Advisor under whom the work has been done. This independent study meets the standards for appearance and conforms to the style and format requirements of the Graduate School of the University of North Dakota.

Paul Nowak

PERMISSION PAGE

Title: INVESTMENT ALTERNATIVES FOR THE CAREER OFFICER

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Signature Jim M Furst

Date July 1983

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Tim M. Furst

Tim M. Furst

ABSTRACT

INVESTMENT ALTERNATIVES FOR THE CAREER OFFICER

Tim M. Furst

The University of North Dakota Graduate Center, 1983

Faculty Advisor: Professor Paul Nowak

This research project was undertaken for the purpose of educating the career officer to make intelligent personal investment decisions. Chapter one introduces, states the problem, justification to the problem, provides scope, introduces a methodology, and states limitations to the study.

Chapter two introduces bonds, stocks, real estate, mutual funds, and annuities. The basic characteristics, advantages and disadvantages of each alternative are discussed.

Chapter three utilizes a linear program model to select the most advantageous investment mix. The author's required notes of return on investment and diversification relationship are used to illustrate how the model works.

Chapter four will summarize the entire study. Additionally, basic conclusions will be drawn and suggestions for future research will be offered.

CHAPTER I

INTRODUCTION

Background

Career officers in the United States armed forces must face the realities of the american economy today. They must be able to profitably deal with personal investments thus, enabling them to prosper in the future. Career officers must be able to distinguish between the different investment alternatives and analyze these alternatives in order to provide for their future financial security.

While this study will be slanted towards the unique needs of the career officer, the results will also be applicable to individuals with similar investment characteristics.

Career officers are currently untrained and un-prepared in the personal financial field. At no point in the normal professional development of career officers must they take a class in, receive training in, or show any aptitude in personal financial matters. Due to the supervisory role in the chain of command, and despite the lack of knowledge and familiarity in finance, these same officers are often called to give financial guidance and advice to subordinates.

This study has been undertaken to increase the awareness of certain investment alternatives. It will discuss five different options available and provide a means by which to select the most useful combination to achieve the requirements of the investor.

Statement of Problem

Officers of the United States aremed forces must receive financial planning and investment training early in their careers to function more effectively as supervisors. The added benefit is that career officers will be more informed and better able to provide for their own personal financial security.

Justification of the Problem

This study will help career officers understand some of the major investment alternatives available to them. It will also provide a model for them to analyze these alternatives in order to suggest the most profitable alternatives available. This study will contribute to the general body of knowledge in that it will provide officers with an investment guide. This academic endeavor is significant due to the literature review and due to the methodology employed to analyze and recommend possible alternatives.

This study provides an opportunity to begin an understanding of personal financial investment options in a single source. Further this study will motivate the career officer to think about his future and formulate some sort of investment strategy.

Scope

Due the vastness of investment material and options available, this study must be limited in scope. The major factor concerns the fact that only five investment alternatives are discussed. These include: bonds, stocks, real estate, mutual funds, and annuities.

The population considerations for this study will be restricted to that of a normal career progression of an on-time, promotion-wise, active duty career officer in the armed forces. This study will take into account only income earned from active duty and will exclude the income of a wife or second job other than investment related income. The retirement date will be at the twenty year point.

This study will focus in on the advantages the individual will receive and not the added value of the officer to the military due to a more informed supervisor as a result of it. This study will not address the social security system or payment to or from it. An active duty member must pay into social security and subsequently will receive his benefits just as any other worker in America would. The social security subject is beyond the scope of this paper.

The topic of military retirement will not be addressed in this study. Military retirement benefits occur as soon as a member retires from a career of twenty years or more. This retirement fund will continue for as long as the individual lives. It is set up similar to a life long annuity. The benefits, investment opportunities, and ramifications of the military retirement fund are beyond the scope of this paper.

The Economic Tax Recovery Act of 1981 established that anyone with earned income is eligible to set up an Individual Retirement Account (IRA). It is obvious that the only question about these tax deferred retirement plans is not whether to set an account up, but where and with what sort of investment firm.[1] IRAs can use practically any medium of investment. Other than suggesting that everyone with earned income has an IRA, this topic is also beyond the scope of this study.

There are two major types of life insurance plans: whole life and term insurance. The topic of life insurance is beyond the scope of this study. At this point, though, it is stressed that the young officer should be

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[1]Candace E. Trunzo, "Do-It-Yourself Pension," Money, March, 1981, pp. 64-68.

aware that there are times a life insurance policy is critical and can serve an extremely important function.

Methodology

The potential investor must be able to differentiate between the many different investment alternatives available. The second chapter will discuss each of five options to include their basic characteristics, advantages, and disadvantages.

The study will then employ a linear programming model to select the best investment mix for a particular investor. The investor must be able to provide the predicted rate of return on the specific investment alternatives. He must also be able to determine what general relationship exists among the various investment alternatives that will best suit his outlook on risk. By developing these relationships into constraints and utilizing the stated rates of return of the investments, the simplex method of linear programming can be applied using current computer technology and software packages to maximize return on investment.

Limitations of the Study

Linear Programming (LP) makes six assumptions in order to function. These assumptions do not necessarily hold up to the real world but must be made in order for linear programming to work.

The first assumption is that LP is deterministic. This means that all coefficients are known with certainty. By looking at sensitivity tests, it can also be determined which coefficients are sensitive and which ones are not. Time should be concentrated on studying the sensitive coefficients.

The second assumption is that LP has proportionality. This means that as capacity is doubled, output is also doubled. LP ignores the fact that there is a law of diminishing returns and economies of scale.

Additivity is the third assumption of LP. This means that the whole is equal to the sum of the parts. The idea of synergism, that two can do more than one, is also included.

LP also assumes that there is no cross elasticity. This means that changing one product will not change another product.

Divisability is the fifth assumption of LP. LP will provide the investor with only a continuous solution, whereas in real life interigized solutions are used.

The final assumption of LP is that of non-negativity. This means that there are no negative numbers. In addition to these six assumptions, there are also requirements if LP is to be used.

There are five requirements of linear programming, the first of which is linearity. This means that relationships are linear. The second requirement is that there is a well defined objective function: that the individual wants to maximize or minimize. Additionally, in order to use LP the variables must be interrelated in some manner. There must also be limited resources for lP to provide a solution. Finally, there must be alternative courses of action to follow.

If the requirements can be met and the assumptions made, linear programming can be a useful tool for management to solve complex problems. Once the objective function is derived, and the constraints developed the problem is ready for the computer.

In order to simplify the problem into a workable form, several additional limitations must be made. The investor is able to afford $200 per month. He places this money in an interest bearing account until he has accumulated $2,400. At the end of each year, the investor is able to make a yearly investment decision, which he must uphold for the next twelve months. At the yearly review, he is allowed to determine how effective last year's investments were. At that time, he may also assess present available interest rates, present feelings towards risk and diversification. After making the above considerations, he may then reinvest both previous year's money and this year's $2,400.

In reality there is usually a commission paid when investments are switched or moved from one option to another. This study will assume that these fees are similar for the various alternatives and will not deal with this issue of reinvesting or switching investments from one type to another.

Additionally, this study will assume that over the short run, rates of return will follow recent historical data. This allows decisions to be made upon recent data of specific options.

While most investors have preferences concerning investment alternatives given a ROI and state of the economy, many cannot verbalize these preferences. This study assumes they can. Another limitation is that the author will use his preferences and rates of return for illustrative purposes. These relationships and required rates of return will be different for each individual officer.

Summary

This chapter established a need for career officers to distinguish between and analyze major investment alternatives. The problem is that currently there is no schooling of even information on personal financial planning. This study is academically significant due to the literature review which provides a brief discussion of various investment alternatives, and because of the methodology employed which will enable various decisions to be quantified and analyzed actually being implemented.

Due to the vastness of the topic of investment, the study requires scope. The population, available income, social security, military retirement pension, IRAs, and life insurance plans were all discussed to address how they are to affect the study.

The methodology of a linear programming model will be utilized to select and analyze different options available. The investor must simply provide required rates of return and a general relationship between various options.

Finally, this chapter discussed the limitations of the study. The major limitation includes the six assumptions and five requirements for a linear program to work. Additional assumption concerning the amount of investment, timing of investment, commission fees, historical rates of return, and ability of investors to make decisions of investment preferences were also addressed.

This chapter has layed the ground work for the study. The next chapter will actually go into great detail concerning the investment options of bonds, stocks, real estate, mutual funds, and annuities. The discussion of each will include the characteristics, advantages, and disadvantages.

Chapter three will deal with the actual application of the linear programming model. For illustrative purposes, it will utilize the author's required interest rates and general investment relationships between risk and rate of return.

Chapter four will summarize, draw conclusions and suggest implications for further research. This chapter will also suggest the necessity to continue in the study of investment and personal financial planning in order to remain abreast of the ever changing world of finance.

CHAPTER II

REVIEW OF LITERATURE OF INVESTMENT ALTERNATIVES

Introduction

Chapter one served as an introduction to the study. The background, problem, scope, methodology, and limitations were discussed to provide a framework and basis of how this paper is going to help the investor and what it will and will not deal with.

This chapter is a review of the literature of the investment alternatives. It is broken down into five major sections to discuss the topics of: bonds, stocks, real estate, mutual funds, and annuities. The characteristics, advantages, and disadvantages of each one of these options will be specifically dealt with. Upon reading this chapter a basic understanding of what each of these investments entail should be grasped.

Chapter three will then apply the linear program model to illustrate how easily a most advantageous mix can be found. The author's personal required rates of return and investment relationships will be used in this illustration.

Bonds

A corporation can borrow money on a long-term basis through the issuance of notes or bonds. Bonds are simply a long-term promissory note, usually sold to underwriters who in turn sell them to the investor.[2]

Characteristics

Bonds are usually issued in $1,000 denominations. The holder of a bond will receive income from two different payments: (1) the par value at a future specified maturity date and (2) the periodic interest payment stated in an annual percentage of the face value of the bond. The coupon rate is this stated interest payment that the investor receives from the company. The yield rate is determined by the price paid for the bond in an inverse relationship between price and yield (i.e. the higher the price the lower the yield).[3]

Advantages

There are several distinct advantages of investing in bonds. In times of recession or depression, dividends on stock may be omitted but interest payments on bonds will continue. Bonds are actually a hedge against a failing economy, such as is seen today, and investors are

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[2] C. Rollin Niswonger and Philip E. Fess, Accounting Principles, (Cincinnati: South-Western Publishing Co., 1977), p. 459.

[3] Jerome B. Cohen and Arthur W. Hanson, Personal Finance, (Homewood, Ill: Richard D. Irwin, Inc., 1968), p. 561.

moving money into this investment more so than when the economy is healthy.[4] When a company ends in bankruptcy court, the bondholders will receive their money before stockholders. The rationale being that bond holders are creditors of the corporation and that stockholders are considered owners of the corporation.

Disadvantages

One disadvantage of bonds is that in order to do well with this investment vehicle, the investor must be fairly knowledgeable about the market. If the investor is not knowledgeable, a money manager can be hired to handle the account for him.

In times of a strong economy, bonds are not the best investment. As a result of being a very safe investment, the return on investment will ve less than other investment vehicles. However, during times of a slowing economy, when a bonds performance is the strongest, the company has the option to exercise its call provision thus enabling the issuing corporation to buy back the bonds and substitute that issue with a lower rate issue. Another disadvantage is that the bond market is more expensive to get into initially.

Conclusion

Investing in bonds is one possible avenue for an

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[4] Charles A. D'Ambrosio, A Guide to Successful Investing, Englewood Cliffs, NJ: Prentice-Hall, Inc., 1970, p. 28.

investor to pursue. In a slower economy bonds have several definite advantages. They provide the investor with a very safe investment, a hedge against recession and in some cases tax-exempt status for the interest income. Limitations to this investment avenue are also present. They include the minimum investment, the call provision, and a substantial amount of knowledge needed to be successful in this area. This section has discussed bonds as an investment avenue for the military investor. The next section will discuss the stock market as a form of investment.

Stocks

Another excellent investment vehicle is to trade capital stock. When a corporation needs to raise money, it can issue stock, thus selling ownership in the company. Capital stock represents actual ownership in the corporation as opposed to bonds, which represent a creditor/debtor relationship. This section will deal with both preferred and common stock characteristics, and the advantages and disadvantages of dealing in the stock market for the military investor.

Characteristics

Capital stock represents actual ownership in a corporation. When contemplating investing in the stock market, the military investor must realize that there are two basic types of stock: preferred and common.

Preferred Stock

While both preferred and common stock are equity securities, which are evidence of ownership in a corporation, there are several differences. Preferred stocks gives the stockholder the right to a specified dividend that must be paid prior to the common stock dividend. The preferred stockholder may receive a dividend, when declared by the board of directors, even if there is no earnings.[5] Preferred stockholders do not have the right to vote. Preferred stockholders will receive their money prior to common stockholders in the event of bankruptcy of the corporation.

Common Stock

Common stock differs from preferred stock in that common stockholders will share in the profits of the corporation. They are not limited to fixed dividends. Common stockholders have the right to vote. As profits go up for the company, so will the dividends and price of common stock.

Advantages

There are several advantages of dealing in the stock market. One advantage is that the owners of stock certificates will participate in the long-term economic growth of the corporation. As the profits of a company

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[5] Ibid, p. 26.

go up, the dividends and price of stock tend to go up. If stocks are bought low and sold high, a substantial gain can be made. Another advantage is that stocks tend to provide a hedge against inflation in the long run. As the cost of living goes up, so do common stock prices thus preserving purchasing power.[6] Another advantage is that the owner of common stock can voice his opinion through voting his shares of stock as to how he wants the company run.

The military investor can purchase stock on margin. When this is done, the investor is able to use leverage and purchase more stock than he actually has money for. If the speculator makes the right investment, a handsome profit can be made.

Disadvantages

Just as substantial profits can be made in a short time, and entire lifetime accumulation of money can be wiped out also. The stock market is extremely risky at times and an investor must take the time to manage his investment throughout each day. If the investor does not have access to or time to manage his portfolio, due to duty limitation of military service, he must hire an account manager to do this for him. A commission must be paid each time stock is bought or sold. This fee can

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[6] John C. Clendenin and George A. Christy, Introduction to Investments, New York: McGraw-Hill Book Company, 1969, p. 112.

rapidly negate any profit made.

Stocks do not always increase in value as inflation tends to increase the cost of living, thus the investor could not be losing money, while his actual buying power really could be decreasing. As with any investment, the more potential for increased profit the greater the risk. When buying on margin, the investor can lose his savings much faster than when paying the full cash price.

Conclusion

There are two basic types of capital stock, preferred and common. This section gave a brief description of each and then oulined the major advantages of dealing in the stock market. These advantages include sharing in the success of economic growth of the company, providing a hedge against inflation and voicing an opinion as to how the company should be run. The major disadvantages were then addressed to include the risk involved, the time of managing an account or paying for this service and commissions. This section has discussed capital stock for the military investor, the next topic will be real estate.

Real Estate

There are several types of real estate investments that the military serviceman can make. The military investor must consider both the advantages and disadvantages along with his unique predicament of being in the military when making a decision to go into this area of investment.

Characteristics

The real estate area offers several opportunities for the military investor. Many officers invest in a personal residence close to the installation where they are stationed. When they are subsequently transferred, they either sell the property or rent it out. There are other real estate investments, however, these two are the major alternatives available to the career officer.

Advantages

There are significant advantages to owning a home or rental property. In inflationary times real estate tends to keep pace with the rate of inflation thus maintaining the investors purchasing power.

Real estate investments provide an excellent tax shelter. Interest expense, property taxes, depreciation, if rental property, repairs and improvements are all deductible on federal tax returns.[7]

Real etate investments allow the use of leverage to a great extent. With a minimal investment, a piece of real estate of considerable value can be purchased. Rental income an significantly supplement a military pay check. The military offers a housing allowance in addition

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[7] Internal Revenue Service, Department of the Treasury, Package X, 1981.

to other pay incentives for members that live off base. If an officer lives on base, this benefit is forfeited.

Disadvantages

There are several disadvantages that are intensified due to the unique situation of the military officer when considering real estate as an investment. Real estate investments require frequent attention. Management and maintenance costs can be astronomical if the officer is unable to perform them himself. With frequent transfers normally associated with a military career, it is almost impossible to perform all the management or maintenance function. Therefore, these services must be purchased from a real estate agent or other such company.

Real estate is a fixed investment and can be extremely difficult to turnover quickly without incurring a loss. If the home purchased is later converted to a rental property, there are other disadvantages to include taking a large loss if the base is closed, or the servicemen are provided adequate housing or forced to live on base. Property taxes also cut into the profit. The cost of liability insurance must also be considered due to the possibility of legal involvement. The national economy and interest rates also directly effect the availability of potential buyers.

Conclusion

The military investor has the option of investing in real estate. Two basic forms of investment in this area are in the form of a personal residence and a rental property. There are many advantages to owning real estate to include real estate as a hedge against inflation. Real estate can also provide attractive tax advantages, leverage and an income supplement. Finally, the investing officer is actually subsidized by the government through a housing allowance for living off base. There are also risks involved to include management and maintenance costs, liquidity problems, devaluation of property in conjunction with base policy, property taxes, liability insurance and interest rates rising too high to provide adequate buyers. These advantages and disadvantages must be weighed carefully when considering a real estate investment. The next area of investment to be examined will be mutual funds.

Mutual Funds

Another possible investment avenue open to the military investor is a mutual fund or an investment company. Prior to investing funds in this area an investor must be aware of both the advantages and disadvantages of a mutual fund.

Characteristics

An investment company simply gathers funds from many investors and invests them in a wide variety of securities to achieve a specific goal. There are both open-ended and closed-end investment companies. This closed-end investment company's stock is similar to that of common stock because it is traded on the stock market.[8] The open-end investment company will vary its number of outstanding shares as new investments take place. The cost of a mutual fund changes, just as does that of common stock. The managers of the mutual fund invest the money in the different mediums and then issue certificates of the company's stock. The mutual fund company must specify exactly what the goals of the company are and follow this prospectus.

Advantages

The biggest advantage to a military member of a mutual fund is that the investment is being managed by a highly professional staff and no matter how small his investment is, it will get the full attention of the manager.[9] As a rule, mutual funds are less risky than

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[8] Investment Company Institute, 1980 Mutual Fund Fact Book, Washington, D.C.: Investment Company Institute, 1980, p. 49.

[9] Ibid, p. 28.

stocks because they are diversified. There is no set minimum amount for getting into mutual funds. Finally, an investor may choose a mutual fund that will achieve goals similar to those of the investor.

Disadvantages

A big disadvantage of a mutual fund is that the sales fee can be incurred up front when signing up for a mutual fund. This is called front loading. It takes most of the investor's initial investment to pay the sales commission. In order to break even with a front loading fund, the investor must stay with it for a couple of years.

The sales commission for mutual tends to be higher than that charged in the stock market. Mutual funds will not grow as fast as the better stocks or bonds during healthy economies.[10]

Conclusion

Mutual funds invest money over a diversified area to achieve a stated goal. The major advantages of a mutual fund include effective management of funds and risk tends to be less than stocks and bonds. There is no set minimum investment and the investor can select a mutual fund that achieves the goals the investor desires. The disadvantages are the high cost of manage-

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[10] Jerome B. Cohen and Arthur W. Hanson, Personal Finance, Homewood, Ill.: Richard D. Irwin, Inc., 1968, p. 693.

ment and sales commission, and that yields from mutual funds tend to be less than that of successful stocks.

Annuities

Annuities are another instrument that the military officer can utilize in order to receive a periodic payment for any set period of time. The investor must carefully analyze the advantages and disadvantages of this investment medium.

Characteristics

An annuity is a contract that provides an income for a specified number of years, or life.[11] Where insurance protects dependents, and annuity protects oneself. In a lump sum annuity the purchaser pays the company, usually an insurance company, a single lump sum. Then at a specified date the company will start paying back a smaller sum for the life of the annuity holder. An annuity basically provides protection against living too long.

Advantages

The primary advantage of an annuity is that it will guarantee the owner a predetermined amount for the rest of his life. There is no worry as to rate of return or interest rate. The insurance company will

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[11] John C. Clendenin and George A. Christy, Introduction to Investments, New York: McGraw-Hill Book Company, 1969, p. 557.

supply/pay the holder the agreed upon amount for the duration of his life.

Disadvantages

One limitation of an annuity is if the investor gives a company a big lump sum and dies the next day. The company may be able to keep all of the money. Another big disadvantage is that the investor does not have access to the money should an emergency arise that would require a large sum of money. The owner of an annuity cannot pull all of his money out and reinvest it in some other medium. If the time from when the annuity holder first pays a large lump sum and when he will start taking out funds is substantial, he will have no idea what the economy or the actual interest might be.

Conclusion

Annuities are an extremely safe avenue of investment. They guarantee a given amount of income for anumber of years or for life. One advantage of an annuity is that is guarantees a set amount for the rest of the investors life. There are no worries about interest rate or yield as the annuity holder is basically gambling on how long he will live. There are major disadvantages of annuities including possible forfeiture of monies upon death, no access to funds, no say in the management of funds and no ability to predict the future interest rates. These are some of the major disadvantages of an annuity. Annuities are one possible way to obtain a source of income after retirement.

Summary

This chapter discussed five investment avenues available to the military investor. The topics of bonds, stock, real estate, mutual funds and annuities were reviewed to build a common basic understanding of the types of investments available.

Chapter three will utilize a linear program model to quantitatively analyze how a military investor should diversify his investment to best achieve his specific needs. The investor must be able to simply make relationships between required rates of return and percentage of total investment money in order for this model to work.

Chapter four will then summarize the study, draw conclusions and make suggestions for further study. This portion of the paper will analyze, to what extent, the study was successful.

CHAPTER III

IMPLEMENTATION OF A LINEAR PROGRAM MODEL

Introduction

The previous chapter was a review of the literature on possible investment alternatives. The characteristics, advantages, and disadvantages were covered in order to build a common body of knowledge concerning the nature of each of these investment options.

This chapter will include the actual application of a linear program model to help the investor select how to disperse their investment dollars. Each investor will have their own particular view of risks and personal preferences concerning diversification of their investment portfolio. For illustrative purposes, the author's views and desired relationship will be utilized for building constraints for the model.

Chapter four will summarize the study. Additionally, implicating for futher study and basic conclusions will be offered.

Portfolio Mix Decisions

When an investor is selecting between the various investment alternatives, the general relationship between risk and rate of return must be understood. Although this is not always true, generally if there is a high risk associated with an investment, the rate of return will also be high.

Likewise, if there is little risk involved, there will be a comparatively small return on investment. This relationship is known to all investors.

One way of predicting future rates of return is to look at historical data and assume that present trends will continue in the short run. By continually watching current rates of return and updating the forecast model, the model will prove more effective over the long run. It would be inappropriate to make a broad generalization concering rate of return for each of the five categories of investment opportunities addressed in this paper. Data concerning a standard rate of return would not effectively predict a rate of return for a specific company based on an investment type average. This is due to the fact that there are so many variable rates of return.

The author's minimum desired rates of return will be utilized as an example to see how these desired rates, when coupled with investor preferences concerning investment mix, can best be used to select the proper investments. These rates of return have been made following a review of the various options, industry trends, and desires of the investor. As the economy fluctuates, so too will the minimal desired rates of return.

The investment vehicle, the associated variable, and the required rate of return are listed in the following table:

TABLE 1

Investment Alternatives	Variable	Minimum Rate of Return
Stocks	X1	5.0%
Bonds	X2	9.5%
Real Estate	X3	12.5%
Annuities	X4	6.0%
Mutual Funds	X5	4.8%

Predicted rates of return are the values that would need to be attained inorder for the investor to put his money in the specific area. Each individual must also consider the desired rate of return, which once again is directly related to risk. Other factors that come to mind include general state of the economy, other possible options available, corporate history, and numerous other factors.

When selecting specific alternatives, the investor will simply disregard investments that do not generate the desired rate of return. If an opportunity presents itself that entices the investor, the portfolio will change to include the new opportunity at the earliest possible time.

Risk Assessment; A Key to Investment Mix

The manner in which the investor views risk will be directly influenced by outside factors. These factors include the general state of the economy and the current rates of return on various investments.

Generally speaking, investors can be either risk takers or risk averters. The individual's attitude towards risk will fluctuate depending upon how he views the effectiveness of the various options open to him (i.e., the state of the economy and the rate of return on the alternatives facing him).

During periods of depression, the investor might have a totally different preference of investment mix than in times of hyperinflation. The general financial needs of an individual will also have a direct effect on the alternatives selected. This study assumes that the investor has budgeted $2,400 per year ($200 per month) for investment.

Most investors will prefer to spread their money among the various alternatives and not concentrate their investment in one alternative. After considering the five investment options available, the question becomes--given the different rates of return of the various investments, how should investment money be utilized to satisfy the required rate of return, risk preference and personal investment selection constraints.

Each investor's constraints will be different. Likewise during different periods of life based upon the state of the economy, or present personal needs and feelings, each investor will change his selection.

After considering the stated rates of return, the desired diversification and the desire to maximize overall rate of return the following constraints were developed:

> Stocks must be at least 10 percent of the total investment package; and not more than 25 percent.
>
> Bonds must be at least 20 percent of the total investment; and not more than 30 percent.
>
> Real estate must be at least 30 percent of the total investment and not more thant 50 percent.
>
> Annuities must be at least 5 percent of the investment and not more than 15 percent.
>
> Mutual funds must be at least 5 percent of the investment package and not more than 20 percent.

Depending on how the individual views these different factors, any combination of the alternatives that meet his requirements and constraints can be developed. These constraints might change due to the investor's viewpoint concerning risk and diversification and the economy.

The Computer Model

There are many advantages to using computer technology to solve investment problems. One major advantage is being able to quickly and easily determine the best investment mix to maximize profits. These forecasts can be provided prior to the actual investment being made. The information provided to the investor will help him determine what the rate of return will be; after consideration is made for his self-imposed constraints. By spending a small amount of time utilizing a linear programming software package on the computer, the investor can develop numerous alternative courses of action. These alternatives would be based upon rate of return on the investment options and the varying imposed constraints.

The output will also show how much the rates of return for investment alternatives can change and still get the same investment mix. Additionally, information on the various self-imposed constraints concerning investment alternatives can be provided.

Table II shows the input made for the example given in this study. After the initial computer run, the coefficients of each variable could be adjusted to determine how these changes will effect the results.

Table III shows the output from the same example. In this particular example, the computer rapidly provided the results after completing seven tableaus of the simplex method.

TABLE II

Max

.5 X 1 + .95 X 2 + 1.25 X 3 + .6 X 4 + .48 X 5

ST

X 1 + X 2 + X 3 + X 4 + X 5 = 2,400

X 1 >= 240

X 1 <= 600

X 2 >= 480

X 2 <= 720

X 3 >= 720

X 3 <= 1,200

X 4 >= 120

X 4 <= 360

X 5 >= 120

X 5 <= 480

TABLE III

LP Optimum Found at Step 7

Objective Function Value

1. 2433.59863

Variable	Value	Reduced Cost
X1	240.000000	0.
X2	720.000000	0.
X3	1200.00000	0.
X4	120.000000	0.
X5	120.000000	0.

Row	Slack or Surplus	Dual Prices
2	0.	0.950000
3	0.	-0.450000
4	360.000000	0.
5	240.000000	0.
6	0.	0.
7	480.000000	0.
8	0.	0.299999
9	0.	-0.350000
10	240.000000	0.
11	0.	-0.470000
12	360.000000	0.

No. Iterations = 7

This output is the answer to the question of how the investor should invest his money to maximize his profits. This output also shows how much the rate of return for a specific variable not included in the maximization solution would have to be increased in order to be included in the maximization. This value will always be zero if the constraints require at least some representation of each variable in the solution.

The output also shows how much slack or surplus is available. In this example, this means how much of an investment could have been included, but was not due to there being a more effective solution. Finally, the output improves as each value addressed in the different constraints is slightly increased.

Table IV gives the sensitivity analysis of both the investment alternatives and the self-imposed constraints. This information is important to the investor because it provides ranges in which changes can be made while rendering the same results.

The variable ranges show how much an investment alternative (variable) can be manipulated, by either increasing or decreasing, to render the same solution. This information is of value when readdressing constraints or considering different rates of return on investment alternatives.

TABLE IV

Do Range Sensitivity Analysis

Yes

Ranges in which the basis is unchanged

OBJ COEFFICIENT RANGES

Variable	Current Coef	Allowable Increase	Allowable Decrease
X1	0.500000	0.450000	Infinity
X2	0.950000	0.299999	0.350000
X3	1.249999	Infinity	0.299999
X4	0.600000	0.350000	Infinity
X5	0.480000	0.470000	Infinity

Righthand Side Ranges

Row	Current RHS	Allowable Increase	Allowable Decrease
2	2400.00000	0.	240.000000
3	240.000000	240.000000	0.
4	600.000000	Infinity	360.000000
5	480.000000	240.000000	Infinity
6	720.000000	Infinity	0.
7	720.000000	480.000000	Infinity
8	1200.00000	240.000000	0.
9	120.000000	240.000000	0.
10	360.000000	Infinity	240.000000
11	120.000000	240.000000	0.
12	480.000000	Infinity	360.000000

The constraint ranges provided at the bottom of the output are also important. This shows the present value of the constraints and how much these values can be changed while maintaining the same values of dual price and reduced cost as addressed above (i.e., if a constant value is changed by more than depicted, the optimal solution investment mix may change). This entire system is explained in further detail in Linear Programming Models With LINDO by Linus Schrage.[12]

Summary

This chapter utilized a linear program model to determine how to diversify an investors funds to most efficiently satisfy the corresponding needs. The author's personal preferences conerning investment mix and minimum required rates of return for the different available avenues was used as an illustration. These preferences were built into constraints and applied to the model to yield the most efficient split of how available funds should be allocated. This model could be applied to other investors by simply rebuilding the constraints after the preferences were stated by the investor.

The next chapter will summarize the entire study.

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[12] Linus E. Schrage, Linear Programming Models With LINDO, The Scientific Press, Palo Alto, California, 1981.

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Other basic conclusions conerning this effort along with implications for further study will also be offered.

CHAPTER IV

SUMMARY, CONCLUSION AND IMPLICATION FOR FURTHER STUDY

Introduction and Summary

This study was undertaken to provide a basic understanding of investment opportunities for the career officer. While the study was intended to help solve the special problems of this type of investor, any investor could apply the study to their particular situation.

Chapter one developed the need for career officers to distinguish between and analyze the major investment alternatives. It showed that currently there is no training in financial matters for these officers. Due to their leadership role and for self-preservation, these officers must develop some expertise in personal financial matters. The scope of the study was stated. Next the general purpose of linear programming was introduced along with its limitations, assumptions and requirements. Finally, the overall limitations of the study were stated.

Chapter two was a review of the literature on five investment vehicles to include: bonds, stocks, real estate, mutual funds, and annuities. The basic characteristics of these alternatives were covered along with the advantages and disadvantages of each. This review built a common understanding of each of these investment options.

Chapter three was the actual implementation of a linear program model to determine how to allocate an investors dollar to best suit particular stated needs. By taking a given available rate of return along with the concept of risk, the investor should be able to establish basic relationships concerning investment mix for the portfolio. The author's preferences and minimum rate of returns were utilized for illustrative purposes.

This chapter includes this summary of the study. Following this, some conclusions will be offered. Implications for future study will complete this academic presentation.

Conclusion

To the extent that this study made the military investor more knowledgeable about investment opportunities it was a success. It would appear, however, that the methodology utilized rendered results that were less than impressive.

The methodology of this linear programming model may not be as complex as is required for real world decisions. While some people might utilize the model in its present form to draw instances and develop trends. It does not appear as relative as would be needed.

While a more sophisticated model could result in a more accurate solution, this study did fulfill the need for career officers to learn about basic investments. The continued study and development of a better methodology could help to make more sound investment decisions.

Implications for Further Study

The utilization of a more sophisticated model could add to the accuracy of the investment decision. It should be noted that the study limited itself in scope to only five investment alternatives. There are numerous investment avenues that could be investigated to determine specifically which should be used to complement a portfolio.

Another area that could be investigated would be keeping abreast of the IRS's rulings for new or changing tax benefits. These rulings can have dramatic effects on profitability when considering income tax.

Investors should also keep current on new available investment alternatives. The more ingenious the investor is with alternatives the harder it is to distinguish between options available.

In closing, the world of personal financial planning is wide open. Potential investors must keep current, utilize available quantititive methods, and be willing to change their investments. The important thing is to be willing to accept information and then put this information to work in order to maximize personal profitability.

APPENDICES

APPENDIX I

Rank	Yrs of Service	1982 Monthly Base Pay	5% for Investment	Housing Allowance
Capt.	4	1845.90	92.30	434.70
	5	1845.90	92.30	
	6	1934.10	96.71	
	7	1934.10	96.71	
	8	2004.00	100.20	
	9	2004.00	100.20	
Major	10	2216.40	110.82	487.20
	11	2216.40	110.82	
	12	2341.20	117.06	
	13	2341.20	117.06	
Lt. Col.	14	2591.50	129.57	535.50
	15	2591.40	129.57	
	16	2785.50	139.28	
	17	2785.50	139.28	
	18	2945.40	147.27	
Col.	19	3283.20	164.16	535.50
	20	3283.20	164.16	

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