

AN EXAMINATION OF RRSP'S AS A TOOL FOR

INTERGENERATIONAL FARM TRANSFERS

by

James S. R. Alty

A thesis
Submitted to the Faculty of Graduate Studies
in partial fulfilment of the
Requirements for the Degree of

Master of Science

Department of Agricultural Economics and
Farm Management
University of Manitoba
Winnipeg, Manitoba

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ABSTRACT

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JAMES S.R. ALTY

Careful planning is an essential component in the successful growth and intergenerational transfer of the farm firm. Growth plans which contribute to high levels of growth also result, generally, in high levels of net value of assets transferred to the farm heir. Increasing land and asset values, overtime, complicate the problem of the new entrant wishing to purchase the farm firm. At the same time the farm parents wish to be paid for their accumulated capital to whatever extent they transfer it to the heir, provide an adequate income for themselves during their retirement years, and to provide income and capital for other children not involved in the farm firm.

The purpose of this study is to analyze RRSP investments as a disinvestment strategy for retiring farm parents in order to allow for successful intergenerational farm firm transfers. The analytical model used in the study is designed to investigate two RRSP investment strategies in a static farm firm environment. The investment strategies were analyzed to determine the likelihood of their contributing to diminished farm firm growth vis-a-vis the case farm firm which serves as the bench mark. The benchmark embodies the actual production, marketing and financial decisions of the farm operator thus the

consequences of alternative RRSP investment decisions may be measured by direct comparison to the benchmark. The RRSP investment study period is 1957 to 1982, inclusive.

The study examines four hypothetical retirement options with a standard set of assumptions. The individual options are augmented by additional option specific assumptions. The four options are examined for the succeeding generations ability to generate and maintain the flow of funds required for debt service for the period starting in 1983 to 1990, inclusive.

The study finds the large final values of the RRSP investment funds make it possible for the farm parents to be relatively generous, to the farm heir, in the transfer options. The smallest final value for the RRSP contribution plan is \$196,346 and the largest final value is \$443,660.00.

The study concludes that a fixed dollar claim to the farm firm's resources, for investing off the farm firm into a RRSP program, strengthens and enhances the consolidated balance sheet. Additionally, the off farm RRSP investment program facilitates an orderly transfer to the next generation without impairing the farm firm's viability.

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Chapter I

INTRODUCTION

The progress of Canadian agriculture has had significant consequences in almost every aspect of the social and economic life of rural Canada. This progress, especially in the last three decades, has been characterized by a decline in the number of farms and growth in size of those remaining. Despite the many changes in agricultural technology the historical family farm firm has remained the dominant form of business organization in the primary agricultural sector. Table 1.1 reports that the single proprietor farm firm is the dominant business entity in rural Manitoba owning and renting 75 percent of the province's farm land (Table 1.2). Perhaps the persistent devotion to the ideal of the family farm has allowed it to resist other forms of business organization. For whatever reason the single proprietor farm firm is clearly the backbone of the primary agriculture sector in Manitoba.

The family farm firm's life cycle can be divided into three stages consisting of entry, growth and exit.¹ The life cycle of the family farm firm generally parallels the farm operators life cycle. It starts with the beginning farmer and ends with his retirement. The farm operator's heir, in turn,

¹ M.D. Boehlje, "The Entry-Growth-Exit Process in Agriculture," Southern Journal of Agricultural Economics, Vol. 5, 1973, pp. 23-37.

TABLE 1.1
BUSINESS ORGANIZATION OF FARM-FIRMS, MANITOBA, SELECTED YEARS

Type of Organization	1971		1976		1981		1986	
	Number	%	Number	%	Number	%	Number	%
Single Proprietorship	32,183	92.0	29,748	97.2	25,701	87.3	22,869	83.7
Partnership:								
(a) with written agreement	2,094	5.9	973	3.0	688	2.3	761	2.7
(b) without written agreement	--	--	--	--	1965	6.7	2468	9.1
Corporation:								
(a) family	548	1.6	1,089	3.4	822	3.0	1035	3.8
(b) other	67	0.2	165	0.5	85	0.3	81	.3
Other Type	80	0.3	129	0.4	121	0.4	122	.4
TOTAL FARMS	34,981	100.0	32,104	100.0	29,382	100.0	27,336	100.0

(i) Includes partnerships without written agreement

SOURCE: Statistics Canada. 1986 Census of Canada, Agriculture, Manitoba

TABLE 1.2
BUSINESS ORGANIZATION OF FARM-FIRMS AND LAND BASE, MANITOBA, 1981

Type of Organization	Hectares/Acres Owned	%	Hectares/Acres Rented	%	Total Farms
Single Proprietorship	3,997,042/9,872,694	78.4	1,755,465/4,335,00	69.7	25,701
Partnership:					
(a) with written agreement	158,803/392,243	3.1	93,232/230,382	3.7	688
(b) without written agreement	462,791/1,143,094	9.1	281,994/696,525	11.2	1,965
Corporation:					
(a) family	326,781/807,149	6.4	195,479/482,833	7.8	882
(b) other	31,722/78,353	0.6	20,165/49,808	0.8	85
Other Type	120,517/297,677	2.4	171,934/242,677	6.8	121
Column Total	5,097,656/12,591,210	100.0	2,518,269/6,220,125	100.0	29,442

SOURCE: Statistics Canada. 1981 Census of Canada, Agriculture, Manitoba.

completes the same type of cycle during his/her lifetime on the farm.

The increasing sophistication of the primary agriculture sector has necessitated a renewed and serious examination of the complex and costly problems of transferring the ownership and control of family farm firms between generations at the retirement or death of the existing farm operators. Until 1982 the continued growth in farm size and quantity of production assets accumulating on Manitoba farms combined with the constant appreciation in the value of farm assets, especially arable land, had increased the cost of intergeneration farm estate transfers. After 1982, however, land values reversed direction and declined until 1988-89 at which time they started to increase.² Values across Canada increased 4.9 percent in 1988-89 and 3.9 percent in 1989-90. In general since the 1960's increasing amounts of capital investment have been required to facilitate farm firm growth and to exploit the economies of size implicit in technological improvement. This growth in farm capital requirements has made it increasingly difficult for beginning farmers to obtain control of a large enough unit to generate an income level

² L. Baker and P.J. Thommassin, "Financing New Farm Entrants: The Long-Term Leasing Option," *Canadian Journal of Agricultural Economics*, Vol. 39, 1991, pp. 255-269.

competitive with off-farm employment opportunities.³

It should be noted that during a down cycle in farm values, such as in the early 1980's, great financial stress is placed on new entrants, or those refinancing their farm firms in the form of cash flow risk. The concern with cash flow risk is measured by the debt/service ratio.⁴

Many family farm firms are based on the principle of perpetual existence and thus are established and managed with the hope and expectation that they will go on indefinitely. Farm families seek to provide for the farms continuity by transferring the ownership of farm assets and managerial control of the farm firm to an heir at the time of the farm parents retirement or death. The capital requirements necessary for the younger generation to achieve entry have become so large the acts of entry and exit often occurs simultaneously.⁵ Many farm parents are working well past their retirement years in order to provide their children an

³ G.E. Roush, "Economic Evaluation of Asset Ownership Transfer Methods and Family Farm Business Arrangements After the Tax Reform Act of 1976," unpublished Ph.D. dissertation, Oklahoma State University, 1978, p. 2.

⁴ R. Ashmead, "Emerging Roles In Financing Agriculture," Canadian Journal of Agricultural Economics, Vol. 34, 1987, pp. 170-184.

⁵ C. L. Dobbins, "The Intergeneration Transfer of the Farm Firm: A Recursive Goal Programming Analysis," unpublished Ph.D. dissertation, Oklahoma State University, 1978, p. 1.

retirement years in order to provide their children an opportunity to enter farming. It is critical that a planning strategy be developed well in advance of the entry-exit process. If the proper strategy is not implemented to transfer ownership of farm assets and provide for continuity of management, family conflicts, large economic losses and inefficient use of capital resources may prevent the achievement of the farm parents retirement, ownership transfer and farm development objectives.⁶

1.1 THE PROBLEM SETTING

The demand for greater investment on Manitoba farms is indicated over time by the increased value of land, buildings, machinery and equipment as well as the increases in the average farm size. (Appendix A)

Increases in farm size have been a result of farm consolidation and new land being brought into production due to improved technology, greater capitalization and better management. During the 25 year period ending in 1986 farm sizes had increased 66 per cent, farm numbers decreased 47 percent and, the proportion of the average total investment in land, buildings and equipment significantly greater.

⁶ Roush, op. cit., p. 2.

Frequently, farm families have found themselves trapped in the situation of "forced savings" during the entry and growth stages of the farm firm. The farm family's current living standards are lowered in order to provide the necessary savings to invest in the farm firm so that it may continue to grow and exploit the economies of size implicit in technological improvement. The effect of "forced savings" combined with inflation of land values over the past three decades has created a situation where many farm parents have a balance sheet reflecting a large amount of equity in the farm firm in spite of the fact that their annual net farm income over the same time period has been low (Table 1.3).⁷ Farm operators to whom these conditions pertain are generally in the late growth stages, if not the exit stage, of the farm firm life cycle. Unfortunately the large capital gains accrued by the farm parents over time represent a real cost to the low equity entrant to the farm firm. The difficulty of the young entrant can be easily demonstrated by assuming a situation where the farm parents are approaching retirement with equity in the farm firm of \$355,000. At a rate of 10 1/2 percent the return to the farm parents would amount to an annual retirement income of \$37,275. The young entrant,

⁷ The downturn in capital values, especially land, in 1982 would have deflated balance sheets until 1988-89 when land values started to escalate again. The magnitude of decrease during the seven year period was not as great as the magnitude of increases over the previous two decades.

TABLE 1.3
INCOME PER FARM-FIRM, MANITOBA, SELECTED YEARS

	1961	1971	1976	1981	1986	1990
Cash Sales	5605	10,800	27,617	55,975	75,891	74,298
Net (production less cost)	1035	4,427	8,574	13,915	13,839	18,524

8

SOURCE: Manitoba Agriculture. 1990 Yearbook.

however, would face annual interest charges of \$37,275 taken on this amount of capital. Inadequate cash flow and low equity will be the immediate barriers to entry faced by the aspiring entrant to farming.

The advancements in technology over time have required a greater use of inputs by farm operators each subsequent period. Greater input usage reflects increasing risks for the farmer. Tables 1.3 and 1.4 show that in 1986 an investment of \$25.30 was required to generate a dollar of net income from farming. This is in stark contrast to the \$7.70 required, in 1956, to generate a dollar of net income. As capital costs rise and profit margins shrink the threat of loss and bankruptcy becomes very real for the low equity entrant.

1.2 THE PROBLEM

Farm parents in the exit stage of the farm firm life cycle have a much shorter planning horizon in contrast to the new entrants planning horizon. The retirement process is the centre of concern for the farm parents which is polarized from the concerns of the new entrant. The exit phase of the farm firm cycle is not given the same careful planning that the earlier phases of the life cycle received. Throughout the farm firm's life cycle is a pervasive desire to obtain full

TABLE 1.4

AVERAGE CAPITAL INVESTMENT PER FARM FIRM, MANITOBA, SELECTED YEARS

Investment	1961		1971		1981		1986		1990	
	\$	%	\$	%	\$	%	\$	%	\$	%
Land and Buildings	16,492	62.0	39,396	67.0	255,250	75.0	240,864	66.0	243,000	67.0
Mach. and Equipt.	6,384	24.0	11,760	20.0	60,350	17.0	83,380	22.0	86,450	24.0
Livestock	3,724	14.0	7,644	13.0	28,400	8.0	42,860	12.0	35,719	9.0
TOTAL	26,660	100.0	58,800	100.0	355,000	100.0	367,104	100.0	365,169	100.0

SOURCE: Manitoba Agriculture. 1990 Yearbook

title to the farm and its assets before retirement.⁸

The independence of the farm business and farm household (including preferences of families) creates a cycle where the quantity of capital employed parallels the cycle of the farm family.⁹

Heady reported that capital investment, expressed as a function of a farm operators age, could be described by a quadratic function with a peak at about age 47. Heady's study showed that during the entry stage, when equities were lowest, farm operators refrained from using long term debt and incurred debt for operating capital. Long term debt was increasingly incurred during the growth stage of the farm firm. It is interesting to note that as farm operators built up equity in their farm firm they did not pursue their credit capabilities to the limits of their equity. Instead, the farm operators retired their debt and invested in nonfarm assets to secure income during retirement.¹⁰ Entry-exit coordination is complicated by this difference in goals possessed by the farm parents approaching retirement and the young entrant.

One of the most frequently overlooked aspects of the entry-growth-exit process is the desire of the farm parents to reduce their debt and consolidate the farm firm and the counter desire of the entrant to expand to a size sufficient

⁸ E.O. Heady, Economics of Agricultural Production and Resource Use, (New York: Prentice Hall, 1952), p. 427.

⁹ Ibid., p. 432.

¹⁰ Ibid., p. 427.

to exploit further economies of scale and/or support an additional family. This problem of entry-exit coordination will be confronting a third of the Manitoba farm operators in the 1990's. Table 1.5 reports that 33.4 percent of Manitoba's 27,336 farm operators were 54 years of age and older. An additional 44.4 percent of Manitoba farmers between the ages of 34 and 54 will face the same retirement problem in the next half generation. Stated another way the 1990's will find 78 percent of Manitoba's farm operators confronting or considering the retirement process. These individuals will have to decide how to use their lifetime accumulation of capital to build a retirement portfolio which will generate a stable flow of income in amounts adequate to meet their changing needs over time which, in all probability, will be at least as long as the farm operators life and his spouses's. Concurrently these individuals need to plan for an orderly transfer of the farm firm and other assets to the next generation assuring that the assets are distributed to the intended heirs without dissolving the farm business or its viability.

Time waits for no man (or woman) and it behooves farm operators to plan for what's ahead, in particular, retirement or disengaging from the farm firm. RRSP's are suggested, in this study, as one of the ways farm operators can advance plan for retirement.

TABLE 1.5

NUMBER AND PROPORTION OF FARM OPERATORS BY AGE GROUPS, MANITOBA, SELECTED YEARS

Age of Operator	1961		1971		1976		1981		1986	
	number	%	number	%	number	%	number	%	number	%
Under 35	7,297	16.9	5,570	15.9	6,880	21.5	7,228	24.6	6,069	22.2
35-54	22,993	53.1	17,773	50.8	14,916	46.4	13,261	45.1	12,137	44.4
Over 54	13,016	30.0	11,638	33.3	10,308	32.1	8,953	30.3	9,130	33.4
TOTAL	43,306	100.0	34,981	100.0	32,104	100.0	29,442	100.0	27,336	100.0

SOURCE: Statistics Canada. 1986 Census of Canada, Agriculture, Manitoba

A RRSP is a contract or trust arrangement entered into by an individual with an eligible financial institution. In consideration of a payment or payments made by the individual, the institution agrees to pay an income to the individual upon retirement. RRSP's offer substantial long-term tax savings to enable taxpayers to accumulate a substantial retirement fund through their own efforts and under their own control.

1.2.1 PROBLEM SYNOPSIS

Given the trend in farm values, over time, it would appear that fewer and fewer young farmers will be able to meet the equity requirements in the future without some form of financial assistance from the previous generation or from some public source. The heavy debt load needed by the new entrant into agriculture may reach such a scale that he or she is unable to fully amortize the debt over the farm life cycle. The inability of new entrants to finance the transfer of ownership of viable farm firms threatens to shake the current structure of Canadian primary agriculture.

There are two major problems related to the intergenerational transfer of family farm firms. The first problem relates to the accumulation of nonliquid assets in the form of fixed capital. The second problem, intertwined with the first, is the farm parents desire to develop a transfer arrangement to an heir in order to assure the continuance of

the farm firm. At the same time, however, the farm parents wish to be paid for their accumulated capital to whatever extent they transfer it to the heir, provide an adequate income for themselves during their retirement years, and to provide income and capital for other children not involved in the farm firm.

1.3 PURPOSE AND OBJECTIVES

The basic hypotheses of this study are as follows:

1. That a critical element in farm firm growth is the relationships between internal (on-farm) investment, external (off-farm) investment and farm family consumption.
2. That Registered Retirement Savings Plans (RRSP's) can be a useful tool for intergenerational farm firm transfers.

1.3.1 SPECIFIC OBJECTIVES

The specific objectives of this study are as follows:

1. To develop a farm firm model that can describe actual farm firm business relationships so that financial/quantitative computations and projections can be performed on disinvestment strategies in preparation for retirement by farm parents.

2. To determine, in a static framework, the level of RRSP investment contributions which will permit the development of a retirement portfolio and allow for continued growth of the farm firm during its entry and growth stages.
3. To provide results that will be useful for planning farm growth when a RRSP retirement portfolio has a prior claim to resources generated by the farm firm.
4. To examine the financial and risk dimensions of the new entrant assuming the ownership and management of the farm firm.

CHAPTER II

PREVIOUS RESEARCH

Research and academic discussions on the growth process are so prolific that time does not permit one to discuss them as thoroughly as one would like to. There are, however, several excellent firm growth review articles and publications with extensive reference lists available.¹¹ Several of these articles will be exploited in depth in the discussion of this study's theoretical framework. The common line of thought to all the articles is that "a fundamental issue in studying farm firm growth is the interrelating of the short run production theory, which involves some fixed resources, and the long run investment theory which varies them."¹² Irwin paraphrases Boulding to say that "the wedding of these two must necessarily recognize that the firm has a balance sheet as well as a production mechanism."¹³ Simply stated

¹¹ Three articles and publications that merit attention are as follows: C. B. Baker, et al., Economic Growth of the Agricultural Firm, Washington State University Technical Bulletin #86, February, 1977. A. N. Halter, "Models of Firm Growth, "Journal of Farm Economics, Vol. 48, 1966, pp. 1503-1510. G. D. Irwin, "A Comparative Review of Some Firm Growth Models., "Agricultural Economics Research, Vol. 20, 1968, pp. 82-100.

¹² E. D. Irwin, "A Comparative Review of Some Firm Growth Models, "Agricultural Economics Research, Vol. 20, 1968, p. 82.

¹³ Loc. cit.

the fundamental principle of growth is to obtain command of the services of additional productive resources by paying a price that is less than the return earned by the resources. Thus, the process of growth involves securing funding to purchase these resources, either from internal or external resources. Finally consumption levels, profitability of the farm, price and yield variability, tax management and whatever other variables one wishes to name are actually the constraints within which the process can operate.

Boehlje¹⁴ describes the farm firm life cycle as consisting of entry, growth and exit phases. The problem of entry into farming has received limited attention. The exit phase of the farm firm has received attention in the form of studies of retirement income and disinvestment strategies or estate planning and transfer strategies.

Lee and Brake¹⁵ provided a comprehensive approach for retirement planning by employing capital budgeting to analyze two alternatives for retirement strategies: renting the land for cash, or liquidating farm assets and investing in securities. This pragmatic study considered capital losses in the sale of the farm (from realtor's fees and other fees),

¹⁴ Boehlje, op. cit., pp. 23-37.

¹⁵ W. F. Lee and J. R. Brake, Conversion of Farm Assets for Retirement Purposes, Research Report #129, Michigan Agricultural Experiment Station, January, 1971.

capital gains taxes, and other realities. The study included a survey of relevant characteristics of the alternative investments. This study did not consider the question of the optimum time for retirement although it did consider life expectancy when comparing investment alternatives.

Boehlje and Eisgruber's¹⁶ study is one of the few studies to relate both farm firm growth and successful transfer of the farm firm to a succeeding generation. This study deemed strategies to be successful if they resulted in large present value of net worth transferred to an heir. However, their model did not consider the effect of price and yield variability on the probability of success of a given growth and transfer plan.

Brucker, Baker and Erickson¹⁷ sought to analyze the investment problems of retiring farmer-operators by building a model which allocated investments among farm firm and non farm firm assets. The model allocated the investments in a manner which maximized the ending estate subject to an annual

¹⁶ M. D. Boehlje and L. M. Eisgruber, "Strategies for the Creation and Transfer of the Farm Estate", American Journal of Agricultural Economics, Vol. 54, 1972, pp. 461-473.

¹⁷ M. H. Brucker, C. B. Baker, and D. E. Erickson, Planning Retirement from Farming: A Computer-Assisted Method For Low-Income Farmers, Special Publication #34, University of Illinois at Urbana-Champaign, College of Agriculture, 1975.

consumption requirement. The model did not propose the profit maximizing strategies for retiring farm operators.

Spence¹⁸ proposed an alternative to the Brucker technique and tested a range of investment strategies using a stochastic simulation model. Spence's study concentrated on the selection of investment strategies which would provide an income for the retiring farm couple and facilitate the transfer of the estate at its maximum value to the next generation. The study recognized that the problem was different from being simply the selection of tax management strategies and more complex than the identification of profit maximizing strategies. The merits of tax sheltered or tax deferred retirement savings plans for the self-employed were not considered. Tax was treated as an externality and tax-issues were not examined in the model.

Spence states that in the American tax environment most "farm families can earn greater after tax returns by investing surplus funds in the farm business than by establishing a tax sheltered or tax deferred saving plan."¹⁹ In the Canadian tax

¹⁸ L. C. Spence, "An Analysis of Investment Strategies for Retiring Farmers," unpublished M.S. thesis, Oklahoma State University, 1976.

¹⁹ Spence, op. cit, p. 86.

environment, however, Tung and Rust²⁰ report that the rate of farm taxfilers participation in RRSPs was greater than that of the non-farm group. They could not determine whether RRSPs or other investment opportunities provided the greatest return to investment. They did conclude that a high proportion of farm operators participated in RRSPs in order to provide future family protection and some tax savings.

Gould and Laiken²¹ discuss the issue of whether investing through an RRSP is always more beneficial than investing without a shelter, by a detailed examination of a variety of investment alternatives and nonfarm firm financial situations. The objective of the study was to provide generalized priority ranking for individual investors of investments held inside or outside a RRSP shelter. The study concluded that an investment program employing a RRSP will, in most cases, result in higher after tax investment return than an equivalent direct investment program. The advantage of the RRSP investment program was found to exist for taxpayers at all income levels. Therefore, farm-operators whose projected lifetime income patterns vary over a wide range of tax

²⁰ F. L. Tung and R. S. Rust, "Farmers' Participation in Registered Retirement Savings Plans," Canadian Farm Economics, Vol. 13, December, 1978, P. 24.

²¹ L. I. Gould and S. N. Laiken, "The Effect of Income Taxation on Investment Priorities: The RRSP," Canadian Tax Journal, vol. 25, November-December, 1977, pp. 658-676.

brackets can benefit from the relative advantage of the RRSP. The study's authors concluded that "this is generally true even if contributions are made while the individual is in a low tax bracket and retirement income is received some years later"²² when the individual is in a higher tax bracket.

Spence's study was designed primarily to aid farm-operators, who had accumulated virtually all their capital in the farm firm, in selecting investment strategies for their retirement. The analysis reported here proposes an alternative to Spence's technique by examining investments, sheltered in RRSPs, made annually throughout the farm-operator's farming career.

The central question, therefore, is whether the farm-parents' should place their earnings in a RRSP directly or outside a RRSP.

Silver and Taube²³ suggest that an investor should use the RRSP shelter. They among others, present a simple computation to illustrate the advantages of investing through an RRSP. Their calculations show that capital invested outside of an RRSP will grow to be less than one-quarter of

²² Ibid., p. 676.

²³ S. Silver and S. Taube, "Tax Deferrals-I", Estate Planning in Canada 1971-1975, (Toronto: Canadian Tax Foundations, 1976, p. 136.

the amount grown within a RRSP, *ceteris paribus*. After the capital is withdrawn from the RRSP at age 65, paying the top marginal tax rate, there is still nearly two-thirds more than the amount to which the investments grew outside the RRSP.

Gould and Laihen²⁴ present the results of a more extensive study that addresses the question of whether or not investing through a RRSP is always better than investing without a shelter. They tested a comprehensive array of investment alternatives and financial positions. Their study concluded that an investment program which makes use of a RRSP shelter will, in most situations, result in a higher after-tax investment return than the equivalent direct investment program. Furthermore they concluded that taxpayers whose projected lifetime income patterns fluctuate over a range of tax brackets can benefit from a RRSP relative to an equivalent direct investment program.

Baker and Thomassin²⁵ reviewed some of the problems associated with farm purchases and transfers. They suggested a fundamental change was required in personal and business attitudes regarding farm purchases. The paper examined the success of a farm purchase option versus a long-term leasing option for a particular set of circumstances. Long-term

²⁴ Gould and Laihen, *op. cit.*, pp. 658-676.

²⁵ Baker and Thomassin, *op. cit.*, pp. 255-269.

leasing was suggested as a way to provide a method for the next generation to enter into farming. The leasing option was found to reduce the financial pressure of entry as well as the cash flow risk.

CHAPTER III

THEORETICAL CONSIDERATIONS

Growth patterns are one of the most significant causes of structural changes in the farm sector, yet theories of growth are ill defined for the farm firm.²³ The intent of the following is to identify and discuss the theoretical considerations relating to the growth of family farm firms beginning with a brief analysis of growth, growth directions and the growth process. The bulk of the discussion shall be devoted to an examination of the family farm firm growth process and conclude with a discussion of the farm firm household relationships. The remainder of the chapter will discuss debt leveraging.

3.1 GROWTH

The term "growth" is used in ordinary discourse with two different connotations. It sometimes denotes merely increase in amount; for example, the increase in output, sales, export, etc. at other times, however, it is used in its primary meaning implying an increase in size or an improvement in

²³ C.B. Baker, et al., Economic Growth of the Agricultural firm, Technical Bulletin #86, Washington State University, February, 1977, p.1.

quality as a result of a development.²⁴

When the concept of growth is being discussed it is important to explicitly define it. As pointed out by Penrose, growth may mean different things to different people and in different situations. For the purpose of this study, growth shall mean the increase in size of the farm firm. Upon first reading, this definition may appear overly simplistic. As before, there is a semantic problem, for size too can mean different things to different people. Renborg defines size as "some measure of the total sum of all means of production which the firm commands."²⁵ Size can be measured either on the input side as total costs or on the output side as the value of total production if the means of production are being optimally utilized.

"The growth process involves a choice of growth directions which among other things is a choice between increases of various means of production."²⁶ Renborg conceptualizes the size of the firm as a vector B, whose elements are the amounts of each means of production measured

²⁴ E. T. Penrose, The Theory of the Growth of the Firm, (New York), John Wiley and Sons Inc., 1959), p. 1.

²⁵ Ulf Renborg, "Growth of the Agricultural Firm: Problems and Theories", Review of Marketing and Agricultural Economics, Vol. 38, June, 1970, p. 52.

²⁶ Ibid., p. 52.

in technical units. These technical units may be whatever one specifies them as thus the farm size may be in as many dimensions as there are elements in B. If one or more of the elements grows, ceteris paribus, then the farm firm realizes a change in size. For example, if the elements --b3, b4 and b5 -- have grown and --b1 and b2 -- have remained constant then one can say the farm firm has grown. However, if there is a decrease in b3 and b5 concurrent to an increase in b1, b2 and b4, it is not possible to tell if the farm as a whole has grown or contracted without some common base of evaluation. It is possible to say that the farm firm has grown and contracted in specific dimensions. If one wishes to estimate the total size change then the farm firm vector B can be multiplied by a cost or a value vector and compared against the value obtained prior to the size change.

3.1.1 GROWTH DIRECTIONS

The elements of B are not the only growth directions of the farm firm. The growth directions of a farm firm may also include the elements of a vector X.²⁷ The elements of a vector X indicate the production processes amongst which the farm firm may choose.

²⁷ Loc. cit.

Vector X is what Penrose calls the "productive opportunities" of the firm, "which comprises all of the productive possibilities that its "entrepreneurs" see and can take advantage of".²⁸ Thus the growth directions of a farm firm are the changing productive opportunities of the farm firm. For example, the changing productive opportunities of the cream producer may lead to the production of fluid milk and ultimately the processing and distribution of bottled milk. The grain producer may see productive opportunities in the growing of grain for certified, registered or pedigreed seed for cleaning and then retailing. The potential for productive opportunities in agriculture are limited only by the imagination of the individual producer.

3.1.2 GROWTH PROCESS

The farm firm growth process is a process in time where the objectives of the farm operator and his family are implemented in order to direct the farm firms growth direction. The growth objectives indicate what is to be achieved as well as when it is to be achieved. The farm-operator, fully cognizant of his own strengths and weaknesses, identifies potential growth directions that will result in attainment of his predetermined objectives.

²⁸ Penrose, op. cit., p. 31.

The goals of the decision maker are assumed to influence the growth process. An increase in farm firm size, regardless of how it is measured, is seldom an end in itself. Farm firm growth is usually a manifestation of attaining the end whatever the ultimate objective may be. The ultimate objective may relate to personal goals, equitable estate transfer to heirs, or consumption levels and financial security of the farm-operator and his family. Of course, in some cases the growth of the farm firm can be a goal in itself. If this is the case, the farm-operator may be interested in the growth process in terms of the rate of growth, or in growth specified in absolute terms to be reached during a specified or unspecified time period. It is, however, more likely that growth is a subgoal, a process of achieving a goal at a higher level.

3.1.3 FAMILY FARM FIRM GROWTH

In the entry stage of the family farm firm cycle (Figure 3.1) a farm-operator would require a minimum amount of capital, OA, and size of a farm firm represented by the short-run average cost curve, SAC₁, in Figure 3.2. The unit cost of production would be reduced for this size of farm firm by expanding output to the amount associated with point G, the minimum point on SAC₁ with an initial amount of net worth, OA, it is expected that the farm-operator is able to save and

obtain credit to purchase AB amount of capital to produce a greater output. The additional investment changes the farm firm size to SAC2 and reduces the average costs of production. The farm-operator would operate at point I and lower his unit cost by EF assuming increasing returns to size exists. The SAC2 curve is assumed to be characteristic of the growth stage of the farm firm cycle. The lower unit cost found in this stage implies that it is more efficient than the initial stage. Throughout the growth process the farm-operator is able to choose, depending upon the availability of resources, different levels of operation.

Initially the farm-operator makes short-run plans for farm firm expansion which ultimately take him into a long-run growth plan. The long-run average cost (LAC) curve is a locus of points indicating the minimum long run cost of producing the output at different farm firm sizes. To remain competitive the farm-operator will determine the size of his farm firm by reference to the LAC curve and select the short-run size SAC which yields the least unit cost of production. The farm-operator would expand the size of his farm firm toward a capital investment of OD. Although this size is assumed to be the most economically efficient stage of production, it may not be so in the farmer-operator's perspective. During the latter part of the growth stage the farm-operator may develop other objectives besides maximizing

profits if indeed that was his/her initial objective.

Given the physical and biological forces which determine production possibilities and economic forces which determine enterprise profitability, the farm-operator must decide how to best allocate the resources under his control in order to attain the objectives of "the family farm firm." Often the farm-operators basic goal is to own the entire amount of capital comprising the farm firm.²⁹ Penrose states that "small businessmen frequently tend to identify themselves with their firm and to view it as their life's work, as a constructive

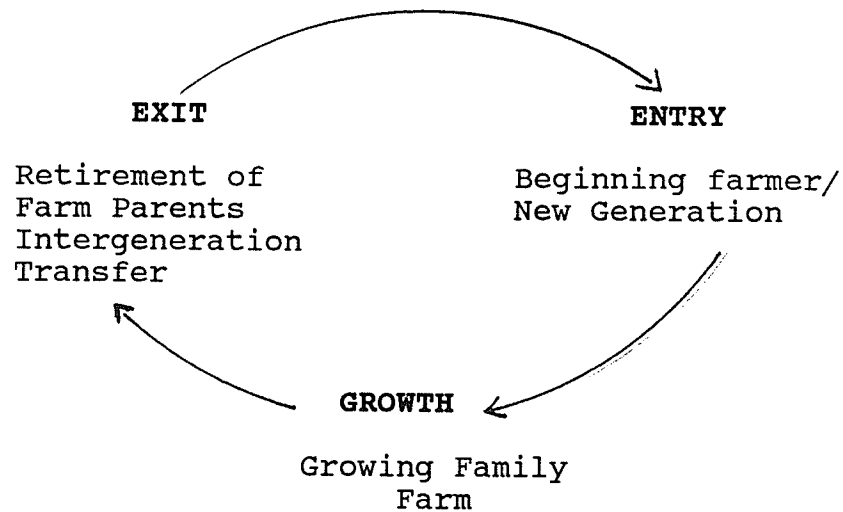


Figure 3.1: Family Farm Firm Cycle

²⁹ J. C. Gilson, "Agricultural Capital and Credit in Canada," unpublished manuscript, University of Manitoba, p. 61.

creation to which they can point with pride and which they can pass on in full strength to their children. To this end they often prefer to reinvest their profits in the firm rather than outside and to draw only moderately on profits for their personal consumption."³⁰ Penrose goes on to say that it is reasonable to "assume that in general the financial and investment decisions of firms are controlled by a desire to increase total long run profits."³¹ Given that profits are a condition for successful growth and that profits are sought

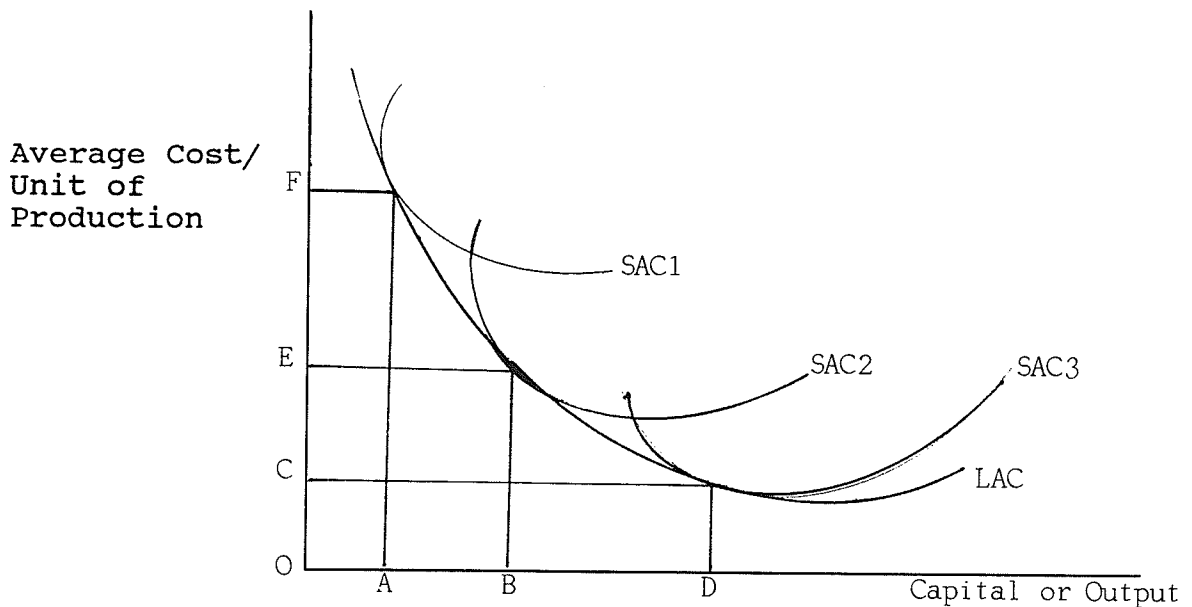


Figure 3.2
Relationship Between Average Cost of Production
and Capital Output

³⁰ Penrose, *op. cit.*, p. 13.

³¹ *Ibid.*, p. 29.

to reinvest in the firm rather than reimburse owners for the use of their capital and their risk taking, "then from the point of view of investment policy, growth and profits become equivalent as the criteria for the selection of investment programmes."³² If growth is synonymous with profits then the rational farm-operator will make production decisions that are conducive to maximizing profits. This is probably the most plausible reason for farm-operators owning such large capital investments by the time they reach the exit stage in the family farm firm cycle. During the growth process, as Penrose points out, farm-operators only draw upon moderate amounts of profits (disposable income) for personal consumption. Brake³³ notes that income tax is the only other significant cash withdrawal with prior claim over investment. Consequently, the consumption behaviour of the farm family, is the major factor constraining the rate of family farm firm growth.

The growth process of the family farm firm is depicted in Figure 3.3.

The farm-operator receives his gross income as a result of combining his capital goods (land, buildings, equipment,

³² Ibid., p. 30.

³³ J. R. Brake, "Firm Growth Models often Neglect Important Cash Withdrawals", American Journal of Agricultural Economics, Vol. 50, 1968, pp. 769-722.

etc.) with variable inputs (labour, seed, fertilizer, etc.) to produce economic output (livestock, livestock products and fieldcrops) that is sold in the market place. A portion of this income is used to pay for the inputs required in generating the gross income. Another portion of this income is used to pay income taxes. If the farm firm has obtained credit to purchase capital goods then the farm-operator would have to use a portion of the gross income for principal and interest payments.

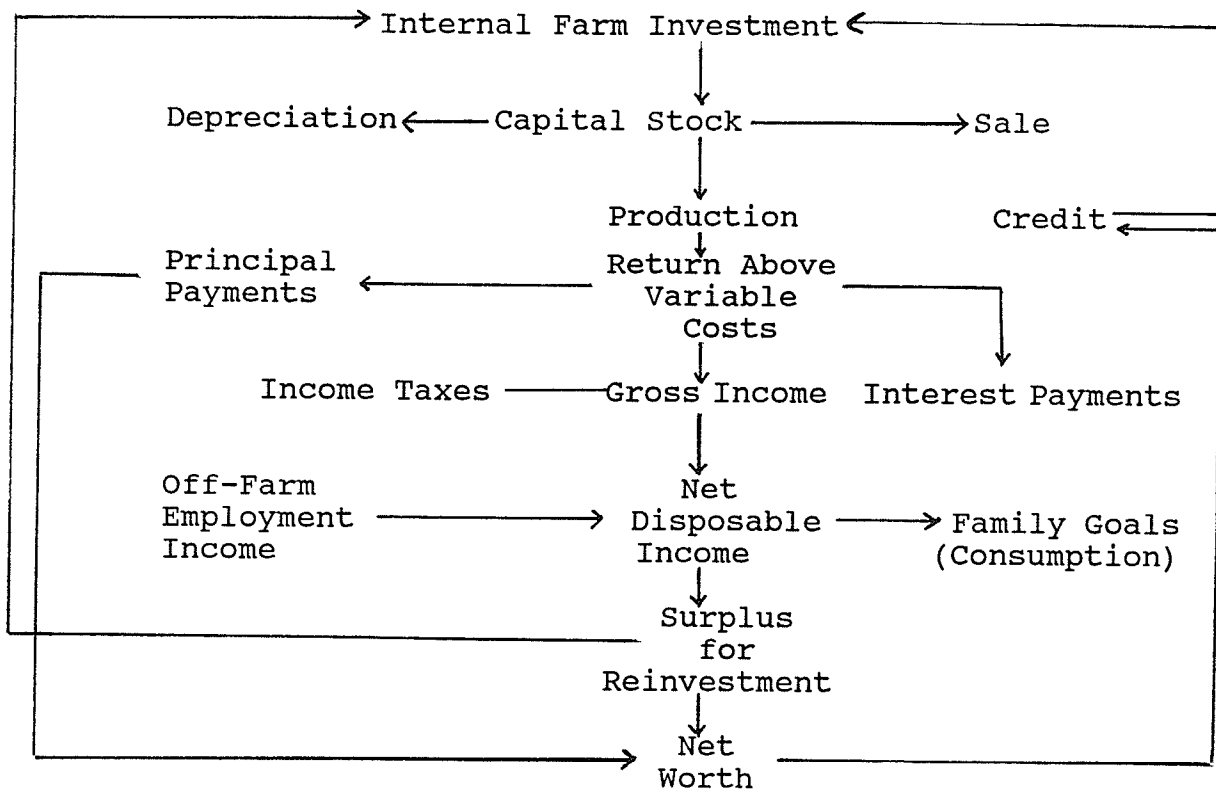


Figure 3.3 Family Farm Firm Growth Process

The disposable income has to be allocated between family consumption and reinvestment. One of the factors affecting the reinvestment of disposable income in the family farm firm is the consumption behaviour of the farm family. The consumption and investment processes involved in the farm firm are illustrated in Figure 3.4.

The curved line labelled C designates the quantity of goods consumed at various levels of disposable income.

Savings (or dissavings) is disposed income which is indicated by the difference between the straight line and the consumption curve. With an income of OA a farmer has a dissavings of HG. A farm-operator with a larger amount of income, OB, has IK amount of savings to reinvest in more capital. The additional capital base will generate a larger disposable income and greater savings.³⁴

Past decisions and the farm firms current ability to generate income determines the amount of capital that a farm-operator has to operate with. The allocation of disposable income between consumption and investment determines the rate of capital accumulation.

³⁴ Gilson, op. cit., p. 65.

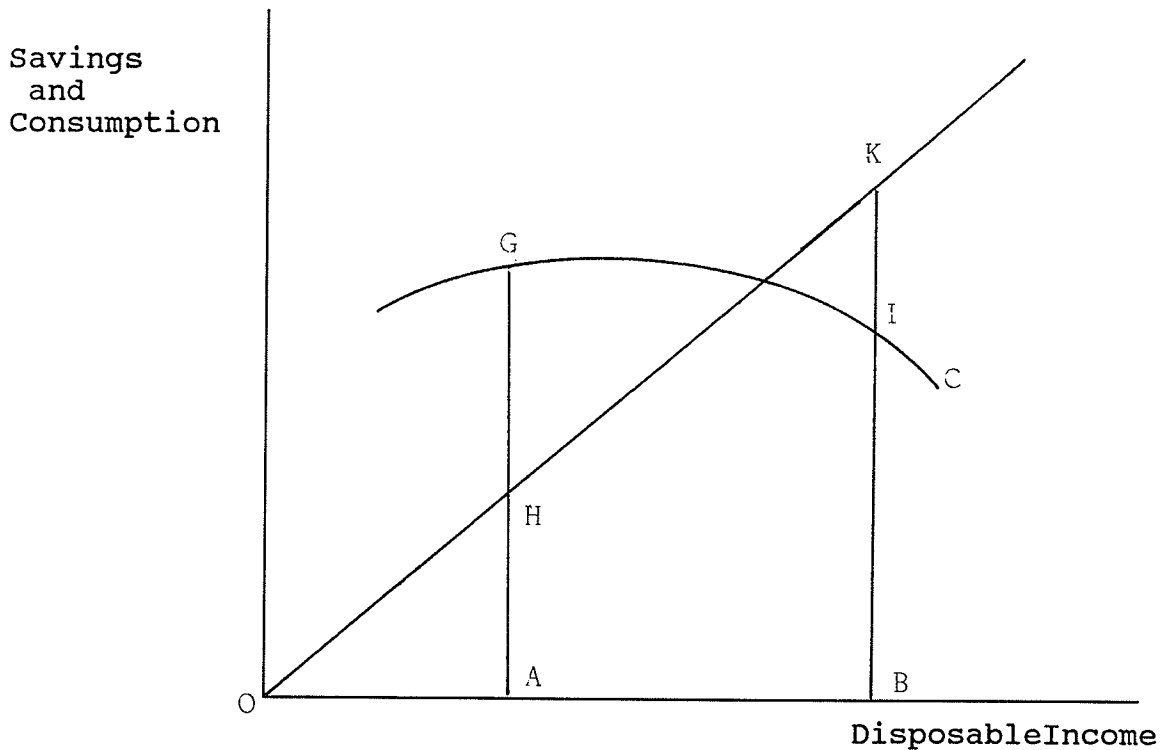


Figure 3.4: Consumption and Savings at Various Income Levels

J. M. Keynes in his text The General Theory of Employment, Interest and Money introduced the concept of the consumption function.³⁵ Keynes stated that the amount spent on consumption is a function of real income. The relationship between total disposable income and total consumption

³⁵ J. M. Keynes, The General Theory of Employment, Interest and Money, (London: MacMillan and Co., Ltd., 1970), p. 41.

expenditure was explained by the concept of average propensity to consume (APC). Usually the APC ratio is less than one (unity) indicating that people do not spend all their current income on current consumption thus leaving a portion of income to savings. A second and complementary concept introduced by Keynes was the marginal propensity to consume (MPC) which explains the change in consumption as a result of a change in income. Keynes stated that "... as income increases people tend to spend a decreasing percentage of income or conversely tend to save an increasing percentage of income."³⁶ The change in the level of savings per unit change in the level of net disposable income is called the marginal propensity to save (MPS).

$$MPC + MPS = 1$$

Mathematically, thus if one knows the value for either the MPC or the MPS then one can determine the other.

In addition to the size of the disposable income there is several other factors influencing consumption. Family size and the previous years consumption are thought to influence consumption. As the family size increases so must the consumption requirements in order to maintain the consumption level the family has enjoyed prior to the increase. Once a family has reached a consumption pattern they enjoy they will try to maintain that standard, for anything less, would be

³⁶ Loc., cit.

substandard. Thus, the previous years consumption behaviour will dictate the minimum standard of living for the current year.

Another factor assumed to influence consumption behaviour is wealth. Other things being equal, an individual with a large accumulated wealth will tend to spend a larger fraction of his income on consumption than would some less wealthy person.³⁷ The largest problem confronting the young entrant in the early stage of the farm firm cycle, is how to get started on an economic size of farm firm business with only a small amount of capital, i.e., wealth. Consequently, in the first stage of the farm firm, the new entrant has to allocate more income for reinvestment in the farm firm. As time passes by the entrant is able to accumulate capital thus the requirements for reinvestment decrease, and more income can be allocated for consumption expenditure.

Present financial liabilities also affect the current level of consumption. The outside opportunities to borrow decrease as the present liabilities increase which relates to the farm firm net-worth. The greater the farm firm networth the greater the collateral that can be used against an

³⁷ T. F. Dernburg and D. M. McGougall, Macroeconomics--The Measurement, Analysis and Control of Aggregate Economic Activity, (New York: McGraw Hill Book Company, 1972), p. 112.

additional loan. The increasing net-worth of the farm firm over time provides it greater opportunities for borrowing outside funds.

3.2 LIFE-CYCLE HYPOTHESIS

The life-cycle hypothesis is a post-Keynes development that is frequently used to explain individual consumption patterns.³⁸ The hypothesis forms a coherent whole theory that provides an understanding of the forces at play, in economic terms, in the relationship between savings and retirement. Ando and Modigliani³⁹ tendered this hypothesis of what happens over an individuals lifetime based on an extensive study of cross-section data of the relationship between income, savings and consumption.

The life-cycle hypothesis has significant implications for the savings rates of the three stages of the farm firm cycle. The farm firm cycle is generally characterized by dissaving in the entry and early growth stages and saving

³⁸ See for example, J. Cawdery and R. Prefontaine, The Recent Behaviour of the Personal Savings Rate in Canada", Department of Finance, April 1980, and J.P. Aubry and D. Fleurent, Simulation Analysis of a Model Based on the Life-Cycle Hypothesis, Technical Report #18, Bank of Canada, February 1980.

³⁹ A. Ando and F. Modigliani, "The "Life-Cycle" Hypothesis of Saving: Aggregate duplications and Tests", American Economic Review, Vol. 53, March 1963, pp. 55-84.

during the growth and exit stages. Dissaving is characteristic of the post exit stage. Changing management abilities and priorities during the farm firms life cycle creates fluctuations in its savings patterns. Figure 3.5, illustrating the hypothesis in a farm firm context, demonstrates that a farm firm will typically earn less and spend more income than it earns during the entry stage.

The area between the consumption line, C, and the income line, I, indicates dissaving or positive saving. During the growth stage the income curve increases to a point in excess of the consumption line and levels off in the exit stage. At the conclusion of the exit stage the income from employment stops abruptly.

The farm firm will dissave for a period of time in the growth stage to pay off debt incurred during the entry stage. It will begin to accumulate assets at an increasing rate during this period in the form of equity in the farm firm and off-farm investments. Savings are positive from some point in the growth stage to the conclusion of the exit stage. The retirement stage, like the entry stage, is a period of dissaving.

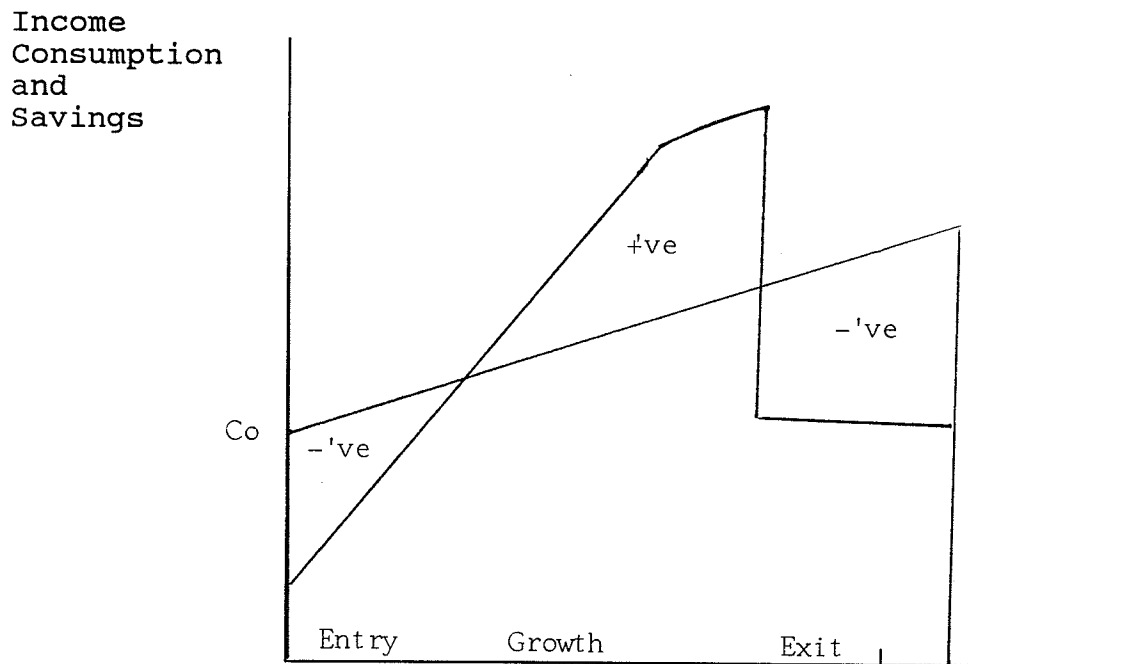


Figure 3.5: Life-Cycle Hypothesis

3.3 FARM FIRM HOUSEHOLD INTERRELATIONSHIPS

Heady⁴⁰ in 1952 provided a theoretical analysis of the relationship between family farm firm growth and consumption behaviour of the household. Heady's analysis offers a good explanation of the selection process the farm firm-household has to contend with. The analysis employs indifference curves and production possibility functions to determine the optimum allocation of income between consumption and investment.

Heady states that the farm firm and the household come into conflict primarily over the portions of annual disposable

⁴⁰ Heady, op. cit., pp. 417-424.

income to be allocated between current consumption and reinvestment in the farm firm as a basis for later income and consumption.

The farm family's desire for the utility of the discounted future returns from investment of current savings gains the satisfaction of current income spent on consumption will determine the allocation of income between capital accumulation and consumption. Time indifference curves as shown in Figure 2.6 depict the alternatives available to the farm household. These curves are probably a fair hypothesis of the way in which consumption goods of one time period substitute for those of another when income is at various levels, I1, I2 and I3.

The slope for each curve indicates the time preference and the amount of consumption foregone in a period to save for future capital accumulation. The indifference curve, T1I1, indicates a low income or consumption level for the curve. The curve is relatively flat suggesting that the farm family places a high value on present consumption, i.e., the APC is quite high, as compared to future capital accumulation or savings. To substitute for current sacrifices in consumption under curve T1I1 a large amount of future income is necessary to convince the farm family to do so. As one moves from T1I1 to higher income or consumption possibilities as suggested by

curves T2I2, T3I3 and T4I4 the slope of the indifference curves increase, indicating that the farm family places less value on current as compared to future income and consumption. In other words the MPS is quite high. The time indifference curves are drawn convex to the origin rather than linear to indicate that the farm family places a different discount or premium on each increment of savings.

In Figure 3.6, if a farm family consumes OC1 in period one they will purchase OK1 amount of capital in period two. If they should, however, only consume OC2 in period one and the net return is non-negative than OK2 will be invested in capital in period two.

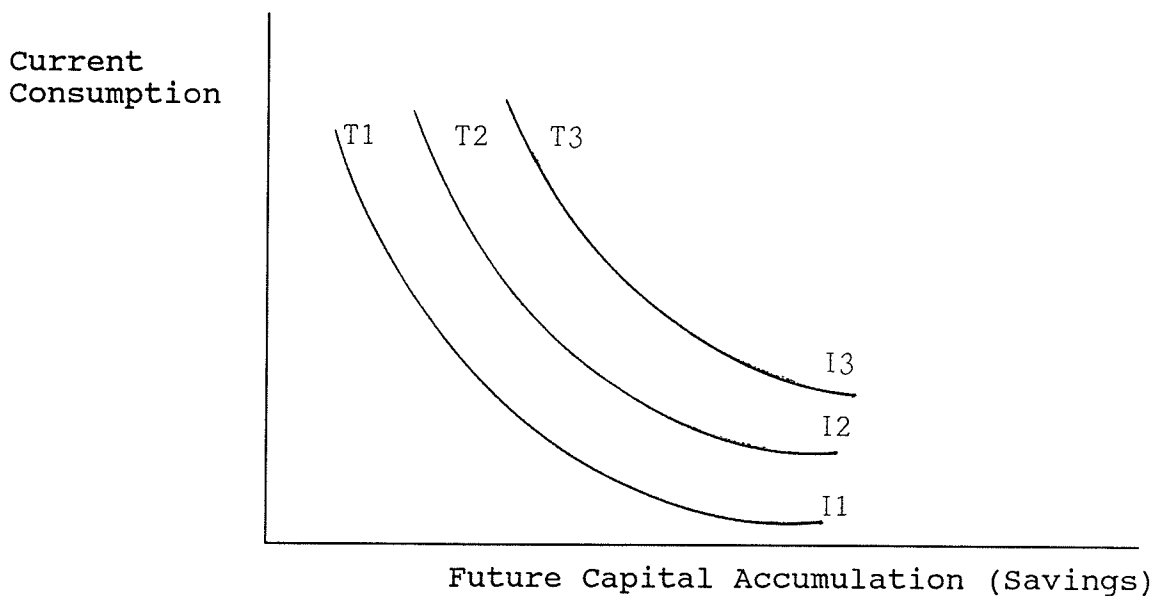


Figure 3.6: Time-Indifference Curves

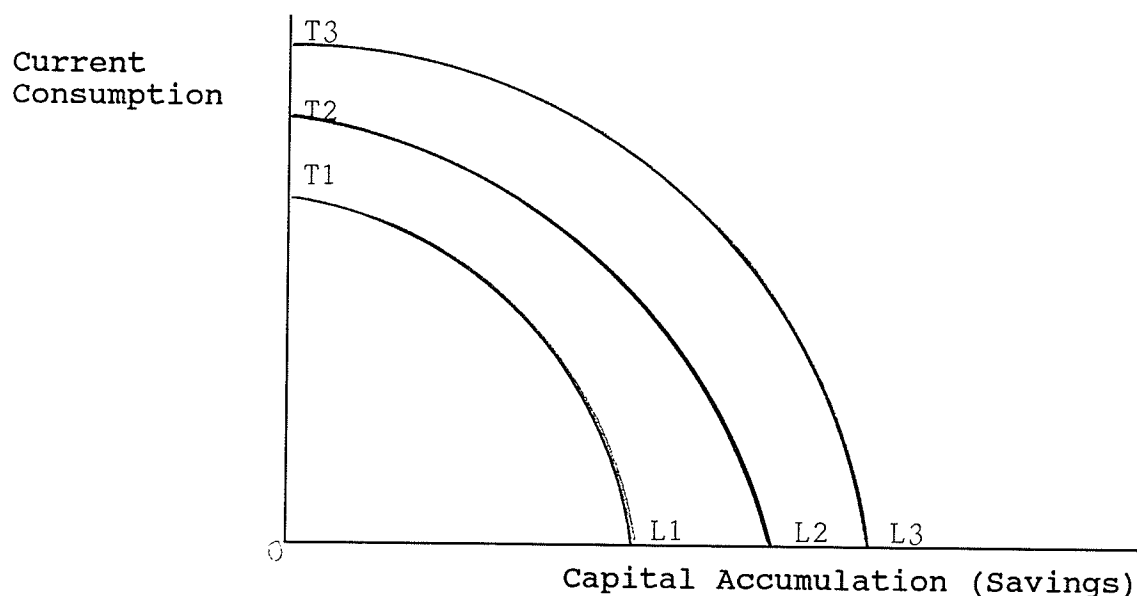


Figure 3.7: Time Production -- Possibility Curve

In order to generate future income for investment and consumption it is imperative that the farm-operator have well planned and realistic objectives. To coin a colloquial concept, a farm-operator must have a "blueprint" for farm firm growth. The time-production possibility curve, shown in Figure 3.7, is a form of "blueprint".

To receive a higher income in period two the farm family will invest in productive capital goods to generate an economic return. Each time-production possibility curve, L1, L2 and L3, indicates one production possibility to generate income for current consumption and a level of capital investment for the following period. Aware of his current

resources and available levels of technology the farm-operator must decide on the level of investment to undertake to produce future income.

Figure 3.8, which is a combination of Figures 3.6 and 3.7, illustrates the farm family's optimum choice for the allocation of production between consumption and capital accumulation at different income possibility levels.

At the lowest level of income I_1 , almost all the current income may be consumed as indicated by point A. At the highest level of income, indicated by C, savings account for a greater portion of current income indicating a higher MPS rather than to consume. This tendency for a declining propensity to consume with increasing income levels was borne out in an Iowa farm survey conducted by Heady in 1950.⁴¹

The optimum growth path over time for the given indifference curves and available production possibilities for the farm firm is indicated by line OK in Figure 3.8. To achieve the optimum growth path requires an efficient allocation of resources to produce the maximum income possible in concert with an intelligent growth strategy to allocate the income properly. A well planned growth strategy is essential for the decisions

⁴¹ Ibid., p. 425.

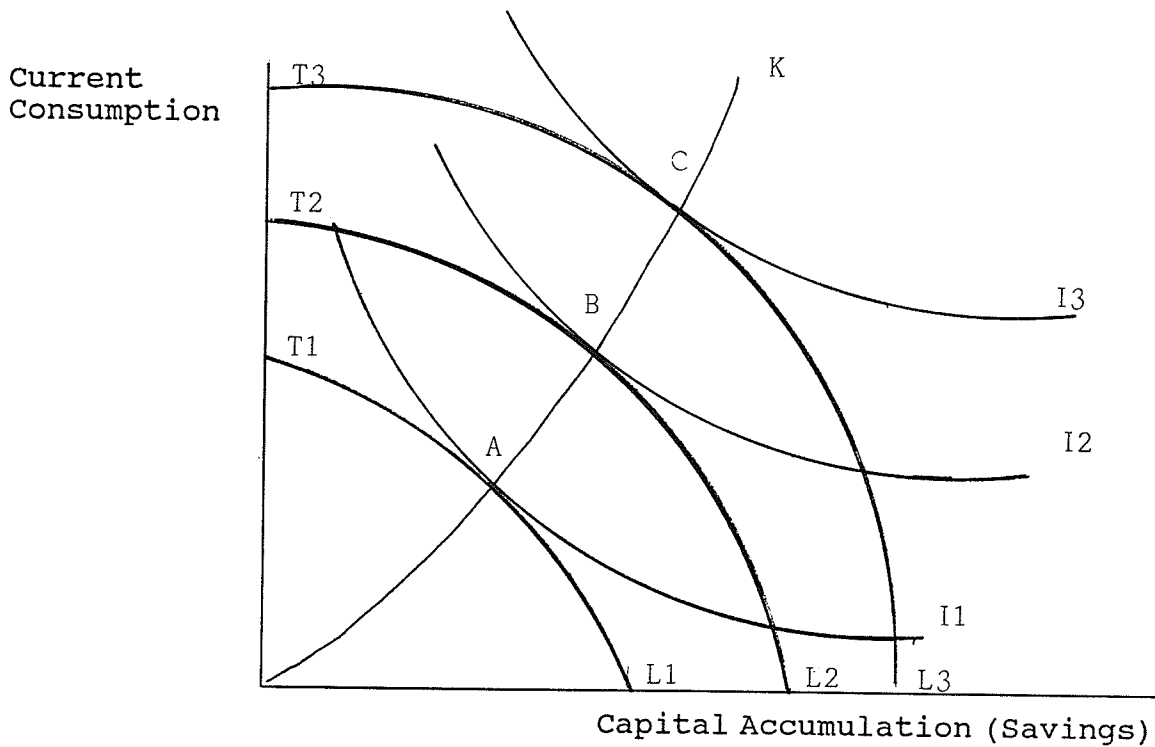


Figure 3.8: Optimum Path of Capital Accumulation

made in period one affect the alternatives available, thus the decisions to be made, in period two. Therefore to achieve the capital investment necessary to reach the minimum point on the long-run average cost curve in Figure 3.8, the family farm firm needs:

1. a well planned and realistic "blueprint" for growth, and
2. managerial abilities capable to implement the "blueprint" to its fullest potential.

3.4 DEBT LEVERAGING

Farm operators are called upon to make many decisions regarding the financial structure of their farm firm over the course of the family farm firm cycle.

One of the key decisions to be made is the proportion of debt and equity to use in financing the farm firm's operations. "The concept of leverage is encountered whenever use is made of funds entailing fixed costs (e.g. debt with fixed interest charges) and these funds are then employed in operations generating variable amounts of revenue."⁴²

During the 1970's, many farmers borrowed money during times of relatively low interest rates and relatively high inflation rates. Baker et al notes that the real interest (nominal rate less the rate of inflation) was actually negative during part of this period.⁴³ Those farm firms borrowing money during this time period were able to grow faster than those farm firms not borrowing money to grow. This concept of debt leveraging is best illustrated with a numerical example.

⁴² P. Lusztig and B. Schwab. Managerial Finance in a Canadian Setting, 2nd Edition, (Toronto: Butterworths, 1977). p.393.

⁴³ Baker et al., op cit., pg. 26.

Consider for instance a farm firm requiring an investment of \$50,000. With taxes at 50 percent, the investment can either be financed entirely through owners' equity or it can be financed by drawing on a \$25,000 loan at 10 percent interest and having an equity investment of \$25,000, only. The starting juncture of analysis will be net operating revenues before interest and taxes so that tax shield distortions do not cloud the issue. Assuming expected earnings before interest and taxes for the first year following the investment of \$10,000 the financial results for the two alternatives are as depicted in Table 3.1.

TABLE 3.1

DEBT LEVERAGING WITH STATIC EARNINGS

	<u>ALL EQUITY</u>	<u>50% DEBT (25,000 AT 10% INTEREST)</u>
Earnings before Interest and Taxes	\$10,000	\$10,000
Interest	---	2,500
	-----	-----
Taxable Earnings	\$10,000	\$ 7,500
Tax Payable	5,000	3,750
	-----	-----
Earnings Available to Farm firm	\$ 5,000	\$ 3,750
Percentage Return on Equity Investment	<u>\$ 5,000</u>	<u>\$ 3,750</u>
	\$50,000 = 10%	\$25,000 = 15%

The use of debt leveraging, as demonstrated in Table 3.1, has increased the expected return on equity from 10 percent to 15 percent. If the farm operator can raise funds through debt at an after tax interest cost of 5 percent, as in Table 3.1, and is able to invest these funds to yield a return which is above the cost, the difference, if any, accrues to him.

The problem associated with debt leveraging, however, is increased expected gains come at the expense of increased risk. In the same fashion that equity gains are magnified with favourable operating results, so are losses to equity

with operating results that have fallen short of projections.

Farm operators assuming debt in the 1970's when commodity prices were high were subject to a financial shock in the 1980's when the commodity prices were no higher, in current dollars, matched against higher input costs. Pursuing the above example in Table 3.1 the consequences of revenue fluctuations can be demonstrated. Assume the estimated earnings, before interest and taxes of \$10,000 could be as high as \$15,000 or as low as \$2,500. The consequences of such fluctuations are demonstrated in Table 3.2.

TABLE 3.2

DEBT LEVERAGING WITH DYNAMIC EARNINGS

	<u>ALL EQUITY</u>		<u>50% DEBT</u>	
Earnings before Interest and Taxes	\$15,000	\$2,500	\$15,000	\$2,500
Interest	-----	---	2,500	2,500
	-----	-----	-----	-----
Taxable Earnings	\$15,000	\$2,500	\$12,500	\$ 0
Tax Payable	7,500	1,250	6,250	0
	-----	-----	-----	-----
Earnings Available to Farm Firm	\$7,500	\$1,250	\$6,250	\$ 0
Percentage Return on Equity Investment	$\frac{\$75,000}{50,000}$	$\frac{\$ 1,250}{50,000}$	$\frac{\$ 6,250}{\$25,000}$	$\frac{\$ 0}{\$25,000}$
	= 15%	= 2.5%	= 25%	= 0%

As demonstrated in Table 3.2 variations in operating revenues will cause variations in equity returns which are amplified through debt leveraging. Variations in operating revenues are an inherent characteristic of agricultural production. These variations are referred to as the cash flow risk of the farm firm.

Ashmead notes that the rate of debt financing in the 1970's was unprecedented in the history of Canadian

agriculture.⁴⁴ This activity was a result of low real interest costs vis-a-vis high inflation rates and commodity prices. Farm operators in the 1970's were basing their financing decisions "based primarily on inflationary considerations and on balance sheet criteria such as debt-to-asset and equity ratios."⁴⁵ Balance sheet risk is determined by the analysis of the farm firm net worth or net asset position. Conventional wisdom suggests that the greater the level of equity in the farm firm the lower the level of balance sheet risk. As Baker et al point out, balance sheet risk does not address the problem of cash flow risk.⁴⁶ This concept was demonstrated during the 1980's when farmers with equity levels thought to be secure were required to renegotiate mortgages at high interest rates and their farms subsequently failed due to reduced cash flows.

3.5 SUMMARY

"Reviewing the development of firm growth research helps to trace the interactions between perceptions of emerging real world problems, the development and applications of theory for properly conceptualizing problems, and the development of

⁴⁴ R. Ashmead, "Emerging Roles in Financing Agriculture," Canadian Journal of Agricultural Economics., Vol. 34, 1987, p. 170.

⁴⁵ Ashmead, op. cit., p. 170.

⁴⁶ Baker et. al, op. cit., p. 256.

appropriate tools for quantitatively modelling the firm's decision environment, specifying its decision process and testing optional growth strategies."⁴⁷ Reviewing the farm firm growth process requires more than an analysis of the expected profit levels of adding resources to the farm firm. The development of the aforementioned factors have been applied, in this study, to the problem of intergenerational farm transfers.

⁴⁷ C. B. Baker, et. al., op. cit., p. 15.

CHAPTER IV

THE FARM FIRM RRSP INVESTMENT MODEL

The primary purpose of the analytical model is to analyze RRSP investments in a static farm firm environment. The model is designed to determine the profitability, liquidity, risk and the likelihood of diminished farm firm growth for alternative RRSP investment decisions vis-a-vis the historic farm firm which serves as the benchmark. The benchmark embodies the actual production, marketing and financial decisions of the farm-operator thus the consequences of alternative RRSP investment decisions may be measured by direct comparison to the benchmark. Positive and/or negative deviations from the benchmark provide an indication of the merits of a specific RRSP investment program decision.

4.1 SCOPE OF THE STUDY

The research in this study was applied to a viable family farm firm located in south central Manitoba. The case-study farm firm was selected for analysis because of the availability of detailed data, from the farm firms records, maintained by the farm operator from January 1957 to December 1982. These data consist of quantitative information concerning capital investment, household expenditures, resource use and production. Consistent data were available

for each year from 1957 to 1982 tracing the farm firm through the first two stages of the farm firm cycle into the exit stage.

The historic data provide a basis for projecting the farms viability during the 1983-1990 time period when the new entrant assumes ownership and management of the farm firm. The years 1983-1990 inclusive, witnessed some of the best, worst and average crops in the history of Manitoba agriculture. Three of the years, 1983, 1984 and 1985, proved to be record breaking years for operating expenses. In absolute dollars, total 1983 farm operating and depreciation expenses were the fourth highest on record. In nominal dollars, total 1984 operating and depreciation expenses were the second highest on record, eclipsed only by 1985's operating and depreciation expenses. The major expense items were interest costs, fuel, fertilizers, feed and pesticides. Clearly, the years under study would be sufficient to challenge the merit and mettle of any intergenerational transfer scheme.

No attempt is made to make this farm firm a benchmark or representative situation for the farm firms within its crop district or Manitoba in general. One may argue that a representative-type synthesized farm firm would provide a more realistic analysis on the basis that simulated results are in

effect compared to an average of actual results rather than one observed set of results. The counter argument, favoured by this research, possesses merit as well. The choice of only one existing farm firm as a case-study firm was made for the following reasons:

1. The use of existing farm firm unit that is actually operating rather than a hypothetical farm firm precludes the possibility of situations occurring that would not be found on an operating farm unit.
2. The farm firm selected has a large capital investment in farms assets. The large capital base presents the initial barrier to entry for the farm heir entering agriculture. The farm family is composed of the farm parents and four children, one of whom is planning to take over the family farm firm.
3. The farm-operator has been a member of a local District Farm Business Association since its inception, therefore consistent farm records are available.

4.2. MODEL DESCRIPTION

This chapter outlines the basic structure of the model based on the farm growth framework developed in the previous chapter.

The Interactive Financial Planning System (IFPS) was the computerized simulation system used in this study. IFPS is a specific English-like modelling language used to specify the relationships that constitute this study's model. IFPS is a product of EXECUCOM Systems Corporation, Austin, Texas. This system, like many other managerial tools, is oriented around a spreadsheet. IFPS is non procedural, for example, rather than starting the modelling with the detail, one can start at the top, building the model down from the very general (a definition of internal farm investment) to the specific detail of cost elements.

Figure 4.1 illustrates the basic structure of the model. The relationships depicted in Figure 4.1 are programmed into an interactive computer model (Appendix A). This model does not solve for the optimal RRSP investment scenario.

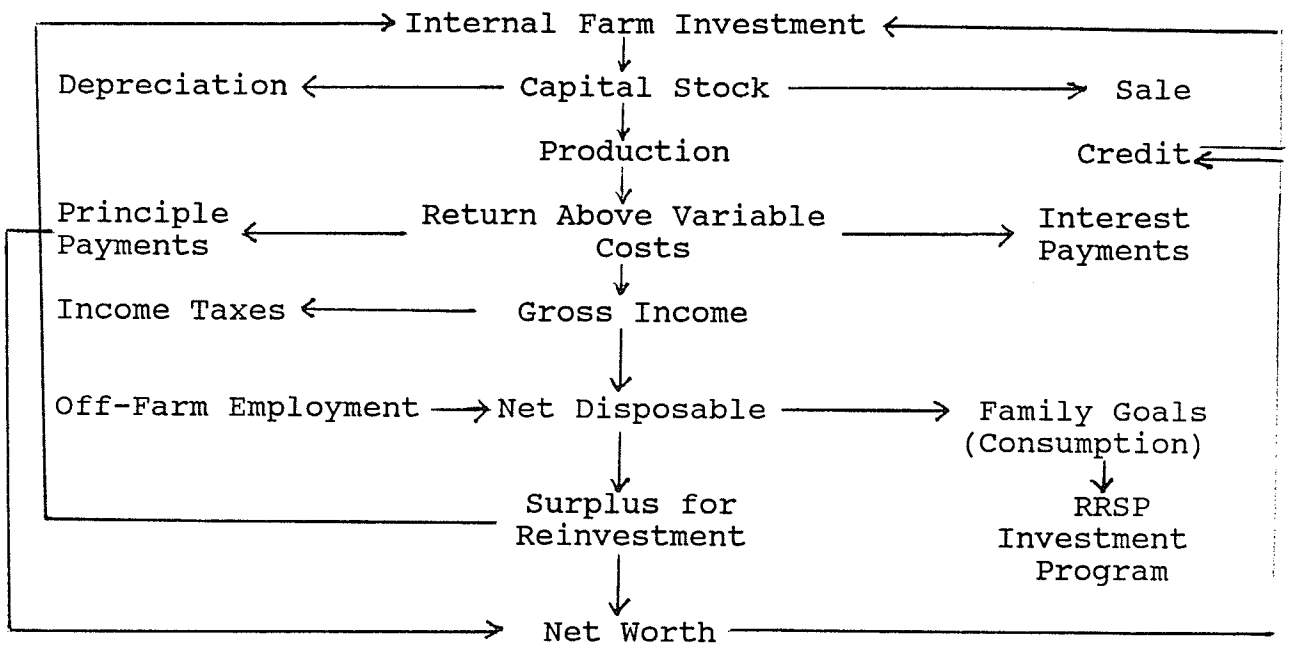


FIGURE 4.1 FARM FIRM GROWTH FRAMEWORK

4.2.1 Farm firm Growth Components

Section I of the model summarizes the farm operating receipts by year, followed by a summary of operating expenses. A summary of all capital transactions is listed in Section II, indicating capital sales and capital expenditures.

Section III covers all the non farm firm business transactions. Included in this section are receipts such as off-farm employment income, investment income and loans

received to make RRSP deposits. The expense side of the non farm firm business transactions includes items such as income tax, household expenditures, personal expenditures, life insurance, personal portion of the farm automobile, RRSP deposits, RRSP loan payments and other off-farm investments. All principle payments on farm firm debt, excluding debt incurred for RRSP investments, are recorded in Section IV of the model.

The core of the model is found in Section V which presents the RRSP investment program. The annual RRSP contribution extracted from the farm surplus is accomplished in one of three ways. The first method is based on the individuals eligible contribution limit for the year as specified by the Income Tax Act.⁶⁰ The contribution limit for an individual is the lesser of a specified dollar amount or a percentage of earned income. Table 4.1 displays the allowable contribution limits for the time period under examination, 1957-1982.

RRSPs were selected as the investment media for the purposes of this study because of their tax shelter features and because they are composed of professionally managed,

⁶⁰ Income Tax Act, section 146.

diversified investment portfolios.⁶¹ There is a vast array of different investment programmes available for RRSPs. The more common funds include equity funds, mortgage funds, fixed income funds and, guaranteed funds. Each fund has different risks associated with the preservation of capital and return. The large number of funds available and the equally large number of institutions offering RRSPs gives the farm parents the opportunity to compare the risks associated with the preservation of capital and return. Finally, RRSPs were selected as the investment media for this study because they do not require extensive analysis prior to purchase and close supervision thereafter as would an equivalent direct investment program.⁶²

A RRSP contribution was made if the farm firm's surplus was greater than or equal to \$100.00 as of December 31 of the year. The operating assumption for all of the RRSP options is

⁶¹ The reader should refer to Appendix B for a discussion on portfolio selection theory.

⁶² The reader should refer to Appendix C for a discussion on applied portfolio selection theory.

TABLE 4.1

RRSP Contribution Limits

Years	Pension Plan Members	Others	Comments
1957-1964	\$1500	\$2500	Not to exceed 10% of earned income
1965-1971	\$1500	\$2500	Not to exceed 20% of earned income
1972-1975	\$2500	\$4000	Not to exceed 20% of earned income
1976-1982	\$3500	\$5500	Not to exceed 20% of earned income

Source: W.G. Leonard, Canadian Income Tax for Businessmen and Accountants, (Don Mills: CCH Canadian Limited, 1979) p. 170.

that \$20.00, 20 percent of \$100.00, is the minimum amount that can be contributed into an RRSP fund. An additional assumption made is that there is no administrative costs in opening or maintaining a RRSP fund.⁶³

The second method requires a fixed claim to the farm firm's surplus. The annual claim is the maximum eligible dollar contribution as exhibited in Table 4.1. This method of contribution is not a valid contribution method under the Income Tax Act. This method was examined, however, in order to determine the effect it would have on the farm firm over the study period. It was examined to determine if there is farm policy implications for retiring farm operators.

If the farm firm's surplus was less than the first contribution amount a loan was made for the difference between the surplus and the required contribution amount plus an additional \$100. The additional \$100 was acquired so that the farm firm would have cash on hand. RRSP loans were amortized over a 5 year period at an interest rate reflecting the farm firm's cost of capital. RRSP loan receipts, contributions and loan payments appear in Section III of the model.

⁶³ Many mutual funds have acquisition fees of up to 97% of the amount invested. The fees usually operate on a sliding scale, the more one invests the less that is charged. They are often negotiable with the occasional fund having no acquisition fee but a charge on redemption.

The RRSP investments employed in the model include 2 growth funds, 3 equity funds and 3 fixed income funds. The funds were selected for their continuity over the study period. There was no attempt to optimize the allocation of contributions among the various funds for any given year. In order to optimize RRSP contributions one must specify an objective function. The classic objective function in economics is utility. Spence⁶⁴ points out that in real world planning situations there is an inability to measure an individuals utility function. This inability requires one to make some naive assumptions about the nature of an individuals utility function. One assumption regarding utility is that by maximizing income or equity one is maximizing utility. "In models of firm growth and allocation of resources among competing enterprises in commercial agriculture this assumption has served the profession quite well; yet in planning for the management of resources in retirement... the assumption of profit maximizing behaviour becomes increasingly unrealistic."⁶⁵ Brucker, Baker and Erickson's modified Fisher type analysis was found to be lacking in its ability to account for differences in risk and variability of returns among alternative investments.⁶⁶ Their approach, predicted

⁶⁴ Spence, op. cit., p. 15.

⁶⁵ loc. cit.

⁶⁶ Irving Fisher pioneered the theory of optimal allocations of investments among physical capital market securities

on the assumption of profit maximizing behaviour, was not able to evaluate the economic consequences of strategies which were not profit maximizing. Rather than making a single analysis to define the optimal investment the procedure used in this model focuses on evaluating the outcome of selected RRSP investments and their effects on the farm firm.

4.2.2. Financial Analysis

Growth patterns are the major source of structural changes in the farm firm. Changes in the farm firm's financial structure are of interest in their own right. These changes flag aggregate welfare effects with farm firm management relevance.

To facilitate the analysis of the farm firm two financial management tools are employed; a statement of financial positions and a statement of net income. These two statements are used to indicate the farm firm's growth and to highlight the basic changes that occur over time.

and cash given the current and future needs and desires of an individual to consume wealth. Fisher's analysis centered on the rates of return to alternative investments as depicted on an opportunity locus. The drawback to using this approach in analyzing investments is the difficulty in quantifying and measuring utility. Brucher et al. used an arbitrary level of current consumption to avoid the measurement of utility. However, this modification of the Fisher type analysis ignores the element of risk.

4.2.3 Ratio Analysis

The information conveyed by financial statements is of marginal value except for obtaining a broad and general overview of the farm firm. The numbers within the financial statements become more meaningful when used in a relationship with other financial statement numbers. Relationships between different accounts in the financial statements can be expressed in the form of ratios. Ratios are useful tools of financial statement analysis because they conveniently summarize data in a form that is more easily understood, interpreted and compared. Ratios permit contrasts to be made over time to discern trends in a farm firm's development and growth.

Ratio analysis represents one of the more basic approaches to financial analysis. This statement is borne out by the fact there is an almost complete absence of underlying theory. The liquidity, solvency and profitability ratios used in this study are briefly discussed.

Liquidity ratios, in general, highlight the farm firms short term ability to meet financial obligations. The Current Ratio, a liquidity ratio, indicates whether current assets are adequate to meet current indebtedness. Simply stated, this ratio reflects the relationship between "near cash" on the one

side and obligations which are currently maturing on the other.

The Intermediate Ratio measures the ratio of intermediate term debts to intermediate assets. Intermediate term debts are identified as those debts used to finance depreciable assets whose economic life is less than 10 years.

The Current plus Intermediate Ratio is a useful ratio for farm firms. This ratio combines the current and intermediate assets and liabilities in a way that provides information on loan security. It indicates whether the assets are sufficient to meet the current and intermediate indebtedness.

Solvency ratios deal with the farm firm's ability to meet long run claims on the farm firm assets. An important solvency ratio used almost universally is the ratio of total debt to equity; the leverage ratio. This ratio measures the farm firm's total obligations to creditors as a percent of the capital provided by the farm operators.

The heart of farm firm growth is the acquisition and control of resources that generate returns in excess of their cost and thus add to the value of the farm firm. As noted in Figure 4.1 reinvested savings also add to wealth and increase future income generating capacity. The farm operator is

concerned with acquiring capital to finance growth at low cost with due regard to liquidity and risk. The farm firm's liabilities are broadly comprised of debt and equity claims on its capital assets. A farm firm, in theory, desires the combination of debt and equity, as reflected by the aforementioned leverage ratio, that minimizes its average cost of capital. Farm firms, traditionally, have relied on credit, retained earnings and leasing to finance growth.

In this study the identification of key growth variables, that express the farm firms rate of growth of equity, were taken from balance sheet and income statement accounting information. The growth rate of the farm firm is determined by the annual percentage in equity. It follows, then, that growth rates can be adjusted by changes in rates of return, costs of debt capital, rates of consumption and taxation.

Various types of profit ratios have been developed to measure profitability. Through the use of these ratios the analyst attempts to gain insights into the managerial efficiency and operations of the farm firm. The Rate of Return on Assets and the Rate of Equity ratios are used as overall indexes of profitability.

Comparing the simulated farm firm's performance and financial position with the benchmark indicate the merits of

the RRSP investments as postulated in this study. The benchmark acts as the relevant norm from which to measure deviations in the liquidity, solvency and profitability ratios.

4.2.4 Tax Considerations

The RRSP funds, which comprise the farm parents contributions as well as the income accumulated on these funds, are only taxable when they are withdrawn from the plan. Although the tax liability must be faced in the future it is important to be aware of the advantages of postponing the tax liability. One of the principal advantages of a RRSP investment is that the farm parents can invest funds which otherwise would have formed the current tax liability. These funds can be employed to earn additional amounts which may be used as a source of retirement income and as a source of funds to pay the tax liability on any withdrawn RRSP proceeds.

The tax savings for the RRSP investment programs are calculated by determining the tax payable before and after an RRSP investment for each year there is taxable income. The difference between the before and after RRSP investment is the tax rebate or savings through registration.

4.3. POST RETIREMENT OPTIONS

The standard of living of the retired farm couple is determined by many factors. The factors that determine the standard of living in retirement are linked with the characteristics of the farm parents and their working life during the first two stages of the farm life cycle. Other factors, however, such as the rate of inflation, are tied to the Canadian economic and legal environment.

Financial security at retirement will be of great concern for the farm parents. Financial security to them will be having sufficient after-tax income flowing into their household each month to pay for the goods and services they consume.

There are many different options available to the farm parents at retirement. This study examines 4 options that permit the retiring farm couple to continue investing into their RRSP fund until age 70.⁶⁷ Because the children are grown up this will be a period of time when personal tax exemptions are minimal. The farm parents in order to maximize their after tax income will deposit the legal maximum

⁶⁷ The four options were based on the options developed by J.C. Gilson, L.B. Baker and J. Alty, "Financing Farm Transfers During the Decade of the 1980's". Winnipeg: Western Farm Management Extension Committee Meeting, Oct. 16-17, 1980.

contribution into their RRSP fund.

The practice in computing the 4 hypothetical retirement options was to operate with a standard set of assumptions. The individual options were then augmented by additional option specific assumptions. The general operating assumptions may be summarized as follows:

1. that the retiring parents are both age 55 and both expect to live until age 85.
2. that the parents have four children; one child will take over the farm; the other three children have careers in non-farm occupations.
3. that the parents would like to continue contributing into their RRSP fund until age 70.
4. that the farm parents will use their liquid assets, excluding the RRSP fund, to maintain their current standard of living should it diminish during the post-exit stage.

Four options with respect to the allocation of the farm parents estate will be examined of which:

1. one part of the farm estate will be used to provide retirement income for the farm parents.
2. one part will be distributed to the farm-heir.

3. the remaining part, if any, will be distributed to the three non-farm heirs.

4.3.1 Option A

Under Option A the following specific assumptions are made:

1. that the farm parents desire the equivalent of an annuity yielding a fixed annual income of \$27,500.00 so that they may make a maximum RRSP contribution annually.
2. that the farm parents will sell to the farm heir the inventory, machinery, equipment and land at a bookvalue of \$393,838.
3. Under Option A the non farm heirs will receive no contributions from the farm estate.

4.3.2 Option B

Under Option B the following specific assumptions are made:

1. that the farm parents desire the equivalent of an annuity yielding a fixed annual income of \$15,000.00.
2. that the farm parents will sell to the farm heir the inventory, machinery and equipment at a bookvalue of \$219,597.

3. that the farm parents will gift the farm land to the farm heir at their retirement.
4. that the non-farm heirs will receive no contribution from the farm estate.

4.3.3 Option C

Under Option C the following specific assumptions are made:

1. The farm parents would receive an annuity paying \$27,500.00 per year for 15 years.
2. that the farm parents will sell to the farm heir the inventory, machinery, equipment and land at a book value of \$393,838.
3. the farm parents will distribute to the 3 non-farm heirs the proceeds from the sale of the inventory, machinery and equipment.

4.3.4 Option D

The specific assumptions for Option D are as follows:

1. the farm parents would receive an annuity paying \$27,500.00 per year for 15 years.
2. the three non-farm heirs would receive their "equal shares" as prescribed:

- a) 1/2 of each of their shares at the retirement of the farm parents.
 - b) the remaining 1/2 of each of their shares when the farm parents reach age 80.
3. the farm heir would receive his share at the time of the farm parents retirement.

4.4 FINANCIAL RISK ANALYSIS OF NEW ENTRANT

A critical component of the study reviews the transition process of the new entrant. The financial risk of the farm retirement options are examined in terms of their impact on the farm firm's ongoing viability. The Lotus 1-2-3 spreadsheet computer modelling system was employed to determine the financial risk.

The Debt Service Ratio is used in this study as a financial risk indicator. The ratio, as defined in Chapter 3,

$$\text{Debt Service Ratio} = \frac{(\text{Cash Receipts} - \text{Cash Operating Costs}) + \text{Off Farm Income} - \text{Living Expense}}{\text{Interest and Principal Payments}}$$

which compares the net residual available for debt servicing to the total debt servicing costs. Ratio numbers greater than 1 indicate there is sufficient funding to cover the farm firm's current debt obligations. Ratio numbers between 0 and 1 indicate the farm firm has funds to cover same, but not all,

of the current obligations. A farm firm that has a value of 0 is able to cover operating expenses and living expenses, only. Ratio values of less than 0 indicate the farm firm is not able to meet its debt obligations nor fully cover operating expenses and living costs.

Farm prices are based on the historical price series from 1983 to 1990, inclusive (Table 4.2). Crop yields for 1983 to 1990, inclusive, are based on Manitoba Crop Insurance Corporation records for the township the case farm is situated in. The new entrants crop selection is a function of the historical pattern of the previous generations crop rotation for 1978 - 1982. The costs of production for each crop selected were taken from the Manitoba Department of Agriculture "Crop Planning Guides" for the years under observation. The crop budgets were adjusted for the appropriate land rental costs developed in the retirement options in chapter 5.

4.5 POST RETIREMENT RRSP CONTRIBUTIONS

The growth of the RRSP funds after the farm parents withdraw from the farm firm is of great importance to them. The effects of inflation can erode their income security in a relatively short period of time. For example, an 8 percent inflation rate will reduce a given dollar amount to 46 percent

TABLE 4.2 CROP PRODUCTION DATA

YIELD PER ACRE (1)		1983	1984	1985	1986	1987	1988	1989	1990
CROP									
Wheat	37.9	45.7	52.9	40.1	41.3	12.1	35.3	39.7	
Barley	59.0	69.8	75.8	68.2	58.3	16.2	58.0	59.7	
Canola	27.0	27.1	32.2	28.9	24.4	13.8	24.0	23.2	
Peas	25.0	31.5	39.6	30.7	34.5	18.3	22.7	30.0	
Flax	19.4	21.8	20.9	27.2	21.4	7.4	11.9	20.8	

PRICE PER BU. (2)		1983	1984	1985	1986	1987	1988	1989	1990
CROP									
Wheat	4.74	4.68	3.95	3.05	2.69	4.71	4.06	2.97	
Barley	2.61	2.63	2.1	1.69	1.55	2.8	2.51	1.96	
Canola	8.69	7.96	5.96	4.47	5.6	6.78	6.01	5.78	
Peas	5.98	6.18	5.75	5.17	5.28	5.85	5.09	4.84	
Flax	8.2	8.05	6.73	4.39	5	9.2	8.41	5.72	

OPERATING COSTS (3)		1983	1984	1985	1986	1987	1988	1989	1990
CROP									
Wheat	85.9	83.9	82.5	87.9	79.5	82.7	88.8	88.4	
Barley	82.7	79.4	78.7	83.6	75.75	79.4	84.1	82.7	
Canola	79.7	83.1	88.4	90.1	78.5	81.1	87	90.3	
Peas	89.1	88.3	93.96	96.1	88	94.8	106.7	112.8	
Flax	72.3	71.9	71.6	80.9	66.6	70.1	77.6	79.5	

(1) Manitoba Crop Insurance Corporation

(2) Manitoba Agriculture Yearbooks for 1983-1990 inclusive

(3) Manitoba Agriculture "Crop Planning Guides" for 1983 - 1990, inclusive

of its original value in ten years and to 21 percent in twenty years. Continued investment into their RRSP fund until age 70 would provide some income protection because of its use of before tax dollars.

This section of the study looks at the performance of the RRSP contributions over the 15 year period between ages 55 and 70.⁶⁸ It should be noted that no allowance has been made for the decrease in purchasing power the accumulated funds can be expected to have when received in the future.

The dramatic growth of before-tax dollars in an RRSP as compared to the growth of after tax dollars can be attributed to two factors:

1. Funds which would have otherwise gone towards the farm

⁶⁸ At age 70 the farm-parents may place their RRSP funds into a Registered Retirement Income Fund (RRIF). A RRIF is one of the alternatives under which they may choose to receive retirement income from the funds accumulated in their RRSP. A RRIF provides the farm parents with a system of withdrawing funds as a retirement income based upon a specific fraction of the market value of the plan each year. The income accumulating on the funds placed in a RRIF is not subject to tax if certain conditions are satisfied. All amounts received as payments out of a RRIF are fully taxable in the year received. Where the taxpayer is 65 years of age or older, amounts received from a RRIF qualify for the \$1000 pension income exemption. Performance is computed with the aid of a compound interest table. The table provides the annuity factor which is the amount of one dollar per annum compounded annually payable at the end of each year accumulated with interest at a specific rate. The specific rates examined in this study are 8, 10 and 12 per cent for a 15 year period.

parents current tax liability are earning income for them within the RRSP, and,

2. The RRSP is not subject to tax on the income or capital gains realized from its investments.

In this study the magnitude of growth is analyzed for annual rates of return of 8 percent, 10 percent and 12 percent.

CHAPTER V

EMPIRICAL RESULTS AND ANALYSIS

This chapter examines the empirical results for the model and RRSP options specified in the previous chapter. The presentation is separated into three sections. A comparison of the benchmark and simulated farm firms during the three stages of the farm firm life cycle is presented in the first section. The second section examines the hypothesized retirement options. The post exit growth of the RRSP funds is examined in the third section.

5.1 FARM ANALYSIS

In this section, the financial ratio and tax analyses are presented. The analysis consists of comparing the benchmark to the simulated farm firms using the two RRSP investment scenarios.

5.1.1 Balance Sheet

The benchmark farm firm's growth strategies have influenced the portfolio position of the farm firm. The results of the RRSP investment program over the life of the farm firm are displayed, at five year intervals, in Tables 5.1 and 5.2. Column A represents the benchmark while columns B and C represent the flexible and fixed RRSP investment programs, respectively.

Table 5.1 shows the actual values of the assets and equities on the balance sheets of the farm firm. The composition of the current assets and the current liabilities are presented to display the impact of the RRSP investment program. Table 5.2 shows the relative importance of the asset and equity composition of the three situations. In each situation the debt structure never exceeds one-third of the farm firm's total assets. Expressed in another way, owners equity is never less than 69 percent of the farm firm's total assets. The largest debt incidence is in the fixed RRSP investment program where loans are incurred in order to make the fixed RRSP investment contribution. The relative importance, however, of the RRSP debt is extremely small being 5 percent or less of the total assets.

TABLE 5.1

COMPARATIVE BALANCE SHEET PRESENTATION OF BENCHMARK FARM AND RRSP INVESTMENT PROGRAMS

	1962			1967			1972			1977			1982		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
<u>ASSETS</u>															
Current	\$10,661	11,356	25,577	34,143	36,975	71,043	56,651	64,469	114,376	229,465	272,003	320,933	340,685	383,036	484,901
Intermediate	18,077	18,077	18,077	35,671	35,671	35,671	26,528	26,528	26,528	118,269	118,269	118,269	122,914	122,914	122,914
Long Term	42,403	42,403	42,403	78,097	78,097	78,097	100,410	100,410	100,410	136,959	136,959	136,959	172,241	172,241	172,241
	\$71,141	71,836	86,057	147,911	150,743	184,811	183,589	191,397	241,314	484,693	527,231	576,162	635,840	678,191	779,056
<u>LIABILITIES & EQUITY</u>															
Current	\$ --	--	4,265	--	--	3,117	--	--	2,795	4,000	4,000	4,000	7,096	7,096	7,096
Intermediate	5,400	5,400	5,400	12,820	12,820	12,820	1,500	1,500	1,500	28,500	28,500	28,500	29,000	29,000	29,000
Long Term	16,562	16,562	16,562	30,471	30,471	30,471	27,040	27,040	27,040	24,380	24,380	24,380	--	--	--
	\$21,962	21,962	26,227	43,291	43,291	46,408	28,540	28,540	31,335	56,880	56,880	56,880	36,096	36,096	36,096
Producer Equity	49,179	49,874	59,830	104,620	107,452	138,403	155,049	162,857	209,980	427,813	470,351	519,282	599,744	642,095	742,960
	\$71,141	71,836	86,057	147,911	150,743	184,811	183,589	191,397	241,314	484,693	527,231	576,162	635,840	678,191	779,056

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Column A represents the historic benchmark

Column B represents the flexible RRSP investment program

Column C represents the fixed RRSP investment program

TABLE 5.2

COMPARATIVE BALANCE SHEET ON % BASIS

	1962			1967			1972			1977			1982		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
ASSETS															
Current	15	16	30	23	25	38	31	34	47	47	52	55	54	59	62
Intermediate	25	25	21	24	24	20	14	14	11	24	22	21	19	17	16
Long Term	60	59	49	53	52	42	55	52	42	28	26	24	27	24	22
	%100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
LIABILITIES & EQUITY															
Current	--	--	5	--	--	2	--	--	1	1	1	1	1	1	1
Intermediate	8	8	6	9	9	7	1	1	1	6	5	5	5	4	4
Long Term	23	23	19	20	20	16	15	14	11	5	5	4	--	--	--
Producer Equity	31	31	30	29	29	25	16	15	13	12	11	10	6	5	5
	69	69	70	71	71	75	84	85	87	88	89	90	94	95	95
	%100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Column A represents the historic benchmark

Column B represents the flexible RRSP investment program

Column C represents the fixed RRSP investment program

The relative importance of the current asset account increases over time as the RRSP funds accumulate. The fixed RRSP fund consistently displays superior performance over time. The margin between the current asset account with the fixed RRSP contribution fund and the flexible RRSP contribution fund varied from 8 to 15 percent over time. The margin between the current asset account of the benchmark and the simulated farm firm with the flexible RRSP contribution fund were less pronounced varying from 0 to 3 percent. The owner's equity account at the end of the farm firm life cycle is 7% greater for the flexible RSP investment program and 23% greater for the fixed RSP investment program over the benchmark.

5.1.2 Income Statement

The flexible RRSP contribution program has no significant effect on the total net income available. There is no expense effect for there are no loans required in order to make a contribution. The fixed RRSP contribution program created some changes in the Net Inventory Charge account to reflect the partial liquidation of grain and feed inventory. This account was drawn down in order to meet the current principal and interest payments for the RRSP loan when there was a cash shortage. The total effect of the RRSP investment programs on the farm firm's income statement was minimal. This

observation can be correlated with the growing retained earnings account on the balance sheet side of the farm firm's operations.

5.1.3 Ratio Analysis

Ratio analysis provides a convenient monitoring procedure for determining the effect of the RRSP investment program. The ratios in Table 5.3 provide an overview of the movements and trends in average relationships as a result of the RRSP investment program.

5.1.3.1 Liquidity

Working capital analysis, although not a true ratio provides a measure of a farm firm's short term liquidity. Table 5.3 illustrates that both RRSP investment programs generate more working capital than the benchmark. This phenomena is explained by the growing RRSP fund, which is a liquid asset, that constitutes part of the current assets. The fixed RRSP investment fund because of its larger contribution base creates the largest pool of near cash that can be used to finance on going operations if called upon. The superior growth of the fixed RRSP fund comes at the expense of increasing the intermediate liability account, RRSP Loan, and depleting the current asset account, Feed and Grain

TABLE 5.3
FINANCIAL RATIOS FOR SELECTED YEARS

	1962			1972			1982		
	A	B	C	A	B	C	A	B	C
Working Capital	\$10,661	\$10,970	\$21,312	\$56,651	\$59,878	\$111,581	\$333,588	\$375,940	\$476,805
Current Ratio	N/A	N/A	5.997	N/A	N/A	40.92	48.01	53.98	68.19
Current + Intermediate	5.321	5.378	4.516	55.42	57.57	32.8	12.84	14.02	16.81
Leverage	0.4466	0.4438	0.4384	0.1841	0.1803	0.1492	0.0602	0.0562	0.0486
Return on Assets	0.1241	0.1236	0.1312	0.1305	0.1283	0.1027	0.038	0.0356	0.1058
Return on Equity	0.1795	0.1784	0.1887	0.1546	0.1514	0.1181	0.0403	0.0376	0.1109
Growth Rate							.9787	.9801	.9828

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- A = Benchmark
- B = Flexible RRSP
- C = Fixed RRSP

Inventory. As discussed earlier, the effects of increasing and decreasing these two accounts has minimal impact on the farm firm. The advantage for the farm firm in maintaining the RRSP programs is the cash flow flexibility provided by the source of funds that are available in the event the farm firm experiences cash flow shortages. This would only be an advantage, however, if the money is withdrawn in a year of low net income.

The current ratios specifying the dollars of current assets available for each dollar of current liabilities indicate high liquidity in each RRSP investment program over the twenty-five year period. The liquidity varies from a low of \$3.00 to a high of \$68.00 of current assets for every dollar of current liabilities. This ratio is an indication of the farm firms ability to meet its current obligations. A 2:1 ratio is frequently considered to be a safe ratio thus the ratios presented in Table 5.4 are desirable from a creditors viewpoint.

The Current plus Intermediate ratio in Table 5.3 further supports earlier findings that the RRSP investment programs enhance the liquidity of the farm firm. As in the previous ratios, the fixed RRSP investment provides the superior ratio over time ranging from a low of \$5.32 to a high of \$16.81 of current and intermediate assets available for every \$1.00 of

current and intermediate liabilities.

5.1.3.2 Solvency Ratios

Solvency ratios indicate a farm firm's ability to meet long run claims. Farm lenders prefer a leverage ratio of 1.0 to 1.5 allowing the farm-operator to have at least as large an investment in their own farm firm as does the lender. The ratios presented in Table 5.3 indicate the farm firm is significantly under leveraged with latitude to expand its leverage without hindering financial progress. The additional debt incurred due to the fixed RRSP investment loans has not created a financial stress on the farm firm.

Increasing financial leverage, in general, will accelerate growth as long as the marginal returns from the use of loan proceeds exceeds the costs of borrowing. The growth of equity displayed in Table 5.3 demonstrates the significant growth of the farm firm from 1957 to 1982.

It is clearly demonstrated the RRSP investment program did not hinder the growth of the farm firm. As displayed in Table 5.3 the farm firms growth in equity was enhanced by the RRSP off-farm investment programs.

5.1.3.3 Profitability Ratios

The Return on Assets and on Equity ratios in Table 5.3 fluctuate greatly from a low of .0356 and .0376 to a high of .1312 and .1546, respectively. In each year reported, with the exception of 1972, the fixed RRSP investment program provides the superior ratios. Analysis of the ratio reveals that the flexible RRSP investment program does not add to the profitability of the farm firm. In each reported year, with the exception of 1967, the flexible RRSP contribution program provided slightly weaker ratios than the benchmark. The overall effect of the weaker ratios is of minimal concern given the strength of the solvency and liquidity ratios.

5.1.4 Tax Considerations

RRSP contributions reduce tax on the income that is generated from the farm firms's operations. This is an advantage to the farm firm because the amounts contributed can be deducted from net farm income in calculating income tax payable. This is generally not an available advantage at the start of the farm firm cycle but may be so in the latter years of the farm firm especially when intermediate and long term debt have been consolidated and retired.

The tax savings in this study are greatest for the fixed

RRSP investment program because of its larger contribution base. The total tax rebate or savings for the fixed and flexible RRSP investment programs, over the testing period, amounts to \$28,814.68 and \$8,758.62 respectively.

The tax savings as a percent of contribution further highlights the tax advantage of an RRSP. The farm-operator's savings were increased to a high of 55 percent and a low of 21 percent. In addition to the tax savings the interest earned on the RRSP contributions accrues in the tax-free shelter. If the RRSP is withdrawn in a future year, the amount withdrawn is added to net farm income. If the tax rate in the year of withdrawal is lower than in the year of original contribution, an overall tax saving results.

5.2 RETIREMENT OPTIONS

5.2.1 OPTION A

Table 5.4 displays the present values of the parents annuity yielding a fixed annual income of \$27,500 for selected interest rates. Under the assumptions given the farm heir would receive the parents farm worth \$393,838⁶⁸ in return for an annual fixed payment of \$27,500 for 15 years. In effect,

⁶⁸ The farm worth includes \$98,683 of inventories, \$122,914 of intermediate assets and \$172,241 of longterm assets.

TABLE 5.4
OPTION A RESULTS

	Annuity Interest Rates			
	10%	12%	14%	16%
P.V. of Parents annuity yielding a fixed annual income of \$27,500 per year for 15 years	\$209,165	187,303	168,905	153,313
Farm heirs initial equity after providing for parents annuity	\$184,673	206,535	224,933	240,525
annual amortized payment (P+I) made by farm heir when mortgage loan for selected years are taken:	10%	12%	14%	16%
30 year	\$ 22,188	23,253	24,119	24,820
25 year	\$ 23,043	23,881	24,575	25,146
20 year	\$ 24,567	25,077	25,503	25,858

the farm heir would be left with an initial equity ranging from \$184,673 to \$240,525 depending upon the selected interest rate. The farm heir would have to meet yearly payments to the parents ranging from \$22,188 to \$25,858. Because the annual payment to the parents might represent an annual claim on the farm which is too large given the 15 year time horizon of the parents the farm heir may wish to borrow the present value of the parents annuity and give the amount directly to the parents. The parents would deposit this sum into an annuity yielding a fixed annual income of \$27,500. The farm-heir could then repay the loan over a longer time horizon resulting in a lower annual payment, principal plus interest, on the loan. An annual amortized payment taken over 30 years at 10 percent would amount to \$22,188; this amount is \$5,312 less than the amount when the farm-heir pays his parents directly. Table 5.4 shows the required annual payments for selected interest rates and amortization periods.

Table 5.5 displays the ability of the farm heir to maintain the flow of funds required to service the annuity claim in Option A. The farm firm is able to provide funds beyond those required to cover all current obligations of the farm firm with the exception of 1988. In 1988 the farm firm is able to provide sufficient funds to cover some, but not all, of its current debt obligations. It should be noted that

TABLE 5.5 OPTION A
DEBT SERVICE RATIO

	1983	1984	1985	1986	1987	1988	1989	1990
30 YEARS								
10%	5	6	5	3	3	1	3	3
12%	4	5	5	3	3	1	3	3
14%	4	5	5	3	3	1	3	3
16%	4	5	5	3	3	1	3	3
25 YEARS								
10%	4	5	5	3	3	1	3	3
12%	4	5	5	3	3	1	3	3
14%	4	5	5	3	3	1	3	3
16%	4	5	5	3	3	1	3	2
20 YEARS								
10%	4	5	5	3	3	1	3	3
12%	4	5	5	3	3	1	3	2
14%	4	5	5	3	3	1	3	2
16%	4	5	4	3	3	1	3	2

the Spring of 1988 was one of the driest on record⁶⁹ Parts of Manitoba received no precipitation for up to three weeks or more during April. Crops were rated poor to fair with yields significantly below normal. Above normal weed infestations were prevalent especially in canola. Common weeds were abundant as farmers cut back use of herbicides. The township in which the case farm is situated suffered a dramatic yield reduction. Truly, 1988 was an exceptional year.

5.2.2 Option B

Option B could be accomplished in a fashion similar to Option A. The difference between the two options is that the land is gifted to the farm heir when the parents achieve age 70. Table 5.6 displays the present values of the parents annuity yielding a fixed annual income of \$15,000 for selected interest rates. In order to provide for a maximum RRSP contribution the parents need to rent their 720 acres to the farm heir for an annual income of \$12,500. The annual land rent plus the annuity income allows for a maximum RRSP contribution.

Under the assumptions given the farm heir would receive the specified assets of inventory, machinery and equipment for

⁶⁹ Manitoba Agriculture 1988, Yearbook, Queen's Printer, Winnipeg. p. 16.

TABLE 5.6

OPTION B RESULTS

	10%	12%	14%	16%
P.V. of parents annuity which yields a fixed annual income of \$15,000 per year for 15 years	\$114,0190	102,165	92,130	83,625
Farm heirs initial equity after providing for parents annuity	\$105,507	117,432	127,467	135,972
Annual amortized payment (P+I) made by farm heir when mortgage loan for selected years are taken				
	10%	12%	14%	16%
30 year	\$ 12,102	12,683	13,156	13,538
25 year	12,569	13,026	13,405	13,716
20 year	13,400	13,679	13,911	14,104

\$219,597 in return for an annual fixed payment of \$27,500 for 15 years. Table 5.6 shows possible initial equity levels available for the farm heir to assume. As in Option A the farm heir may wish to borrow the present value of the parents annuity and give this amount directly to the parents in order to stretch the time horizon of the loan. The parents would deposit this sum into an annuity yielding a fixed annual income of \$15,000. The \$12,500 received from the land rental would be deposited into short term savings instruments. An annual amortized payment taken over 30 years at 10% would amount to \$12,102; this amount is \$2,898 less than the amount when the farm heir pays his parents directly. Table 5.6 displays the required annual payment for selected interest and amortization periods.

Table 5.7 demonstrates that Option B presents no cash flow risk to the farm firm for any combination of interest rate and amortization period.

5.2.3 Option C

Option C could be accomplished by the farm heir taking out a loan for the equivalent of \$346,670, at 10 percent interest, and paying off each of the claimants. The annual principal and interest payment required from the farm heir

TABLE 5.7 OPTION B
DEBT SERVICE RATIO

	30 Years	1983	1984	1985	1986	1987	1988	1989	1990
	10%	8	10	10	6	6	2	6	5
	12%	8	10	9	5	5	2	2	2
	14%	8	9	9	5	5	2	5	5
	16%	7	9	9	5	5	2	5	5
	25 Years	1983	1984	1985	1986	1987	1988	1989	1990
95	10%	8	10	9	5	6	2	5	5
	12%	8	9	9	5	5	2	5	5
	14%	8	9	9	5	5	2	5	5
	16%	7	9	8	5	5	2	5	5
	20 Years	1983	1984	1985	1986	1987	1988	1989	1990
	10%	8	9	9	5	5	2	5	5
	12%	7	9	8	5	5	2	5	5
	14%	7	9	8	5	5	2	5	4
	16%	7	9	8	5	5	2	5	4

would amount to \$36,880 for a 30 year amortization period. Table 5.8 provides the calculations for different rates of interest and different amortization periods. The annual claims presented in each scenario in Table 5.8 represent very large financial burdens on the farm heir.

The potential for the farm heir to realize a substantial gain on the farm land during the 20, 25 or 30 year amortization period is significant. At the beginning of the amortization period the land is valued, conservatively, at \$172,241.⁷⁰ Assuming further inflation in land values of 5 percent per year this farm land would be worth \$267,202 ten year later, \$435,244 at the end of 20 years and \$708,967 in 30 years time. It is recognized that the capital gains in the farmland are not available to service the annual debt loads. The inflation of lands, a fixed asset, however, on the balance sheet of the farm firm will have a positive effect on the owner's equity account on the equity side of the ledger. A larger owner's equity position will lower the leverage ratios that farm-lenders are careful to analyze. Many farmer-operators and farm lenders prefer low leverage ratios. Higher leverage ratios under managed circumstances create more rapid growth rates decreasing the average cost of capital to some point and then moving it up rapidly.

⁷⁰ Kraft determined the total annual rate of return of a farmland investment in Western Canada to be 18.4 percent in the ten year period 1970 to 1979.

TABLE 5.8
OPTION C RESULTS

	INTEREST			
	10%	12%	14%	16%
P.V of parents annuity which yields a fixed annual income of \$27,500 per year for 15 years.	\$209,165	187,303	168,905	153,313
Remaining equity in farm firm after payment of present-value of parents annuity.	\$184,673	206,535	224,933	240,525
Share of remaining equity provided to each of 4 heirs.	\$ 46,168	51,634	56,233	60,131
Amount of loan taken out by farm heir to pay parents' annuity and equity owing to 3 non-farm heirs.	\$346,670	342,204	337,605	333,707
Annual payment (P+I) by farm heir for loan taken out for selected years.	10%	12%	14%	16%
30 year	\$ 36,880	42,483	48,209	54,024
25 year	38,302	43,632	49,120	54,733
20 year	40,835	45,817	50,975	56,284

TABLE 5.9 OPTION C
DEBT SERVICE RATIO

30 Years	1983	1984	1985	1986	1987	1988	1989	1990
10%	3	3	3	2	2	1	2	2
12%	2	3	3	2	2	1	2	1
14%	2	3	2	1	1	1	1	1
16%	2	2	2	1	1	1	1	1

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25 Years	1983	1984	1985	1986	1987	1988	1989	1990
10%	3	3	3	2	2	1	2	2
12%	2	3	3	2	2	1	2	1
14%	2	2	2	1	1	1	1	1
16%	2	2	2	1	1	1	1	1

20 Years	1983	1984	1985	1986	1987	1988	1989	1990
10%	2	3	3	2	2	1	2	2
12%	2	3	3	1	2	1	2	1
14%	2	2	2	1	1	1	1	1
16%	2	2	2	1	1	1	1	1

Table 5.9 demonstrates that the large financial burdens of Option C create situations for cash flow risk. For the year 1986 and forward the farm firm is faced with situations where it has sufficient funds to cover some, but not all, of its current debt obligations. Cash flow risk occurs in all three amortization periods for the 14% and 16% interest rates. In 1988 the farm firm is not able to cover all of its current obligations. The farm firm in 1990 is able to meet its current obligations at the 10% interest level, only.

5.2.4 Option D

Table 5.10 displays the results of Option D where a sinking fund is created to pay off non farm heirs. The results for 10 per cent interest rate would be as follows:

1. The parents' annuity would amount to \$209,165
2. Each share to the heirs would amount to \$46,168 as a present value
3. The non-farm heirs would
 - a) receive immediately \$23,084 each for a total of \$69,252
 - b) their remaining share, \$69,252, to be paid when the parents reach the age of 80 years would be

TABLE 5.10

OPTION D RESULTS

	INTEREST			
	10%	12%	14%	16%
P.V. of parents annuity which yields \$27,500 per year for 15 years	\$209,165	187,303	168,905	153,313
Total share of equity going to 3 non-farm heirs				
(a) 1/2 of share when parents retire at age 55	\$ 69,252	77,451	84,350	90,197
(b) 1/2 of share when parents reach age 80	\$ 69,252	77,451	84,350	90,197
Amount paid per year by farm heir into sinking fund to provide 1/2 share going to non-farm heirs when parents reach age 80	\$ 7,629	9,875	12,273	14,794
Annual payment (P+I) paid by farm heir on mortgage taken out to buy parents annuity and 1/2 share going to non-farm heirs when parents retire at age 55				
	10%	12%	14%	16%
30 year	\$ 29,534	32,868	36,164	39,422
25 year	\$ 30,673	33,757	36,848	39,939
20 year	\$ 32,701	35,447	38,239	41,071
Total annual payment by farm heir to meet sinking fund obligation and annual payment on the amortized loan				
30 year	\$ 37,163	42,743	48,437	54,216
25 year	\$ 38,302	43,632	49,121	54,733
20 year	\$ 40,330	45,322	50,512	55,865

provided for by a sinking fund.⁷¹ The farm heir would pay enough each year into the sinking fund so that its final amount in 25 years time, assuming 10% interest, would amount to \$69,252.

4. In conclusion the \$393,838 equity in the business would be distributed as follows:
 - a) \$209,165 to the parents for a retirement annuity
 - b) \$46,168 to the farm heir as part of the farm business when it is transferred to him.
 - c)
 - i) \$23,084 each to the three non-farm heirs for a total of \$69,252
 - ii) \$23,084 each to the three non-farm heirs for a total of \$69,252 to be transferred at the end of 25 years.
 - d) the actions to be taken by the farm heir would be as follows:
 - i) take out an amortized loan for \$278,417 (\$209,165 to parents and \$69,252 to non-farm heirs). The annual payment due for a 30 year loan at 10 percent would yield \$69,252 at the end of 25 years and would be used to pay off non-farm heirs.
 - ii) the farm heir would annually pay \$37,163 to

TABLE 5.11 OPTION D

DEBT SERVICE RATIO

	1983	1984	1985	1986	1987	1988	1989	1990
30 YEARS								
10%	3	3	3	2	2	1	2	2
12%	2	3	3	2	2	1	2	1
14%	2	3	2	1	1	1	1	1
16%	2	2	2	1	1	1	1	1
25 YEARS								
10%	3	3	3	2	2	1	2	2
12%	2	3	3	2	2	1	2	1
14%	2	2	2	1	1	1	1	1
16%	2	2	2	1	1	1	1	1
20 YEARS								
10%	3	3	3	2	2	1	2	2
12%	2	3	3	1	2	1	2	1
14%	2	2	2	1	1	1	1	1
16%	2	2	2	1	1	1	1	1

meet the sinking fund obligation and the annual payment on the amortized loan.

Table 5.10 shows the required annual payments for selected interest rates and amortization periods.

The results of Table 5.11 duplicate those of Table 5.9. The years 1983-1985, inclusive, indicate the farm firm is able to provide the necessary funds to cover all current obligations with a residual to carry forward. The farm firm is not able to cover all of its current debt obligation from 1986 onward. There is no point, however, when the farm firm cannot make any debt payments.

5.3 POST RETIREMENT RRSP CONTRIBUTIONS

Tables 5.12 and 5.13 display the 1982 values of the fixed and flexible RRSP investment funds, respectively. These final values are the result of 25 years of contributions and accumulated earnings. In addition to the actual values Table 5.12 and 5.13 display how the maximum RRSP contribution of \$5,500 may grow, earning compound interest at the rate of 8, 10 and 12 percent. When combined with the actual growth results an indicator is provided as to what the farm parents may realize at age 70 when they roll the funds into an annuity or RRIF.

TABLE 5.12

HISTORIC AND PROJECTED PERFORMANCE OF FIXED CONTRIBUTION FUNDS

	Balance Fund A			Balance Fund B			Equity Fund A		
	8%	10%	12%	8%	10%	12%	8%	10%	12%
Projected 15 year Performance	149,337	174,748	205,038	149,337	174,748	205,038	149,337	174,748	205,038
1982 end value for fixed contribution	148,717	148,717	148,717	151,656	151,656	151,656	191,068	191,068	191,068
TOTAL	\$ 298,054	323,465	353,755	300,993	326,694	356,694	340,405	365,816	396,106

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	Equity Fund B			Equity Fund C			Fixed Fund A			Fixed Fund B		
	8%	10%	12%	8%	10%	12%	8%	10%	12%	8%	10%	12%
Projected 15 year performance	149,337	174,748	205,038	149,337	174,748	205,038	149,337	174,748	205,038	149,337	174,748	205,038
1982 end value for fixed contribution	160,641	160,641	160,641	198,344	198,344	198,344	220,941	220,941	220,941	268,920	268,920	268,920
TOTAL	\$ 309,978	335,389	365,679	347,681	373,092	403,382	370,278	395,689	425,979	418,257	443,668	473,958

TABLE 5.13

HISTORIC AND PROJECTED PERFORMANCE OF FLEXIBLE CONTRIBUTION FUNDS

	BALANCE FUND A			BALANCE FUND B			EQUITY FUND A		
	8%	10%	12%	8%	10%	12%	8%	10%	12%
Projected 15 year performance	149,337	174,748	205,038	149,337	174,748	205,038	149,337	174,748	205,038
1982 end value for flexible contribution	47,851	47,851	47,851	47,276	47,276	47,276	53,802	53,802	53,802
TOTAL	\$ 197,188	222,599	252,889	196,613	222,024	252,314	203,139	228,550	258,840

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	EQUITY FUND B			EQUITY FUND C			FIXED FUND A			FIXED FUND B		
	8%	10%	12%	8%	10%	12%	8%	10%	12%	8%		
Projected 15 year performance	149,337	174,748	205,038	149,337	174,748	205,038	149,337	174,748	205,038	149,337	174,748	205,038
1982 end value for flexible contribution	47,009	47,009	47,009	51,172	51,172	51,172	60,270	60,270	60,270	66,500	66,500	66,500
TOTAL	\$ 196,346	221,757	252,047	200,509	225,920	256,210	209,607	235,018	265,308	215,837	241,248	271,538

A comparison of Tables 5.12 and 5.13 indicate that the largest end values occur in the fixed RRSP investment programs. This is necessarily so because of the larger contribution base over the time period examined. The fixed income funds outperform the other funds suggesting that over the study period they had greater stability of capital and income than the balanced and equity funds. Common share equity investments have shown themselves to be poor hedges against inflation. Rampant inflation creates serious problems throughout an economy and historically has resulted in weak equity share markets.

CHAPTER VI

SUMMARY AND CONCLUSIONS

6.1 SUMMARY

In the economy of the 1990's farm operators must deal with increasingly competitive market factors, technological changes and high capital requirements. High degrees of variability in cash flow are an inherent characteristic of the primary agriculture industry. This variability is the cumulative result of production, marketing and financial uncertainties, including the uncertainty of government payments under the multitude of programs. The current discussion regarding the General Agreement on Tariffs and Trade (GATT) provide further uncertainty, if not anxiety, for some farm operators. In spite of some alarm over the changing primary agriculture sector it appears that the family farm firm will continue to survive.

The transfer of the family farm firm from one generation to the next is of an ongoing interest to most farm families given the apparent sustainability of the family enterprise. The large capital requirements for starting a farming career in the 1990's however, does present some very real challenges to the next generation. It is clear that in order to enhance

a smooth inter-generational farm firm transfer the retiring farm parents need to start planning for the transfer at the purchase of the first assets, not at the time of the sale of the last assets.

The major purpose of the study is to analyze RRSP investments as a disinvestment strategy for retiring farm parents in order to allow for successful intergenerational farm firm transfers. It is intended to provide insight into the feasibility of such a strategy in the uncertain environment of the primary agriculture sector.

Specific objectives are:

- (1) to develop a farm firm model that can describe actual farm firm business relationships so that financial/quantitative computations can be performed on disinvestment strategies in preparation for retirement by farm parents.
- (2) to determine, in a static framework, the level of RRSP investment contributions which will permit the development of a retirement portfolio and allow for continued growth of the farm firm during its entry and growth stages.
- (3) To provide results that will be useful for planning farm growth when a RRSP retirement portfolio has a prior

claim to resources generated by the farm firm.

(4) to examine the financial and risk dimensions of the new entrant assuming the ownership and management of the farm firm.

Registered Retirement Savings Plan (RRSP) options were used as the vehicle for off farm investments. RRSP's were used because they provide farm-operators a retirement fund that in most cases will provide a higher after-tax investment return than the equivalent direct investment program. RRSP's offer substantial long term tax savings and enables the farm tax payer to accumulate a retirement fund through their own efforts and under their own control.

RRSPs are a nongovernment approved savings plan, under section 69 of the Income Tax Act. It is designed to allow individual taxpayers, such as farmers, who have no private pension plan through employment a similar tax advantage to that given taxpayers with pension plans through employment.

The tax advantage is gained in that contributions to an RRSP are deductible from earned income for tax purposes, resulting in immediate and potentially substantial savings in income tax. The funds invested are held in a personal RRSP trust which also provides the farm operators a tax shelter for all interest income and capital gains generated by the trust

funds. The potential rate of accumulation of funds within a RRSP is much greater than is the case with funds exposed to personal taxes. Of much greater importance to the farm operator is the ability to invest off the farm into a sheltered fund. This off-farm investment provides a prudent alternative investment strategy in contrast to the farm operators who have their entire life savings invested in their farm firm. For the non off-farm investors the farm firm represents their sole investment for retirement and consequently they have a strong commitment to maintain their lifelong investment. This commitment may require these people to work well past their desired retirement age and potentially at a great personal sacrifice to their retirement income in order to provide the next generation an opportunity to start farming on a healthy financial footing.

The analytical model used in the study was designed to investigate two RRSP investment strategies in a static farm firm environment. The investment strategies were analyzed to determine the profitability, liquidity, risk and the likelihood of their contributing to diminished farm firm growth vis-a-vis the historic farm firm which serves as the benchmark. The benchmark embodies the actual production, marketing and financial decisions of the farm operator thus the consequences of alternative RRSP investment decisions may be measured by direct comparison to the benchmark.

Producer Equity, or net worth, is an accepted commercial measure of a farm firms solvency. The three examined options presented a positive producer equity indicating that the farm firm could be liquidated, creditors paid, with the residual claimed by the farm operator. In the final year of the comparison the benchmark had a producer equity of \$599,744 compared to the flexible and fixed RRSP strategies which recorded \$642,095 and \$742,960, respectively. It is clear the RRSP investments enhanced the ending producer equity account concurrent to providing liquid funds not tied to the farm firms capital structure. This is a benefit for it allows the RRSP fund to stay ahead of inflation. As aforementioned the income generated in a RRSP fund is not subject to tax until it is withdrawn from the fund. Frequently, farm operators invest in land and capital with the intention that the increase in value of their land investment exceeds inflation. The problem with using land investment as a hedge against inflation is that it can result in cash flow problems in years of low income. Furthermore, if the farm operator wishes to sell or transfer land in a period of falling land prices, such as in the mid 1980's the perceived retirement fund falls accordingly.

Ratio analysis, which relates different items from the farm firms financial statements to one another, represents a basic approach to financial analysis. Ratio are relied upon by the

various stake holders in the farm firm including the farm operator and the various creditors, if any.

The liquidity ratios for each of the strategies demonstrated the farm firms strong short term ability to meet its financial obligations. The leverage ratio highlighted the farm firms debt equity structure and the ease with which it could service outstanding debt throughout the examined time period. The return on equity ratio portrays, over the time period examined, a diminishing earning power and efficiency with which the farm firms resources are used. This may indicate the farm firm is not using its inputs, such as fertilizer and chemicals, to maximum economic advantage. Although there is a declining return on equity, the fixed strategy shows the strongest ratio in the final year of study, 1982. The benchmark and the flexible strategy present final ratios that are virtually identical suggesting the off-farm RRSP investments are not contributing to the declining ratio. In general, ratios must be used with caution in order to understand what the ratios appear to imply or point to. Using ratios over a time period, however, can prove quite useful to discern trends in performance.

Financial security at retirement is of great concern for the retiring farm operators. The non monetary concern of the retiring farm operators is to transfer a viable farm firm to

the next generation. The study examined four hypothetical retirement options with a standard set of assumptions. The individual options were then augmented by additional option specific assumptions.

The general operating assumptions may be summarized as follows:

- (1) that the retiring parents are both age 55 and both expect to live until age 85.
- (2) that the parents have four children; one child will take over the farm; the other three children have careers in non-farm occupations.
- (3) that the parents would like to continue contributing into their RRSP fund until age 70.
- (4) that the farm parents will use their liquid assets, excluding the RRSP fund, to maintain their current standard of living should it diminish during the post-exit stage.

Four options with respect to the allocation of the farm parents estate were examined of which:

- (1) one part of the farm estate will be used to provide retirement income for the farm parents.
- (2) one part will be distributed to the farm-heir.
- (3) the remaining part, if any, will be distributed to the three non-farm heirs.

In general, the capital gains that have been realized on the benchmark farm firms assets over the study period as a result of inflation become real costs to the next generation assuming the farm firm. The four options examined demonstrate the value of the independent RRSP funds in providing flexibility to the farm parents in transferring the farm firm. The independent "nest egg" allows for creative planning and a reduction of risk to the farm parents for their retirement fund is not subject to the management ability of the succeeding generation nor the vagaries of the agriculture economy. The RRSP fund also allows the farm parents to make financial concessions to the farm heir, on the farm firm transfer, without impairing their own standard of living upon retirement.

The four retirement options were examined for the succeeding generations ability to maintain a flow of funds, required for debt service, for the period of 1983 to 1990, inclusive. Under Options A and B the following specific assumptions are made:

- (1) that the farm parents desire the equivalent of an annuity yielding a fixed annual income of \$27,500. so that they may make a maximum RRSP contribution annually (Option A.)
- (2) that the farm parents will sell to the farm heir the inventory, machinery, equipment and land at a

bookvalue of \$393,833.00 (Option A). For Option B the farm parents will sell to the farm heir the inventory, machinery and equipment at a bookvalue of \$219,597.00.

- (3) Under Options A and B the non farm heirs will receive no contribution from the farm estate.

Options A and B do not present a cash flow risk to the farm heir as determined by the debt service ratio. All the combinations of interest rates and amortization periods indicate a very strong ability to service all current obligations. There is no indication that the farm parents and the farm heir cannot achieve the objectives set out in the aforementioned general and option specific assumptions. It is assumed that under these two options the farm heir could start to contribute to a RRSP fund following the example of the farm parents.

Under Options C and D the following specific assumptions are made:

- (1) that the farm parents will sell to the farm heir the inventory, machinery, equipment and land at a bookvalue of \$393,838.00 (Option C)
- (2) that the farm parents will distribute to the three non farm heirs the proceeds from the sale of the inventory, machinery and equipment (Option C).

- (3) the farm parents would receive an annuity paying \$27,500.00 per for 15 year (Option D)
- (4) the farm heir would receive his share at the time of the farm parents retirement (Option D).

Option C and D present a considerable financial burden on the farm heir. The burden is demonstrated in the low debt service ratios especially for the latter years of the study period. The latter years of the study were characterized by declines in prices for the major crops. In fact, the commodity prices in the latter part of the decade were no higher, in current dollars, and with higher input costs than in the 1970's indicating reduced levels of profitability. Although the farm firm is able to cover some of its current obligations it is not able to cover all of the current obligations. It should be noted that the debt service ratios are on the threshold of being able to service the debt and not being able to service the debt. Under these two options the farm firm is not in such difficulty that the farm heir would expect to lose control of the farm, in the short run, but is exposed to a degree of risk caused by depressed commodity prices and, in 1988, reduced yields. It is clear, however, that the farm firm will eventually fail under Option C and D unless economic conditions improve and/or there is government assistance available. Under the current tax rules the farm heir would not be in a position to make a contribution to a

RRSP fund.

In addition to the financial burden on the farm heir is the transfer of risk to the heir. The non farm heirs receive their shares without any risk burden. It is assumed the non farm heirs hold off-farm jobs. The objective of the farm parents to treat all their children equally is most difficult to achieve. Treating all concerned equitably, however, is a reasonable alternative. An equitable alternative is to make an accommodation for the risk assumed by the farm heir.

The dramatic growth of before-tax dollars in an RRSP as compared to the growth of after-tax dollars can be attributed to two factors:

- (1) funds which would have otherwise gone towards the individual's current tax liability are earning income within the RRSP, and
- (2) the RRSP is not subject to tax on the income or capital gains realized from its investments.

The large final values of the various RRSP investment funds made it possible for the farm parents to be relatively generous, to the farm heir, in the transfer options. The smallest final value was \$196,346 for the flexible RRSP contribution plan and the largest final value was \$443,660.00 for the fixed contribution plans. At age 70 the farm parents can transfer their RRSP funds into a Registered Retirement

Income fund (RRIF) Similar to RRSP's the income accumulating on the funds placed in a RRIF is not subject to tax if certain conditions are satisfied.

This study has examined a number of retirement strategies, employing RRSP's, available to farm operators. Although the strategies presented are by no means exhaustive they illustrate the importance of planning for retirement and intergenerational transfers to the farm firm. Such strategies have long term implications starting in one generation and passing into the succeeding generation.

The shortcoming of this analysis is best expressed in a discussion of the needs for future research efforts. The needed extensions and improvements on this analysis can be divided into two categories: (1) modifications of the model and (2) extended economic analysis in future model inputs.

Tax considerations on the transfer of farm firm capital are not dealt with in this study. The tax impact of federal and provincial taxes on the farm transfer should be considered in future research. Normally Section 69 of the Income Tax Act requires a family trans-action (non arms length) to occur at fair market value. Some important amendments to this have been made that overrule Section 69, in order to defer taxes in family transfers for example "rollovers". A rollover occurs

when eligible property is transferred between the farm parents and the farm heir, and the recognition of a capital gain or loss, or recaptured depreciation is deferred for income tax purposes. The rollover provision is one of the most significant tax planning considerations for farm operators. As this area is very complex it warrants examination on its own.

Further economic analysis is required in order to identify the efficient portfolios of RRSP funds to be compared against the random selection of RRSP funds. Markowitz's quadratic programming techniques could be employed to describe the efficient set of funds which minimize variability (risk).

Finally, research can be directed to examining RRSP options that take into account the modest cash flows of new entrants into the entry stage of the family firm life cycle. Further development of the carry forward rule, especially for farm operators, would be a contribution to increased participation by this group in RRSPs. The carry forward rule, which came into effect in 1991 allows a tax payer who, for example, did not contribute the maximum amount in any one year after 1990, but did so in 1993, the opportunity to make a deductible contribution to be first applied against any unused deduction room carried forward from 1991. This option provides more flexibility especially in view of variable

annual cash flows. The difficulty for new farm entrants, however, is the rule is limited to those individuals who have a taxable income. Research efforts could be applied to the carry forward rule to allow "paper contribution" of funds into a RRSP reserve in years when there is no taxable income.

As this stage of research concludes, further work can be directed toward making the model more complete and more applicable to use by farm operators in extension settings. It is acknowledged the characteristics of individual farm firms will be as unique as each of the farm operators are, however, the basic principle of retirement planning is applicable to all situations: retirement planning is a life long responsibility that must begin in the first stage of the farm firm life cycle with the purchase of the first assets, not at the exit stage with the sale of the last assets.

6.2 CONCLUSIONS

A number of conclusions can be drawn from the findings of this study which include the following:

1. Successful entry of new entrants into the farm firm in the face of high and rising capital requirements and variability in yields, prices, and net returns will require careful planning.

2. Farm parents need to develop, at the outset of their farming career, a retirement portfolio strategy which will generate a stable flow of income in amounts adequate to meet their perceived retirement needs and allow an orderly transfer of the farm firm and their assets to the next generation thus assuring the assets are distributed to the intended heirs without dissolving the farm firm or its viability.

3. Farm parents who systematically invest into an RRSP, even if the investment requires external borrowing, will develop a secure and independent retirement fund that will not impair the growth and therefore the viability of the farm firm. Stated in another way, a fixed dollar claim to the farm firms resources, for investing off the farm into a RRSP program, would strengthen and enhance the consolidated farm firm balance sheet and allow for an orderly thransfer to the next generation without impairing the farm firm's viability.

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APPENDIX A
THE PROBLEM SETTING

APPENDIX A

THE PROBLEM SETTING

FARM SIZE AND NUMBERS

Increases in farm size have been a result of farm consolidation and new land being brought into production. This expansion was permitted by greater increases in production efficiency due to improved technology, greater capitalization and better management. During the 25 year period ending in 1986, the average total hectares per farm in Manitoba increased 66 percent from 170 hectares (420 acres) to 283 hectares (700 acres) (Table A.1). Paralleling the farm size increases was a decrease in farm numbers. Manitoba farm numbers over the 1961-1986 period decreased 47 percent from 43,306 farms to 27,336 (Table A.1). The decrease in farm numbers coupled with the increase in land holdings has been caused by improved technology and substitution of capital for labour. The total capital invested by Manitoba farm operators in livestock, machinery, equipment, land and buildings in 1990 was fourteen times greater than it was 29 years earlier (Table A.2). The proportion of the average total investment in land and buildings increased from 62 percent to 75 percent of the total investment in 1981 and decreasing to 67 percent in 1990.

FARM SCALE

The total number of farms in Manitoba has been declining at the same time as the number of larger farms is increasing. Expressed another way, the dynamics of the Manitoba primary agriculture industry is composed of an expanding sector made up of relatively larger farms and a contracting sector made up of relatively small farms. Table A.3 show that in the 25 year period ending in 1986 the numbers of farms with sales of \$10,000 or more steadily increased and the number of farms with sales less than \$10,000 decreased. These statistics support the assertion that the scale of farming is increasing over time.

TABLE A.1

AVERAGE FARM-FIRM SIZE, MANITOBA, SELECTED YEARS

Year	Total Farms	Average Size	
		Total Hectares/Acres	Improve Hectares/Acres
1961	43,306	170/420	112/276
1971	34,981	220,543	148/366
1976	32,104	240,593	162/402
1981	29,442	259/639	187/462
1986	27,336	283/700	198/489

SOURCE: Manitoba Agriculture. 1986 Yearbook.

TABLE A.2

AVERAGE CAPITAL INVESTMENT PER FARM FIRM, MANITOBA, SELECTED YEARS

Investment	1961		1971		1981		1986		1990	
	\$	%	\$	%	\$	%	\$	%	\$	%
Land and Buildings	16,492	62.0	39,396	67.0	255,250	75.0	240,864	66.0	243,000	67.0
Mach. and Equipt.	6,384	24.0	11,760	20.0	60,350	17.0	83,380	22.0	86,450	24.0
Livestock	3,724	14.0	7,644	13.0	28,400	8.0	42,860	12.0	35,719	9.0
TOTAL	26,660	100.0	58,800	100.0	355,000	100.0	367,104	100.0	365,169	100.0

SOURCE: Manitoba Agriculture. 1990 Yearbook

TABLE A.3

FARM-FIRM NUMBERS BY VALUE-OF-SALES CLASSES, MANITOBA, SELECTED YEARS

Economic Class by Farm-Firm Sales	1971		1976		1981		1986	
	#	% of total	#	% of total	#	% of total	#	% of total
\$10,000 and over	9,464	27.0	18,725	58.3	21,423	72.8	21,429	78.4
\$2,500 and over	15,872	45.4	8,540	26.6	5,094	17.3	3,833	14.0
\$250 and over	9,608	27.5	4,787	14.9	2,925	9.9	2,074	7.6
All Farm-Firms	34,981	100.0	32,104	100.0	29,442	100.0	27,336	100.0

SOURCE: Statistics Canada. 1986 Census of Canada, Agriculture, Manitoba

APPENDIX B
SAMPLE INPUT AND OUTPUT

OPERATING TRANSACTIONS

APPENDIX B SAMPLE INPUT AND OUTPUT

CROP RECEIPTS

WHEAT	0	1717	2462	1698	5118	3575	3304	2839	4281	5891	8224
OATS	0	1282	405	517	1363	184	508	905	544	898	1002
FLAX	0	542	501	2134	1481	2778	3509	1205	3038	567	3311
BARLEY	0	0	214	345	0	0	0	0	0	0	0
RAPE	0	0	0	0	0	0	0	0	0	0	0
FORAGE SEED	0	0	37	0	726	171	137	1008	686	299	2013
SPECIAL CROP	0	0	0	0	0	0	0	0	0	1765	1328
CORN	0	0	0	0	0	0	0	0	0	0	0
PEAS	0	0	0	0	0	0	0	0	0	0	0
BUCKWHEAT	0	0	0	961	794	797	1284	2088	1696	1041	2079
SNFLWRS	0	0	0	0	730	0	0	0	0	0	0
TOTAL CROP RECEIPTS	0	3541	3619	5655	10212	7505	8742	8045	10245	10461	18978

LIVESTOCK RECEIPTS

CATTLE	0	1426	584	1017	1227	5474	7066	8602	8209	8410	9038
HOGS	0	0	384	943	1428	3575	4254	5219	5939	5945	6221
POULTRY	0	0	384	365	539	389	195	0	0	0	0
OTHER	0	366	0	0	0	76	0	0	0	0	0
TOTAL LIVESTOCK RECEIPTS	0	1792	1352	2325	3194	9514	11515	13821	14148	14355	15259

LIVESTOCK PRODUCT RECEIPTS

DAIRY	0	336	394	340	0	0	0	0	0	0	0
EGGS	0	526	416	355	640	425	364	0	55	0	0
TOTAL LIVESTOCK PRODUCTS RECEIPTS	0	862	810	695	640	425	364	0	55	0	0

OTHER FARM RECEIPTS

CUSTOM WORK	0	0	66	180	51	99	197	271	299	1147	327
REC PRIOR PERIOD	0	0	0	0	0	0	0	0	0	0	0
LOAN DRAWDOWN	0	0	0	5600	1500	5800	6164	3000	7950	11145	30900
CWR GRANTS	0	27	614	381	300	754	511	905	1182	1097	1993
MISC	0	202	0	0	971	0	605	358	0	0	447
TOTAL OTHER FARM RECEIPTS	0	229	680	6161	2822	6653	7477	4534	9431	13389	34031
TOTAL FARM RECEIPTS	0	6424	6461	14836	16868	24097	28098	26400	33879	38205	68268

EXPENSES

CROP	0	675	473	729	748	733	1108	1428	2970	3164	5740
LIVESTOCK	0	322	443	499	774	2114	1150	1349	684	650	805
CAR	0	68	69	88	80	99	88	95	148	280	224
TRUCK	0	180	260	266	262	707	437	306	329	986	387
TRACTOR	0	873	715	742	1277	1278	836	971	721	441	750
COMBINE	0	169	203	136	420	79	271	222	329	413	202
OTHER EQPT	0	293	141	126	142	224	256	265	188	158	382
REPAIRS MAINT	0	45	72	90	203	252	733	702	651	793	281
RENT LAND	0	1956	2286	0	526	0	0	0	0	0	2880
SMALL TOOLS	0	0	0	0	0	0	156	136	211	102	60
LABOUR	0	162	13	172	775	473	657	1123	449	1151	1205
UTILITIES	0	131	92	109	53	132	147	150	139	180	185
INSURANCE	0	18	22	40	41	46	47	49	50	51	71
LOAN INTRST	0	13	0	0	398	1159	1041	1083	3369	6517	8775
PAYABLES PRIOR PERIOD	0	332	200	22	676	1944	0	0	184	0	0
PFTY TAXES	0	0	0	546	691	833	824	951	920	949	1017

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LVSTK SALES	0	0	0	0	0	0	0	0	0	0	0
MACH SALES	0	0	0	550	300	0	1400	0	480	6342	6953
TOTAL SALES	0	0	0	550	300	0	1400	0	480	6342	6953

EXPENDITURES

LVSTK EXP	0	0	370	716	0	3169	6682	0	0	7206	6336
MACH EQPT EXP	0	1044	207	1793	1659	1323	6245	5467	1772	13387	15762
LAND EXP	0	15	30	24000	6000	0	0	0	0	0	0
BLDG EXP	0	0	0	725	1027	2363	585	900	617	0	0
TOTAL CAPITAL EXP	0	1059	607	27234	8686	6855	13512	6367	2389	20593	22098

NON FARM BUSINESS TRANSACTIONS

RECEIPTS

OFF FARM EMPLOY	0	0	0	0	0	0	0	0	0	0	0
OTHER OFF FARM INC	0	405	290	2256	45	502	338	352	403	1123	395
RSP LOAN	0	2372	2282	1622	2082	2099	1830	2519	1495	1725	966
TOTAL NON FARM RECEIPTS	0	405	290	2256	45	502	338	352	403	1123	395
TOTAL NON FARM RECEIPTS RSP	0	2777	2572	3878	2127	2601	2168	2871	1898	2848	1361

OUTLAYS

INCOME TAX	0	0	0	0	0	0	0	0	40	731	308
HOUSEHOLD	0	1038	1285	1167	1255	1664	1776	1762	2026	2068	2138
PERSONAL	0	579	996	851	997	1172	1546	1101	1366	1672	2408
LIFE INS	0	159	159	203	177	231	203	208	1049	356	448
VEH	0	63	137	176	204	198	88	189	295	560	368
RSP LOAN PYMNTS	0	0	421	987.7	1400	1922	2451	2354	2410	2380	2306
INVTMNTS	0	0	500	0	0	0	0	0	0	0	0
TOTAL NON FARM OUTLAYS	0	1839	3077	2397	2633	3265	3613	3260	4776	5387	5670
TOTAL NON FARM OUTLAYS RSP PYMNT	0	1839	3498	3385	4033	5187	6064	5614	7186	7767	7976

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DEBT PRIN REPAY	0	22	246	519	841	1023	3083	4470	6194	6517	8776
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SUMMARY

TOTAL DOLLAR INFLOW	0	6829	6751	17642	17213	24599	29836	26752	34762	45670	75616
TOTAL DOLLAR INFLOW RSP	0	9201	9033	19264	19295	26698	31666	29271	36257	47395	76582
TOTAL DOLLAR OUTFLOW	0	8167	8795	33196	18587	20225	25122	18465	18684	41829	50906
TOTAL DOLLAR OUTFLOW RSP	0	8167	9216	34184	19987	22147	27573	20819	21094	44209	53212
CASH FLOW	0	-1338	-2044	-15554	-1374	4374	4714	8287	16078	3841	24710
CASH FLOW RSP	0	1034	-183	-14920	-691.8	4551	4093	8452	15163	3186	23370

ANNUAL RSP CONTRIBUTION FROM CASH BASED ON LESSER OF DOLLAR LIMIT OR PERCENT LIMIT

CASH POSITION PRE RSP	45	228	318	978	518	501	770	81	1105	875	1634
RSP PERCENTAGE LIMIT	0	.9000	.9000	.9000	.9000	.9000	.9000	.9000	.9000	.8000	.8000
RSP DOLLAR LIMIT	0	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
RSP CODE	0	1	1	1	1	1	1	0	1	1	1
RSP CALCULATION	0	22.80	31.80	97.80	51.80	50.10	77	0	110.5	175	326.8
MAX RSP CONTRIB	0	22.80	31.80	97.80	51.80	50.10	77	0	110.5	175	326.8
RSP CONTRIBUTION	0	11.40	15.90	48.90	25.90	25.05	38.50	0	55.25	87.50	163.4
SPOUSAL RSP CONTRIBUTION	0	11.40	15.90	48.90	25.90	25.05	38.50	0	55.25	87.50	163.4
CASH POSITION POST RSP	45	205.2	286.2	880.2	466.2	450.9	693	81	994.5	700	1307

EXTERNAL INVESTMENT RETIREMENT PORTFOLIO
MUTUAL FUND GROWTH

EQUITY A	1	.9500	1.270	1.060	.9900	1.290	.9800	1.150	1.240	1.050	.9000
EQUITY B	1	.9000	1.240	1.020	1.020	1.270	.9800	1.130	1.180	1.030	.9200
EQUITY C	1	.9200	1.240	1.050	1.040	1.270	1	1.160	1.180	1.060	.9300
FIXED INCOME A	1	1	1.060	.9600	1.120	1.070	1.060	1.070	1.070	1.020	1
FIXED INCOME B	1	1	1	1	1.120	1.070	1.060	1.060	1.070	1.040	1

FUND GROWTH FROM CASH LESSER OF DOLLAR OR PERCENT

BALANCED A GROWTH	0	22.80	58.93	157.3	212.3	321.8	385.9	428.4	611.7	811.2	1081
BALANCED B GROWTH	0	22.80	60.76	160.4	215.4	308.6	360.9	411.4	596.0	806.7	1045
EQUITY A GROWTH	0	22.80	60.76	162.2	212.4	324.1	394.6	453.8	673.2	881.8	1120
EQUITY B GROWTH	0	22.80	60.07	159.1	214.1	321.9	392.5	443.5	633.9	827.9	1088
EQUITY C GROWTH	0	22.80	60.07	160.9	219.1	328.4	405.4	470.2	665.4	880.3	1145
FIXED INCOME A GROWTH	0	22.80	55.97	151.5	221.5	287.1	381.3	408.0	547.1	733.0	1060
FIXED INCOME B GROWTH	0	22.80	54.60	152.4	222.5	288.2	382.5	405.4	544.3	741.0	1068

ANNUAL RSP CONTRIBUTION FROM SURPLUS BASED ON LESSER OF DOLLAR LIMIT OR PERCENT LIMIT

ELG INC RSP	0	9201	9033	19264	19295	26698	31666	29271	36257	47395	74582
FARM OUTLAY	0	8189	9462	34703	20828	23170	30656	25289	27288	50726	61988
SURPLUS PRE RSP	0	1012	-429	-15439	-1533	3528	1010	3982	8969	-3331	14594
RSP SURPLUS CODE	0	1	0	0	0	1	1	1	1	0	1
RSP SURPLUS CALC	0	101.2	0	0	0	352.8	101.0	398.2	896.9	0	2919
MAX RSP SURPLUS CONTRN	0	101.2	0	0	0	352.8	101.0	398.2	896.9	0	2500
SURPLUS POST RSP	0	910.8	-429	-15439	-1533	3175	909.4	3584	8072	-3331	12094

FUND GROWTH FROM SURPLUS LESSER OF DOLLAR OR PERCENT

BAL A SURPLUS	0	101.2	120.4	121.6	124.1	511.6	592.2	1056	2132	2217	4562
BAL B SURPLUS	0	101.2	128.5	132.4	135.0	514.8	574.7	1053	2140	2268	4519
EQUITY A SURPLUS	0	101.2	120.5	136.2	134.9	526.8	617.3	1108	2271	2385	4646
EQUITY B SURPLUS	0	101.2	125.5	128.0	130.6	518.6	609.3	1087	2179	2245	4565
EQUITY C SURPLUS	0	101.2	125.5	131.8	137.0	526.8	627.9	1127	2226	2360	4695
FXD INC A SURPLUS	0	101.2	107.3	103.0	115.3	476.2	605.8	1046	2017	2057	4557
FXD INC B SURPLUS	0	101.2	101.2	101.2	113.3	474.1	603.6	1038	2008	2088	4588

RSP FIXED DOLLAR CLAIM TO SURPLUS

SURPLUS PRE FXD DOLLAR CLAIM	0	1012	-429	-15439	-1533	3528	1010	3982	8969	-3331	14594
DOLLAR WITHDRWL	0	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
SURPLUS POST FXD DOLLAR CLAIM	0	-1488	-2929	-17939	-4033	1028	-1490	1482	6469	-5831	12094

FUND GROWTH FROM SURPLUS FXD DOLLAR CLAIM

HAL A SURPLUS FXD	0	2500	5475	8030	10690	16184	18036	22520	28849	32503	32727
HAL B SURPLUS FXD	0	2500	5675	8345	11012	15715	16957	21831	28261	32457	31387
EQTY A SURPLUS FXD	0	2500	5675	8516	10930	16600	18768	24083	32363	36482	35333
EQTY B SURPLUS FXD	0	2500	5600	8212	10876	16313	18487	23390	30100	33503	33323
EQTY C SURPLUS FXD	0	2500	5600	8380	11215	16743	19243	24822	31790	36198	36164
FXD INC A SURPLUS FXD	0	2500	5150	7444	10837	14096	17442	21163	25144	28147	30647
FXD INC B SURPLUS FXD	0	2500	5000	7500	10900	14163	17513	21064	25038	28540	31040
RSP FIXED DOLLAR CLAIM TO CASH											
CASH PRE FXD RSP CLAIM	45	228	318	978	518	501	770	81	1105	875	1634
DOLLAR WITHDRWL	0	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
CASH POST RSP FXD CLAIM	45	-2272	-2182	-1522	-1982	-1999	-1730	-2419	-1395	-1625	-866
BORROW CODE	0	1	1	1	1	1	1	1	1	1	1
BORROW CALC	0	2372	2282	1622	2082	2099	1830	2519	1495	1725	966
BORROW CALC CODE	0	2372	2282	1622	2082	2099	1830	2519	1495	1725	966
BORROW AMT	0	2372	2282	1622	2082	2099	1830	2519	1495	1725	966
BORROW AMT CODE	0	1	1	1	1	1	1	1	1	1	1
BORROW RSP	0	2272	2182	1522	1982	1999	1730	2419	1395	1625	866
BORROW CASH	0	100	100	100	100	100	100	100	100	100	100
RLC SHT CASH	45	100	100	100	100	100	100	100	100	100	100

FUND GROWTH FROM CASH FXD DOLLAR CLAIM

HAL A CASH FXD	0	2500	5475	8030	10690	16184	18036	22520	28849	32503	32727
HAL B CASH FXD	0	2500	5675	8345	11012	15715	16957	21831	28261	32457	31387
EQTY A CASH FXD	0	2500	5675	8516	10930	16600	18768	24083	32363	36482	35333
EQTY B CASH FXD	0	2500	5600	8212	10876	16313	18487	23390	30100	33503	33323
EQTY C CASH FXD	0	2500	5600	8380	11215	16743	19243	24822	31790	36198	36164
FXD INC A CASH FXD	0	2500	5150	7444	10837	14096	17442	21163	25144	28147	30647
FXD INC B CASH FXD	0	2500	5000	7500	10900	14163	17513	21064	25038	28540	31040
FDC INDEX	1.050	1.050	1.050	1.050	1.050	1.050	1.050	1.050	1.050	1.050	1.050
PURCHASES	0	0	0	24000	6000	0	0	0	0	0	25000
INFLATION	0	0	0	24000	31200	32760	34398	36118	37924	39820	66811

COMPARATIVE ANALYSIS

ASSETS

CASH	45	228	318	978	518	501	770	81	1105	875	1634
CASH POST RSP FLEX	45	205.2	286.2	880.2	466.2	450.9	693	81	994.5	700	1307
CASH POST RSP FXD	45	100	100	100	100	100	100	100	100	100	100
POST RSP SURPLUS	0	-1488	-2929	-17939	-4033	1028	-1490	1482	6469	-5831	12094
BONDS/INVEST	500	500	1000	0	0	0	0	0	0	0	0
RSP ACTUAL	0	0	0	0	0	0	0	0	0	0	0
RSP CASEFARM	0	22.80	58.93	157.3	212.3	321.8	385.9	428.4	611.7	811.2	1081
FXD RSP	0	2500	5475	8030	10690	16184	18036	22520	28849	32503	32727
LIFE/INSUR	400	456	744	957	1440	1683	1931	2050	2950	3245	3420
PREPAIDS	0	0	0	0	0	0	0	0	0	0	0
INVENTORIES	0	0	0	0	0	0	0	0	0	0	0

CURRENT ASSETS	6348	6296	7421	9932	10758	8604	10661	11911	16133	20000	19638
CURRENT ASSETS	6348	6296	7448	9992	10918	8876	10970	12339	16634	20636	20392
CURRENT ASSETS	6348	6168	7203	9054	10340	8203	9991	11930	15128	19225	18104
CURRENT ASSETS	6348	8668	12257	16096	19631	22465	25577	32096	41567	49348	48525
CURRENT ASSETS RSP	9883	10417	12842	4414	22580	28240	30245	41442	57500	57235	73720
AUTOTRCKSNETDEF	800	1120	1008	907	700	1575	2380	1910	1528	1589	3599
MACHEOPTNETDEF	3975	4198	3942	3615	5833	5787	8457	11994	11341	11554	25289
LIVESTOCK	2510	2105	3175	3935	5016	5022	7240	7480	6090	7420	7600
TOTAL INV	12688	12535	13484	16454	20349	18804	26002	31164	31037	36079	51072
LT INV RSP	12688	12535	13063	15466	18949	16882	23551	28810	28627	33699	48766
INTER ASSETS	7285	7423	8125	8457	11549	12384	18077	21384	18959	20563	36488
ACCTS REC	0	0	0	0	0	0	35	0	0	364	0
BLDGS NETDEF	0	0	4300	5080	7360	7728	8005	8348	7963	7584	7237
LAND	0	0	0	24000	30000	30000	30000	30000	30000	30000	30000
LAND INFLATED	0	0	0	24000	31200	32760	34398	36118	37924	39820	66811
LT ASSETS HIST	0	0	4300	29080	37360	37728	38005	38348	37963	37584	37237
LT ASSETS INFL	0	0	4300	29080	38560	40488	42403	44466	45887	47404	74048

TOTAL ASSETS HIST	13633	13719	19846	47469	59667	58716	66743	71643	73055	78147	93363
TOTAL ASSETS INFL	13633	13719	19873	47529	61027	61748	71450	78189	81480	88603	130928
TOTAL ASSETS HIST RSP	17168	17840	25262	41951	71489	78352	86327	101174	114422	115382	147445
TOTAL ASSETS INFL RSP	13633	16091	24682	53633	69740	75337	86057	97946	106412	117315	159061

EQUITIES

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PAYABLES	858	246	68	1309	850	2533	0	184	0	0	0
RSP LOAN LIAB	0	2372	1951	3382	3814	4266	4265	4107	4613	4095	3880
CURRENT LIAB RSP	858	2618	2019	4691	4664	6799	4265	4291	4613	4095	3880
INTER LIAB	0	0	0	0	0	0	5400	7480	5910	8940	13450
LT LIAB	0	0	0	21503	18728	17633	16562	15992	14368	12763	10623
TOTAL LIAB	858	246	68	22812	19578	20166	21962	23656	20278	21703	24073
TOTAL LIAB RSP	858	2618	2019	26194	23392	24432	26227	27763	24891	25798	27953
RET EARNINGS HISTORICAL LAND C	12775	13473	19778	24657	40089	38550	44781	47987	52777	56444	69290
RET EARNINGS INFLATED LAND COS	12775	13473	19805	24717	41449	41582	49488	54533	61202	66900	106855
RET ERN HIST RSP	12775	15845	24614	30821	50162	55171	64095	74290	86134	95612	134988
RET ERNG	12775	13473	19805	24717	41449	41582	49488	54533	61202	66900	106855
RET ERN INFL RSP	12775	13473	22663	27439	46348	50904	59830	70184	81522	91517	131109
TOTAL EQUITIES HISTORICAL LAND	13633	13719	19846	47469	59667	58716	66743	71643	73055	78147	93363
TOTAL EQUITIES INFLATED LAND C	13633	13719	19873	47529	61027	61748	71450	78189	81480	88603	130928
EQUITIES HIST RSP	13633	18463	26633	57015	73554	79603	90322	102053	111025	121409	162941
EQUITIES HIST RSP	13633	16091	24682	53633	69740	75337	86057	97946	106412	117315	159061
EQUITIES	13633	13719	19873	47529	61027	61748	71450	78189	81480	88603	130928

BUDGET AND RATIO ANALYSIS

GROSS RECEIPTS	0	6829	6751	17092	16913	24599	28436	26752	34282	39328	68663
GROSS RECEIPTS RSP	0	9201	9033	18714	18995	26698	30266	29271	35777	41053	69629
CASH OPERATING EXPSE	0	7108	8188	5962	9901	13370	11610	12098	16295	21236	28808
CASH OFG EXP	0	7108	8609	6950	11301	15292	14061	14452	18705	23616	31114
DEBT REPAYMENT	0	22	246	519	841	1023	3083	4470	6194	6517	8776
INVE CHG	12688	-153	949	2970	3895	-1545	7198	5162	-127	5042	14993
INV CHG RSP	12688	-153	528	2403	3483	-2067	6669	5259	-183.3	5072	15067
NET CAPITAL ADJUSTMENT	0	-1059	-607	-26684	-8386	-6855	-12112	-6367	-1909	-14251	-15145
PROFIT LOSS FR OPERATIONS	12688	-1513	-1341	-13103	1680	1806	8829	8979	9757	2366	30927
PRFT LOSS FR OFRTNS RSP	12688	881	766	-11950	3203	3006	11291	13614	15036	8228	38363
OFF FARM INCOME	0	405	290	2256	45	502	338	352	403	1123	395

PROPRIETOR WITHDRWL RSP	0	1839	3498	3385	4033	5187	6064	5614	7186	7767	7976
ADDN TO RET EARNINGS	12688	-2947	-4128	-13244	-908	-957	5554	6071	5344	-2629	25344
ADDN TO RET ERN RSP	12688	1819	-160	-11456	1297	420.2	7396	10871	9708	2578	31439

WORKING CAPITAL	5490	6050	7353	8623	9908	6071	10661	11727	16133	20000	19638
WORKING CAPITAL	5490	6050	7380	8683	10068	6343	10970	12155	16634	20636	20392
WORKING CAPITAL	5490	5922	7135	7745	9490	5670	9991	11746	15128	19225	18104
WORKING CAPITAL RSP	5490	8422	12189	14787	18781	19932	25577	31912	41567	49348	48525
WORKING CAPITAL RSP	9025	7799	10823	-277.3	17916	21440	25980	37152	52887	53140	69841
CURRENT RATIO	7.399	25.59	109.1	7.587	12.66	3.397	999999	64.73	999999	999999	999999
CURRENT RATIO	7.399	25.59	109.5	7.633	12.85	3.504	999999	67.06	999999	999999	999999
CURRENT RATIO	7.399	25.07	105.9	6.917	12.16	3.238	999999	64.84	999999	999999	999999
CURRENT RATIO	7.399	35.24	180.3	12.30	23.09	8.869	999999	174.4	999999	999999	999999
CURRENT RATIO RSP	11.51	42.17	186.1	3.369	26.53	11.14	30245	224.0	57500	57235	73720
INTER RATIO	7285	7423	8125	8457	11549	12384	3.347	2.858	3.207	2.300	2.714
CURRENT PLUS INTER	15.87	55.54	225.3	14.04	26.21	8.283	5.321	4.344	5.937	4.537	4.173
CURRENT PLUS INTER	15.87	55.54	225.7	14.08	26.40	8.390	5.378	4.400	6.022	4.608	4.229
CURRENT PLUS INTER	15.87	55.02	222.1	13.37	25.72	8.124	5.197	4.346	5.767	4.450	4.059
CURRENT PLUS INTER	15.87	65.15	295.4	18.74	36.64	13.75	8.083	6.977	10.24	7.819	6.320
CURRENT PLUS INTER RSP	19.99	6.812	10.38	2.743	7.316	5.974	4.999	5.337	7.265	5.968	6.359
LEVERAGE HISTORICAL LAND COST	.0672	.0183	.0034	.9252	.4884	.5231	.4904	.4930	.3842	.3845	.3474
LEVERAGE INFLATED LAND COST	.0672	.0183	.0034	.9229	.4723	.4850	.4438	.4338	.3313	.3244	.2253
LEVERAGE HIST RSP	.0672	.1652	.0820	.8499	.4663	.4429	.4092	.3737	.2890	.2698	.2071
LEVERAGE INFL RSP	.0672	.1943	.0891	.9546	.5047	.4800	.4384	.3956	.3053	.2819	.2132
TURNOVER HISTORICAL LAND COST	0	.4978	.3402	.3601	.2835	.4189	.4261	.3734	.4693	.5033	.7354
TURNOVER INFLATED LAND COST	0	.4978	.3397	.3596	.2771	.3984	.3980	.3421	.4207	.4439	.5244
TURNOVER HIST RSP	0	.5158	.3575	.4461	.2657	.3407	.3506	.2893	.3127	.3558	.4722
TURNOVER INFL RSP	0	.5718	.3660	.3489	.2724	.3544	.3517	.2988	.3362	.3499	.4377
PROFIT	12688	-.2215	-.1986	-.7666	.0993	.0734	.3105	.3356	.2846	.0602	.4504
PROFIT RSP	12688	.0957	.0848	-.6385	.1686	.1126	.3731	.4651	.4203	.2004	.5510
RETURN ON ASSETS HISTORICAL CO	.9307	-.1103	-.0676	-.2760	.0282	.0308	.1323	.1253	.1336	.0303	.3313
RETURN ON ASSETS INFLATED LAND	.9307	-.1103	-.0675	-.2757	.0275	.0292	.1236	.1148	.1197	.0267	.2362
RETURN ASSTS HIST RSP	.9307	.0477	.0288	-.2096	.0435	.0378	.1250	.1334	.1354	.0678	.2354
RETURN ASSTS INFL RSP	.9307	.0548	.0310	-.2228	.0459	.0399	.1312	.1390	.1413	.0701	.2412
RETURN ON EQUITY HISTORICAL LA	.9932	-.1123	-.0678	-.5314	.0419	.0468	.1972	.1871	.1849	.0419	.4463
RETURN ON EQUITY INFLATED LAND	.9932	-.1123	-.0677	-.5301	.0405	.0434	.1784	.1647	.1594	.0354	.2894
EQUITY GROWTH HISTORICAL COST	.5180	.0033	.2328	1.049	.4634	-.0361	.3050	.1862	.0536	.1935	.5781
EQUITY GROWTH INFLATED COST	.5180	.0033	.2338	1.051	.5129	.0274	.3686	.2560	.1250	.2706	1.608
RETURN EQTY HIST RSP	.9932	.0556	.0311	-.3877	.0639	.0545	.1762	.1833	.1746	.0861	.2842
RETURN EQTY INFL RSP	.9932	.0654	.0338	-.4355	.0691	.0591	.1887	.1940	.1844	.0899	.2926
EQTY GRWTH HIST RSP	.5180	.1835	.3104	1.154	.6283	.2298	.4072	.4457	.3409	.3945	1.578
EQTY GRWTH INFL RSP	.5180	.0934	.3264	1.100	.6119	.2127	.4073	.4517	.3216	.4142	1.586
RISK BASIS EQTY GRWTH HIST	0	-.1802	-.0776	-.1048	-.1649	-.2660	-.1023	-.2595	-.2872	-.2011	-.9998
RISK BASIS EQTY GRWTH INFL	0	-.0901	-.0926	-.0492	-.0991	-.1853	-.0387	-.1957	-.1966	-.1436	.0220
FARM INT RATE OF RETURN											.0242
FARM INT RATE RIN RSP		.1236	.0345								.0312
RISK BASIS INT RATE RETURN	0	-.1236	-.0345	0	0	0	0	0	-.0045	0	-.0071
COST OF CAPITAL	.0600	.0600	.0600	.0600	.0600	.0700	.0700	.0700	.0700	.0700	.0700
PRESENT VALUE	0	-1648	-4026	-18795	-21546	-20304	-21389	-20102	-15934	-22239	-19957
PRSNT VALUE RSP	0	463.4	-373.5	-14687	-16991	-15721	-17299	-16012	-12434	-19156	-17587
RATE	.0600	.0600	.0600	.0600	.0600	.0700	.0700	.0700	.0700	.0700	.0700
NET TERMINAL VALUE	0	-1851	-4795	-23728	-28833	-28988	-32760	-32842	-27478	-41804	-39927
NET TRMNL VALUE RSP	0	520.7	-444.8	-18542	-22737	-22423	-26528	-26173	-21426	-36150	-35379
PAYMENT1			563.1	563.1	563.1	563.1	563.1				
INTEREST1			142.3	117.1	90.31	61.94	31.87				
PRINCIPAL1			420.8	446.0	472.8	501.2	531.2				
BALANCE1			1951	1505	1032	531.2	0				
PAYMENT2				541.7	541.7	541.7	541.7	541.7			

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BALANCE3					1334	1029	706.0	363.3	0		
PAYMENT4						494.3	494.3	494.3	494.3	494.3	
INTEREST4						124.9	107.8	79.27	54.37	27.98	
PRINCIPAL4						369.3	391.5	415.0	439.9	466.3	
BALANCE4						1713	1321	906.2	466.3	0	
PAYMENT5							498.3	498.3	498.3	498.3	498.3
INTEREST5							125.9	103.6	79.92	54.81	28.21
PRINCIPALS5							372.4	394.7	418.4	443.5	470.1
BALANCE5							1727	1332	913.6	470.1	0
PAYMENT6								434.4	434.4	434.4	434.4
INTEREST6								109.8	90.32	69.68	47.79
PRINCIPAL6								324.6	344.1	364.8	386.6
BALANCE6								1505	1161	796.5	409.8
PAYMENT7									598.0	598.0	598.0
INTEREST7									151.1	124.3	95.91
PRINCIPAL7									446.9	473.7	502.1
BALANCE7									2072	1598	1096
PAYMENT8										354.9	354.9
INTEREST8										89.70	73.79
PRINCIPAL8										265.2	281.1
BALANCE8										1230	948.7
PAYMENT9											420.7
INTEREST9											120.8
PRINCIPAL9											300.0
BALANCE9											1425
PAYMENT10											
INTEREST10											
PRINCIPAL10											
BALANCE10											
PAYMENT11											
INTEREST11											
PRINCIPAL11											
BALANCE11											
PAYMENT12											
INTEREST12											
PRINCIPAL12											
BALANCE12											
PAYMENT13											
INTEREST13											
PRINCIPAL13											
BALANCE13											
PAYMENT14											
INTEREST14											
PRINCIPAL14											
BALANCE14											
PAYMENT15											
INTEREST15											
PRINCIPAL15											
BALANCE15											
RSP LOAN	0	2372	2282	1622	2082	2099	1830	2519	1495	1725	966
RSP PYMNT	0	0	421	987.7	1400	1922	2451	2354	2410	2380	2306
RSP LOAN LIAB	0	2372	1951	3382	3814	4266	4265	4107	4613	4095	3880
CENTER INCOME STATEMENT											
UNDERLINE*											
OPERATING RECEIPTS											
UNDERLINE											
CROP	0	3541	3619	5655	10212	7505	8742	8045	10245	10461	18978
LIVESTOCK	0	1792	1352	2325	3194	9514	11515	13821	14148	14355	15259
LIVESTOCK PRODUCTS	0	862	810	695	640	425	364	0	55	0	0

TOTAL LIVESTOCK PRODUCTS RECEI 0 0 0 0 0 0 0 0 0 0 0 0

OTHER FARM RECEIPTS

CUSTOM WORK	25	0	136	0	0	0	0	90	0	1515	609
REC PRIOR PERIOD	0	0	0	0	0	0	0	0	0	0	0
LOAN DRAWDOWN	4800	11179	10300	3190	0	0	0	20000	8250	32500	38000
GOV GRANTS	2558	2859	1399	410	975	1477	6504	11858	21006	8486	5529
MISC	229	0	971	50	0	0	774	2425	655	1124	1417
TOTAL OTHER FARM RECEIPTS	7612	14038	12806	3650	975	1477	6778	34373	29911	43625	45555
TOTAL FARM RECEIPTS	39181	51756	46551	41978	30429	53470	70786	131190	112498	150443	99805

EXPENSES

CROP	6502	8259	9947	9732	8496	8955	15143	27600	19327	20103	22792
LIVESTOCK	34	40	42	45	0	0	0	0	0	0	0
CAR	400	405	500	500	363	216	539	362	538	469	614
TRUCK	512	577	445	570	1144	1172	888	1628	1641	1917	2406
TRACTOR	589	1740	1038	1138	1680	1276	963	3081	2567	1900	1496
COMBINE	254	766	380	538	484	551	587	797	1371	1303	1202
OTHER EQPT	384	383	376	864	501	649	927	1226	995	744	1042
REPAIRS MAINT	185	377	293	776	1089	796.4	1063	2561	237	906	345
RENT LAND	2750	2875	3003	2150	4024	4520	5335	4063	3812	1938	2325
SMALL TOOLS	273	210	52	71	203	124	324	196	183	249	482
LABOUR	1146	1378	1209	1166	1464	1408	2236	1394	4383	3791	3234
UTILITIES	168	183	237	246	254	202	229	276	307	412	605
INSURANCE	103	101	116	113	113	118	163	163	208	357	391
LOAN INTRST	11562	7414	12550	2067	1454	1412	1389	1302	1239	1210	1157
PAYABLES PRIOR PERIOD	0	0	0	454	405	1190	0	0	0	0	0
PRTY TAXES	1248	1563	1563	1563	1557	1571	1567	1984	2441	2477	3116
OTHER EXP	293	199	157	166	210	430	77	1045	306	140	352
TOTAL FARM EXPENSE	26403	26470	31908	22159	23441	24590	31430	47678	39555	37916	41558

CAPITAL TRANSACTIONS

SALES

LIVESTOCK SALES	0	0	4600	5114	0	0	0	0	0	32107	26613
MACH SALES	1190	100	400	0	8600	0	8371	1950	350	21850	1225
TOTAL SALES	1190	100	5000	5114	8600	0	8371	1950	350	53957	27838

EXPENDITURES

LIVESTOCK EXP	6406	11700	4600	100	0	0	0	23296	42947	33312	30000
MACH EQPT EXP	26783	1341	1878	2867	13413	1600	24551	33702	3324	29950	42267
LAND EXP	21000	0	0	0	0	0	0	0	0	0	0

1.140 1.090 1.080 1.080 1.090 1.110 1.050

FIXED INCOME B 1.030 1.130 .9900 1.160 1.180 1.070 1.060 1.050 1.110 1.120 1.060

FUND GROWTH FROM CASH LESSER OF DOLLAR OR PERCENT

BALANCED A GROWTH	1578	2190	2528	2324	2712	4591	6272	9018	14641	19251	21746
BALANCED B GROWTH	1494	2137	2608	2680	3126	5022	6544	9300	14881	19370	21098
EQUITY A GROWTH	1433	2135	2692	2681	3235	5278	6787	9701	14962	20057	23618
EQUITY B GROWTH	1543	2180	2737	2969	3444	5463	7017	9614	15344	19265	20797

ANNUAL RSP CONTRIBUTION FROM SURPLUS BASED ON LESSER OF
DOLLAR LIMIT OR PERCENT LIMIT

FLG INC RSP	41787	53212	52040	49607	41619	54218	74677	134606	114140	210220	132663
FARM OUTLAY	99353	56563	58186	48272	51571	38478	74125	125736	122003	166735	150320
SURPLUS PRE RSP	-57566	-3351	-6146	1335	-9952	15540	5547	8870	-7863	43485	-17657
RSP SURPLUS CODE	0	0	0	1	0	1	1	1	0	1	0
RSP SURPLUS CALC	0	0	0	267.0	0	3108	1109	1774	0	8697	0
MAX RSP SURPLUS CONTRN	0	0	0	267.0	0	3108	1109	1774	0	5500	0
SURPLUS POST RSP	-57566	-3351	-6146	1068	-9952	12432	4437	7096	-7863	37985	-17657

FUND GROWTH FROM SURPLUS LESSER OF DOLLAR OR PERCENT

BAL A SURPLUS	5292	6191	5572	5059	5514	9670	10586	10243	12087	18916	20430
BAL B SURPLUS	5061	6073	5830	5922	6515	10730	11303	10929	12787	19566	20349
EQTY A SURPLUS	4600	5749	5749	5671	6465	10931	11494	11429	12915	20223	22852
EQTY B SURPLUS	5113	6084	6084	6534	7187	11661	12304	11617	13708	20031	20631
EQTY C SURPLUS	5493	6756	6688	6353	7243	13248	13563	12895	15217	21782	22217
FXD INC A SURPLUS	4557	4876	4583	5309	6052	9705	11590	14292	15578	22791	23931
FXD INC B SURPLUS	4725	5340	5286	6399	7551	11188	12968	15391	17084	24634	26112

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RSP FIXED DOLLAR CLAIM TO SURPLUS

SURPLUS PRE FXD DOLLAR CLAIM	-57566	-3351	-6146	1335	-9952	15540	5547	8870	-7863	43485	-17657
DOLLAR WITHDRWL	2500	2500	2500	2500	2500	4000	4000	4000	4000	5500	5500
SURPLUS POST FXD DOLLAR CLAIM	-60066	-5851	-8646	-1165	-12452	11540	1547	4870	-11863	37985	-23157

FUND GROWTH FROM SURPLUS FXD DOLLAR CLAIM

BAL A SURPLUS FXD	40464	49843	47358	43228	49619	63046	65785	56628	70822	84112	96341
BAL B SURPLUS FXD	37653	47684	48276	49328	56761	70410	70889	61420	75862	88948	98006
EQTY A SURPLUS FXD	37480	49350	51850	51239	60913	77704	77819	69368	82386	99420	117844
EQTY B SURPLUS FXD	39821	49888	52388	56459	64605	80880	81645	69316	85793	96440	104834
EQTY C SURPLUS FXD	44812	57618	59542	56683	67119	97967	96089	82793	101695	114314	122100
FXD INC A SURPLUS FXD	33147	37967	38189	44508	53239	62031	70993	80673	91933	107546	118423
FXD INC B SURPLUS FXD	34471	41452	43537	53003	65044	73597	82013	90113	104026	122009	134830

RSP FIXED DOLLAR CLAIM TO CASH

CASH PRE FXD RSP CLAIM	1620	1719	2783	752	892	6820	8864	25822	31272	15000	4770
DOLLAR WITHDRWL	2500	2500	2500	2500	2500	4000	4000	4000	4000	5500	5500
CASH POST RSP FXD CLAIM	-880	-781	283	-1748	-1608	2820	4864	21822	27272	9500	-730
BORROW CODE	1	1	0	1	1	0	0	0	0	0	1
BORROW CALC	980	881	0	1848	1708	0	0	0	0	0	830
BORROW CALC CORR	980	881	0	1848	1708	0	0	0	0	0	830

FUND GROWTH FROM CASH FXD DOLLAR CLAIM

BAL A CASH FXD	40464	49843	47358	43228	49619	63046	65785	66628	70822	84112	96341
BAL B CASH FXD	37653	47644	48276	49328	56761	70410	70889	61420	75862	88948	98006
ERTY A CASH FXD	37480	49350	51850	51239	60913	77704	77819	69368	82386	99420	117844
ERTY B CASH FXD	39821	49888	52388	56459	64605	80880	81645	69316	85793	96440	104834
ERTY C CASH FXD	44812	57618	59542	56683	67119	97967	96089	82793	101695	114314	122100
FXD INC A CASH FXD	33147	37967	38189	44508	53239	62031	70993	80673	91933	107546	118423
FXD INC B CASH FXD	34471	41452	43537	53003	65044	73597	82013	90113	104026	122009	134840
FCC INDEX	1.050	1.050	1.050	1.050	1.050	1.050	1.050	1.050	1.050	1.050	1.050
PURCHASES	0	0	0	0	0	0	0	0	0	0	0
INFLATION	70152	73659	77342	81209	85270	89533	94010	98710	103646	108828	114769

COMPARATIVE ANALYSIS

ASSETS

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CASH	1620	1719	2783	752	892	6820	8864	25822	31272	15000	4770
CASH POST RSP FLEX	1296	1375	2226	601.6	713.6	5456	7091	21822	27272	12000	3816
CASH POST RSP FXD	100	100	284	100	100	2820	4864	21822	27772	9500	100
POST RSP SURPLUS	-60066	-5851	-8646	-1165	-12452	11540	1547	4870	-11863	37985	-23157
BONDSINVEST	0	0	0	0	1350	2606	3920	0	22600	42000	82000
RSP ACTUAL	0	0	0	0	0	0	3200	9400	14800	31700	41600
RSP CASEFARM	1578	2190	2529	2324	2712	4591	6272	9018	14641	19251	21746
FXD RSP	40464	49843	47358	43228	49619	63046	65785	66628	70822	84112	96341
LIFEINSCSV	3700	4040	4350	4340	3320	4880	4800	5100	5450	5660	6075
PREPAIDS	1000	0	0	0	0	0	0	0	0	0	0
INVENTORIES											
GRAINFEED	25481	25118	16900	20101	28867	38650	79770	97520	20360	92150	80600
GRN LESS PYMNT	23437	23270	15435	18991	27727	37329	78688	96653	19493	91733	80398
SUPPLIES	298	305	295	3670	2740	1890	6850	16450	16725	18290	9685
LIVSTKSUPPLIES	544	495	429	375	330	305	280	260	250	240	235
MSHLD GOODS	1500	1500	1500	1500	1500	1500	2000	2500	3500	4000	4500
CURRENT ASSETS	34143	33177	26257	30738	38999	56631	109684	157052	114957	209040	229465
CURRENT ASSETS	35397	35023	28228	32912	41533	59878	114183	162070	125598	225291	250257
CURRENT ASSETS	32623	31558	23757	30086	38207	52651	105684	153052	110957	203540	224795
CURRENT ASSETS	71043	79553	69650	72204	86686	114376	170387	208813	180911	287235	320933
CURRENT ASSETS RSP	37937	100910	80149	93364	105712	166338	253112	298399	176777	427122	400022
AUTOTRCKSNETDEF	3390	2360	1916	4135	3495	2820	5400	19360	15810	12760	12400
MACHEDFNETDEF	25781	24210	24695	19954	24838	23708	36542	48321	48936	59052	82907
LIVESTOCK	4500	4400	6700	0	0	0	0	0	20000	25600	22962
TOTAL INV	63494	60388	52435	49735	61770	68873	130842	184411	125581	212092	213289
LT INV RSP	61450	58540	50970	48625	60630	67552	129760	183544	124714	211675	213087
INTFR ASSETS	35671	32970	33311	24089	28333	26528	41942	67681	84746	97412	118269
ACCTS REC	0	0	0	0	0	0	0	0	0	0	0
BLDGS NETDEF	7945	7635	7963	8453	8756	10877	12710	20020	22490	21330	22690
LAND	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000
LAND INFLATED	70152	73659	77342	81209	85270	89533	94010	98710	103646	108828	114269
LT ASSETS HIST	62945	62635	62964	63453	63756	65877	67710	75020	77490	76330	77690
LT ASSETS INFL	78097	81294	85305	89662	94026	100410	106720	118730	126136	130158	136959
TOTAL ASSETS HIST	132759	128782	122531	118280	131088	149056	219336	299753	277193	382782	425424

EQUITIES

PAYABLES	0	0	454	798	1190	0	0	0	0	0	4000
RSP LOAN LIAB	3117	2523	2174	1216	2139	2795	1908	1174	389.3	0	0
CURRENT LIAB RSP	3117	2523	2628	2014	3329	2795	1908	1174	389.3	0	0
INTER LIAB	12820	11290	10860	6005	2000	1500	1000	500	20000	8250	28500
LT LIAB	30471	29387	28446	28232	27498	27040	26583	26075	25540	24975	24380
TOTAL LIAB	43291	40677	39760	35035	30688	28540	27583	26575	45540	33225	56880
TOTAL LIAB RSP	46408	43200	41934	36251	32827	31335	29491	27749	45929	33225	56880
RET EARNINGS HISTORICAL LAND C	89468	88105	82771	83245	100400	120516	191753	273178	231653	349557	368544
RET EARNINGS INFLATED LAND COS	103874	108611	107084	111628	133203	158276	235262	321906	290940	419637	448605
RET ERN HIST RSP	141520	154140	148506	150920	178356	212774	291466	368649	346253	481580	519282
RET ERNG	105874	108611	107084	111628	133203	158276	235262	321906	290940	419637	448605
RET ERN INFL RSP	138403	150616	146332	149704	176217	209980	289558	367475	345864	481580	519282
TOTAL EQUITIES HISTORICAL LAND	132759	128702	122531	118280	131088	149056	219336	299753	277193	382782	425424
TOTAL EQUITIES INFLATED LAND C	149165	149288	146844	146663	163891	186816	262845	348481	336480	452862	505485
EQUITIES HIST RSP	187228	196340	190441	187171	211183	244109	320957	396399	392182	514805	576162
EQUITIES HIST RSP	184811	193817	188266	185955	209044	241314	319049	395224	391793	514805	576162
EQUITIES	149165	149288	146844	146663	163891	186816	262845	348481	336480	452862	505485

BUDGET AND RATIO ANALYSIS

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GROSS RECEIPTS	39617	52231	47040	42645	31311	54218	71301	132656	113790	156263	103995
GROSS RECEIPTS RSP	40597	53112	47040	44493	33019	54218	71301	132656	113790	156263	104825
CASH OPERATING EXPSE	31558	34207	37693	27977	29679	33609	46136	65261	65830	78992	69006
CASH ONS EXP	33602	35055	39158	29087	30819	34931	47218	66128	66697	79409	69208
DEBT REPAYMENT	11562	7414	12550	16218	7339	2147	956	1008	1035	20564	8845
INVE CHG	12422	-3106	-7953	-2700	12035	7103	61969	53569	-58830	86511	1197
INV CHG RSP	12685	-2911	-7570	-2345	12005	6922	62208	53784	-58830	86962	1411
NET CAPITAL ADJUSTMENT	-52999	-13994	-1478	2147	-4813	-1600	-17580	-66650	-53921	-12805	-44429
PROFIT LOSS FR OPERATIONS	-44080	-5490	-12634	-2103	1515	23965	68598	63306	-65826	130413	-17088
PRET LOSS FR OPERNS RSP	-33582	956.8	-1549	14853	9422	24790	68472	63447	-65658	150560	-7615
OFF FARM INCOME	436	475	489	667	882	748	515	1466	1292	5820	4190
OFF FARM INCOME RSP	1416	1356	489	2515	2590	748	515	1466	1292	5820	5020
TOTAL INCOME	-43644	-5015	-12145	-1436	2397	24713	69113	64772	-64534	136233	-12898
TOTAL INCOME RSP	-37166	2313	-1060	17368	12012	25538	68987	64913	-64366	156380	-2595
TAX WITHDRWL	396	484	362	395	669	835	1873	3591	13399	10316	7299
PROPRIETOR WITHDRWL	5155	6737	5785	5818	6238	9019	14706	17583	26275	41076	27448
PROPRIETOR WITHDRWL RSP	7199	8081	7250	6928	7378	10340	15788	18450	27142	41493	27650
ADDN TO RET EARNINGS	-49195	-12236	-18292	-7649	-4510	14859	52534	43599	-104208	84841	-47645
ADDN TO RET ERN RSP	-39760	-6256	-8672	10045	3965	14363	51326	42872	-104908	104572	-37544
WORKING CAPITAL	34143	33177	25803	29940	37809	56651	109684	167052	114957	209040	225465
WORKING CAPITAL	35397	31023	27774	32114	40343	59878	114183	162070	125598	225291	246257
WORKING CAPITAL	32623	31558	23304	29288	37017	52651	105684	153052	110957	203540	220795
WORKING CAPITAL	71043	79553	69196	71406	85496	114376	170387	208813	180911	287235	316933
WORKING CAPITAL RSP	34820	98386	77521	91350	102383	163543	251204	297225	176388	427122	396022
CURRENT RATIO	999999	999999	57.83	38.52	32.77	999999	999999	999999	999999	999999	57.37
CURRENT RATIO	999999	999999	62.18	41.24	34.90	999999	999999	999999	999999	999999	62.56
CURRENT RATIO	999999	999999	52.33	37.70	32.11	999999	999999	999999	999999	999999	56.20
CURRENT RATIO	999999	999999	153.4	90.48	72.85	999999	999999	999999	999999	999999	80.23
CURRENT RATIO RSP	37937	100910	176.2	116.9	88.76	166338	253112	298399	176777	427122	99.98
INTER RATIO	2.782	2.920	3.067	4.011	14.16	17.67	41.90	135.1	4.237	11.81	4.150
CURRENT PLUS INTER	5.445	5.858	5.265	8.058	21.10	55.42	151.5	448.6	9.985	37.14	10.70
CURRENT PLUS INTER	5.543	6.022	5.439	8.378	21.89	57.57	156.0	458.6	10.52	39.11	11.34

APPENDIX C
PORTFOLIO SELECTION THEORY

APPENDIX C

PORTFOLIO SELECTION THEORY

Portfolio selection theory is concerned with the best way to form combinations of securities and evaluating alternative combinations of securities. It provides a normative model to explain the behaviour of rational risk-averse investors in allocating capital between securities promising returns with varying degrees of risk.

Modern portfolio selection theory owes its name and origin to Harry Markowitz's paper "Portfolio Selection" published in 1952.⁷² Markowitz made three significant contributions via this paper. First, he reasoned that most portfolios could be removed from consideration because they were inefficient in that they (i) had more risk than another portfolio of equal return or (ii) they offered less return than another portfolio of equal risk. Markowitz's second contribution demonstrated why and by how much the risk of a portfolio might be less than the sum of the risks of each individual security. Finally, Markowitz proved that efficient portfolios could be created through quadratic programming.

⁷² H. M. Markowitz, "Portfolio Selection, "Journal of Finance, Vol. 7, 1952, pp. 77-91.

The problem of selecting combinations of enterprises for farms is similar in nature to the portfolio problem for the investor. The selection of farm enterprise and asset combinations can be regarded as a special case of the portfolio problem. The similarity occurs when a farm-operator, with a specific holding of land, views his net incomes from farm firm enterprises and assets in probabilistic terms, creating the problem of selecting an optimal mix of enterprises and assets. It is the similarity of the two that allows the applications of portfolio selection theory to the study of farm firm diversification.

A great deal of time and effort has been devoted to the analysis of the farm firm diversification problem. The majority of these studies have been developed and influenced by Markowitz's analysis of the portfolio problem.⁷³ These studies calculated the probability distributions of net returns from farm enterprises and identified the "efficiency frontiers" or "efficiency locus". If one assumes that farm-operators are risk averse, these studies provide a possible solution to the investment problem by limiting the alternatives in the feasible set of strategies. The following discussion is directed to an examination of the under-pinnings of portfolio theory which provides a potential solution to the farm firm problem.

ASSUMPTIONS

The possibilities for applying portfolio selection theory to decisions related to resource allocation and investment choice under risk for the farm firm are illustrated in the following discussion. The analysis that follows is based on a restrictive set of assumptions that are enumerated below:

1. Investors' maximize one-period expected utility and exhibit marginal utility of wealth. Although investors do not visualize assets as probability distributions of expected returns over some holding period, their behaviour is consistent with this process.
2. Investors' risk estimates are proportional to the variability of the expected returns.
3. Investors' base their decisions in terms of expected return and risk. That is, utility (U) is a function of variability of return (σ) and expected returns ($E(r)$). Symbolically, $U = f(\sigma, E(r))$.
4. Investors', for any given level of risk, prefer higher returns to lower returns. Symbolically,
$$\delta U / \delta E(r) > 0.$$

The converse, of course, is that for any given level of return, investors prefer less risk over more risk. Symbolically, $\delta U / \delta \sigma < 0$.

These assumptions will be maintained throughout the ensuing discussion. Those investors that concur with these assumptions will prefer "Markowitz efficient assets".

Portfolio analysis is structured on the premise that the most desirable assets are those which have:

1. the minimum expected risk at any given expected rate of return, or conversely,
2. the maximum expected rate of return at any given level of expected risk.

In all cases but one, these assets are portfolios of assets rather than individual assets. Whether these portfolios contain one or more assets they are called "efficient portfolios". Individuals that adhere to the above assumptions obviously prefer efficient portfolios to non-efficient portfolios.

In the "real world" many investors are observed to be holding non-efficient portfolios. This observation raises legitimate questions as to the validity of the assumptions and thus the analysis. Needless to say portfolio analysis is

based on some simplified assumptions about reality. It is worthwhile at this point to examine the assumptions underlying portfolio analysis.

The first assumption may be violated in many respects. Firstly, not all investors possess a sophisticated knowledge of economic forecasting techniques or may not know how to determine the rate of return from their investment. Secondly, rather than considering the assets terminal wealth or rate of return, investors may instead examine non-pecuniary return or the "glamour", of that particular asset. Finally, investors frequently do not base their decisions on probability distributions but on the subjective "most likely" outcome.

It is debated, frequently, whether these violations of the assumptions are serious or not. Investors concerned with an assets non-pecuniary return or "glamour" probably do so because they believe these factors affect the assets terminal wealth or rate of return. "Most likely" estimates are probably based on some form of subjective probability distribution albeit perhaps implicitly.

The third assumption may be an oversimplification if investors are truly concerned with the non-pecuniary return or "glamour" of an asset. If these or any other factors do affect the expected value and variability of a security's rate

of return then this assumption is not violated.

The fourth and final assumption has been attacked by many as inadequate. Its critics point out that business people infrequently maximize or minimize; they only attempt to do a satisfactory or sufficient job.⁷⁴ However, it can be argued that if some highly competitive business person attempts to achieve optimization of a particular objective then other business people will follow the leader. If this argument resembles the truth, then the fourth assumption is not so inadequate.

The most desirable situation would be to have none of these assumptions violated. However, it is not absolutely necessary to have this ideal state of the world in order to establish and maintain the value of the analysis. So long as the analysis can yield worthwhile predictions then it can be of value in spite of the debatable assumptions. After all, people need only behave as if they were described by the assumptions for a theory to be useful.

RISK

Risk is a concept that is an integral part of portfolio

⁷⁴ P. Lusztig and B. Schwab, Managerial Finance in a Canadian Setting, (Toronto: Butterworths, 1977), p.6.

analysis. Unfortunately it is a concept that does not lend easily to a universal definition. Verbal definitions of risk abound in the literature, but due to their subjective nature, they do not yield to a quantitative measurement.⁷⁵ Variance, standard deviation and the "largest loss" over a period of time were also recommended by Markowitz as useful measures.

Modern portfolio theory has associated risk with variance or variability of return. Variability, in an asset is not a desirable feature for the more variable in return, the more uncertain one is about the actual return. The analysis of variability must also consider investments of widely differing characteristics and thus for risks coming from different origins. Spence⁷⁶ has tendered the following summary of risk origins to demonstrate the complexity of the risk issue.

Business Risk - The probability of a decline in the value of an equity asset due to a decline in the earnings of the business.

Market Risk - The probability of a decline in the trading value of an equity asset (such as a common stock or a mutual fund) due to the

⁷⁵ F. Block, "Risk and Performance," Financial Analysis Journal, March-April 1966. Reprinted in C.F.A. Readings in Financial Analysis, Second Edition, (Georgetown, Irwin Dorsey Ltd., 1970), p. 565.

⁷⁶ Spence, op. cit., p. 13.

investors' expectations regarding that asset's earning power in the future.

Interest Rate Risk - The probability of an increase in the general level of interest rates which will cause the price of a fixed income asset (for example a bond) to decline until the overall yield is comparable with the elevated market rate.

Purchasing Power Risk - the probability of a decline in the real value of the income produced by a fixed income asset due to an increase in the general price level (inflation).

Longevity Risk - the probability of exhausting the income producing capital base before death.

The mathematical expectations of the possible rates of return is $E(r)$ which represents the mean or expected value of the probability distribution of returns. The expected return is defined in Equation 2.1 as $E(r) = \sum p_i r_i$ (2.1) where p_i is the probability of the i th rate of return. Graphically, any area to the left of $E(r)$ represents disappointing outcomes to the investor as they indicate one's risk.

The semivariance of returns, as suggested by Markowitz, is defined in Equation 2.2. This indicator of risk measures

the area below $E(r)$ in the probability distribution of returns.

$$SV = \sum P_i (r_i - E(r))^2, \quad (2.2)$$

where r_i are the rates of return that are less than $E(r)$. The r_i 's are below average rates of return.

The dispersion or width of the entire probability distribution, rather than just the area below $E(r)$, is indicated by the variance of returns which is defined as

$$\sigma^2 = \sum P_i (r_i - E(r))^2 \quad (2.3)$$

The standard deviation of returns is the square root of Equation 2.3.

Three different types of probability distributions of returns can occur for an asset. One asset's probability distribution of rates of returns may be symmetric or skewed to the right or left. Blume⁷⁷ indicates that the distribution of returns are symmetric thus one can employ the standard deviation of returns with confidence. Markowitz points out that the standard deviation (variance) "is superior with respect to cost, convenience and familiarity"... and "will produce the same set of efficient portfolios"... as the

⁷⁷ M. E. Blume, "Portfolio - Theory A Step Toward its Practical Application, Journal of Business, April, 1970, p. 163.

semivariance if the probability distributions are symmetric.⁷⁸

UTILITY FOUNDATIONS

Utility theory provides a conceptual framework within which decisions under uncertainty can be examined. This theory is used extensively by economists to detect increases or decreases in satisfaction which individuals derive from the use or ownership of goods and services. Its virtues are its low information requirements and its generality.

Utility theory is applicable in a general sense for the purposes of this research. Its focus will be on investment outcomes.

Investment outcomes affect utility through its effects on wealth. Utility from investments can be depicted as a function of the rate of return on invested wealth because the rate of return is a measure of the rate at which wealth is accumulated.

If a utility maximizer knew in advance all the possible investment outcomes i.e., a world of certainty, then he would

⁷⁸ H. M. Markowitz, Portfolio Selection, Efficient Diversification of Investments (New York: John Wiley and Sons, 1959), pp. 193-194.

place all his wealth in the asset that produced the highest expected rate of return. However, in an uncertain world one can only maximize what one "expects" utility to be. Thus with this element of uncertainty in decision making the concept of risk becomes an important consideration. Symbolically, the relationship between an investor's utility and his investments in a world of uncertainty is represented in Equation 2.4.

$$\begin{aligned} E(u) &= f (E(r), \text{risk}) \\ &= f (E(r), \sigma) \quad (2.4) \end{aligned}$$

Economists have been able to distinguish between three classes of investors:

(a) risk averters - individuals with concave utility functions who require a positive premium in expected values before undertaking a risky proposition.

(b) risk seekers - individuals with convex utility functions who accept risk even when the expected value is known to be negative.

(c) risk neutral - individuals with linear utility functions who are neither willing to pay a premium to enter a fair game of chance and so not require a risk premium in order to enter such a game.

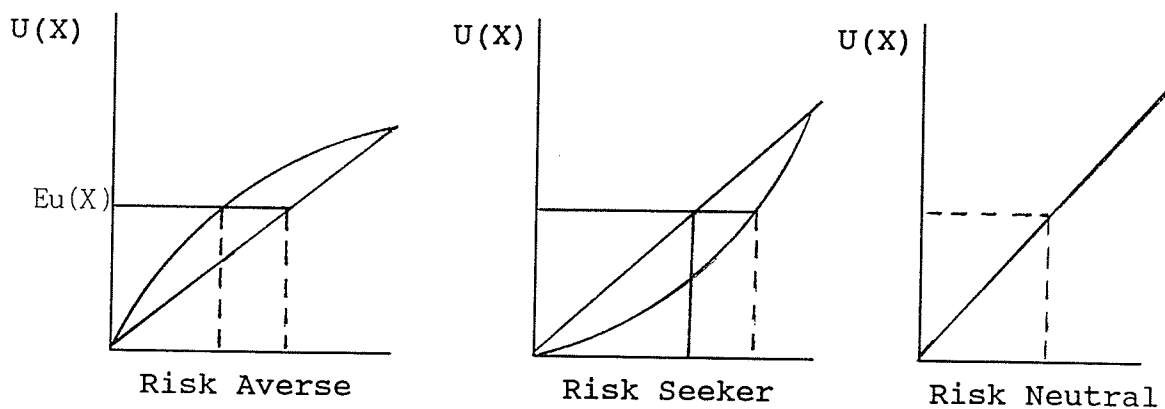


Figure C.1: Three Basic utility Functions

Figure C.1 depicts the three utility functions.

The concept of utility, on first reading, seems very complex and theoretical. However, it is a useful concept for predicting and analyzing choices. Utility theory allows one to rank uncertain alternatives according to their expected utilities.

INVESTOR PREFERENCES AND INDIFFERENCE CURVES

Investor's preferences can be represented by indifference curves, Figure C.2; they are sometimes called utility isoquants. Indifference curves are drawn so that investor satisfaction is equal all along their length. The curves are positively sloped reflecting investors dislike for risk and like for larger expected returns, the positively sloped curves

reflect the risk seekers preferences.

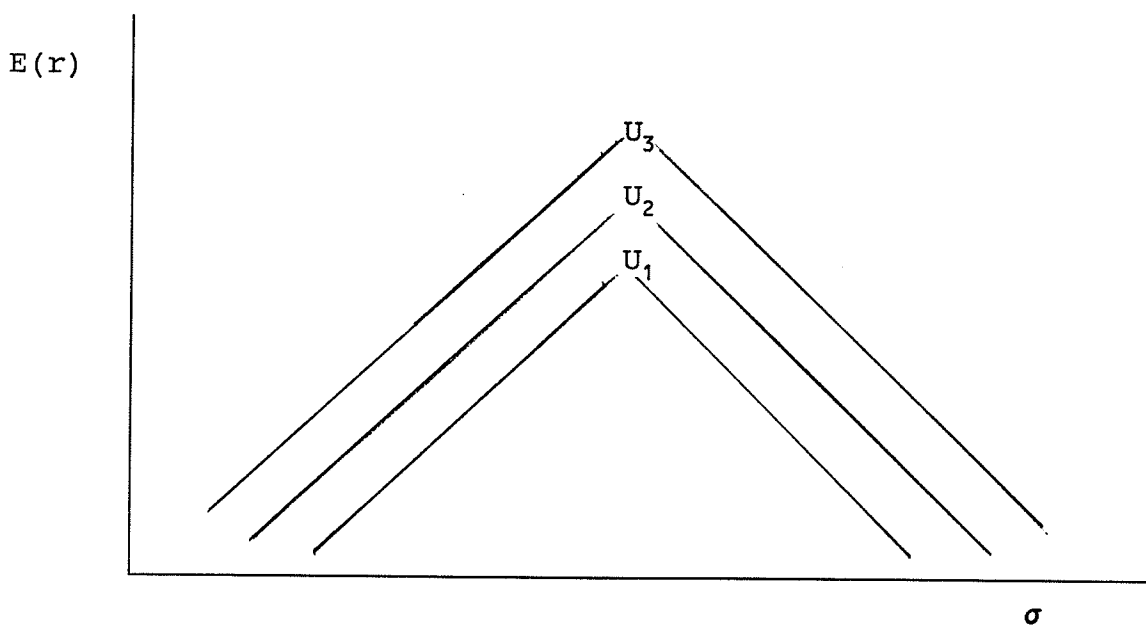


Figure C.2: Indifference Curves for Return and Risk

The higher numbered indifference curves indicate higher levels of satisfaction. As the curves rise they become more vertical reflecting diminishing willingness to assume risk.

The indifference map can be made determinate by including the line Q which indicates the dominant opportunity locus of investments. The investor will try to attain the highest indifference curve tangent to the dominant opportunity locus, Q , and thereby reach a point R where satisfaction is maximized.

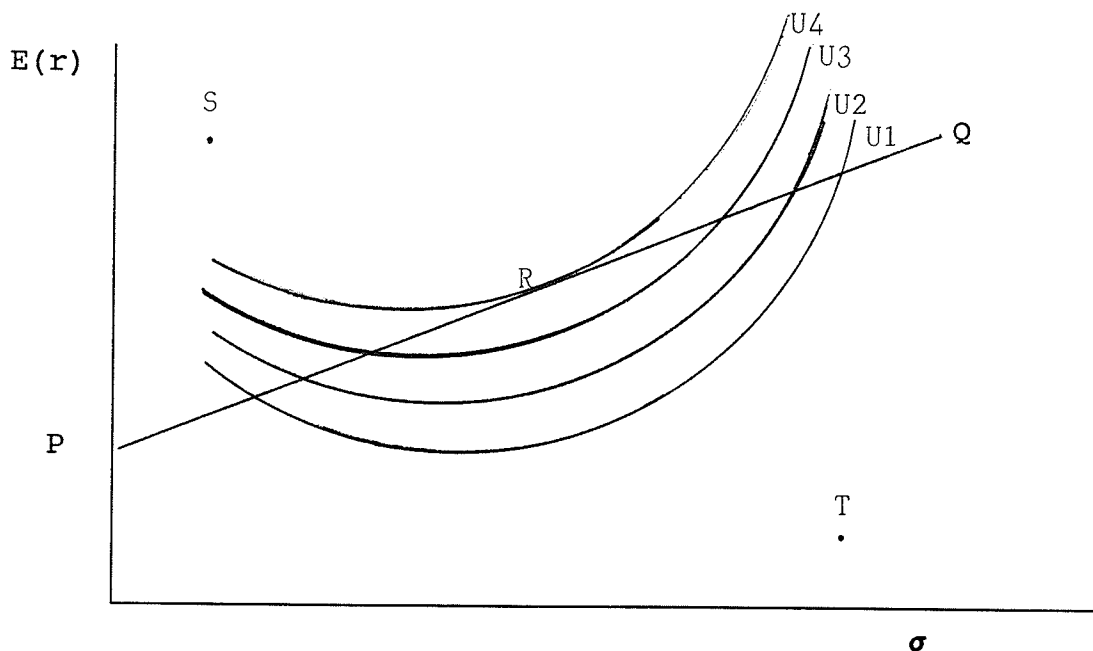


Figure C.3: Investor Indifference Curves

Investments in Figure C.3, such as T with larger risks and no compensating returns, which are dominated by superior investments will receive little demand and consequently its price will decrease. An investment's rate of return is the ratio of its dividends plus capital gains or losses, all over the purchase price. After a fall in price for T the denominator of the ratio will decrease enough to increase the value of the rate of return. The equilibrium return on T will move toward Q as the temporary capital losses occur. Point S, and all other points above line Q, represent undervalued investments whose prices will be bid up. The higher denominator in the rate-of-return ratio will decrease the expected rate-of-return on the formerly undervalued investment, and it will tend to be relocated on Q.

OPPORTUNITY LOCUS

The central focus of applied portfolio theory is the analysis concerning the opportunity locus. There is a large body of literature pertaining to the mathematical analysis of portfolio selection. Computer simulation models have been developed to routinize portfolio selection. Although mathematical analysis cannot accommodate all the qualitative variables that influence portfolios it can help in slimming the problem to manageable size.

Once the problem has been cut down to size one can then examine the alternatives and exercise ones judgement effectively.

W. J. Baumol⁷⁹ writes that the sheer complexity of the portfolio selection problem is its combinatorial character. The complex combinatorial character can be simply demonstrated with the portfolio selection of two securities out of three possible stocks; A, B and C. The investor must compare the following three portfolios: AB, or AC, or BC. To make the selection slightly more complex one can add two more stocks i.e., five candidate stocks. The potential portfolio can now be AB, AC,

⁷⁹ W. J. Baumol, Portfolio-Theory: The Selection of Asset Combinations (Monistown: General Learning Press, 1970), p. 21.

AD, AE, BC, BD, BE, CD, EC, or DE. The addition of two new candidate stocks increases the number of possible portfolios from three to ten. If one were to select ten stocks from a hundred possible candidates then the number of alternative portfolios would exceed 17,000,000,000,000. "In general, the number of possibilities increases far more rapidly than the number of stocks to be considered and soon grows astronomical".⁸⁰

It is obvious that a potential investor could not possibly weight the advantages and disadvantages of a portfolio without some sort of sophisticated aid.

Markowitz devised a computational model to trace out the efficient (opportunity) locus and to identify the portfolios that make it up. Identifying the efficient locus culls out the nonoptimal investment candidates and provides the investor with a systematic listing of the relative riskiness of the remaining candidates from which to select.

An opportunity set can be generated by plotting all investments $E(r)$ and connecting these possible investments with lines representing possible portfolios (Figure 2.12). All individual securities as well as all portfolios not containing P are found within the opportunity set. Any point

⁸⁰ Loc. cit.

found within the opportunity set is said to be a feasible investment. The efficient frontier, which constitutes all the efficient investments, of the opportunity set is found between points A and B.

An efficient investment has one of the following characteristics: (1) it has more return than any other investment with the same variability of returns or (2) it has less risk than any other security with the same return. The efficient frontier of the opportunity set is said to dominate all other investments in the opportunity set. The opportunity set characteristically takes on the peculiar scalloped quartermoon shape as shown in Figure C.4.

The particular shape of the efficient frontier is explained by Hirschleifer in the following way:

The curvature shown for the efficient frontier - opposite to that of the $(E(r), \sigma)$ indifference curves - follows from the covariance effect, since moving to higher value of portfolio $E(r)$ progressively reduces the number of securities that can be held in combination so as to lower σ .⁸¹

⁸¹ J. Hirschleifer, "Efficient Allocation of Capital in an Uncertain World", American Economic Review, May 1964, p.

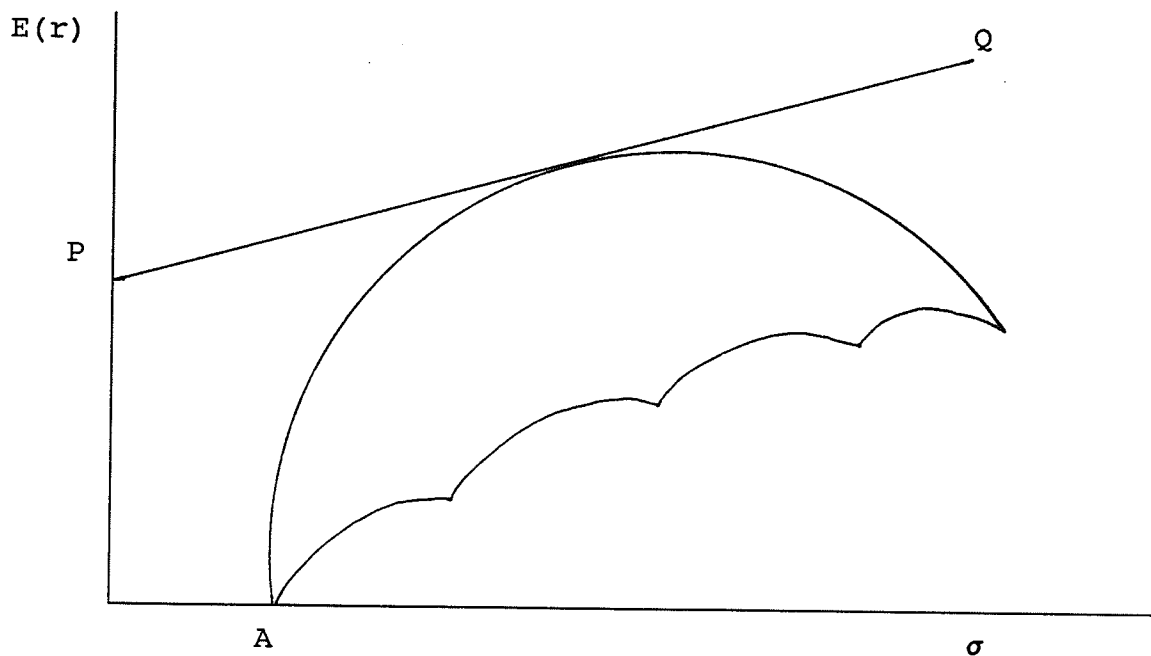


Figure C.4: The Opportunity Set

Covariance is a useful method of measuring how two random variables react to events. The covariance between A and B may be defined as:

$$\text{Cov}(A,B) = E((A-A)(B-B)) = E(AB) - AB$$

Three basic relationships using A and B are illustrated in Figure C.5. If one takes the product of each pair of values one would arrive at a positive amount for the sum of the average of these products. In illustration 1, however, the higher the value of A, the higher the value of B; in illustration 2 the higher the value of A, the lower the value of B; and in illustration 3 the value of A has no effect on B. The difficulty is resolved in Figure C.6 by subtracting the mean of A from the observed value of A and the mean of B from the observed value of B. The result is a shifting of the

A and B axes so that the average of the products is positive for illustration 1, negative for illustration 2, and zero for illustration 3. This is shown in Figure C.7.

If $E(AB) = AB$ and $Cov(AB) = 0$ then X and Y are statistically independent. Covariance can be equal to zero where there is not statistical independence.

The scale used to measure variables can have an effect on the covariance. The correlation coefficient is univariant to scale. It is obtained by dividing the covariance by the product of the two standard deviations.

$$\rho_{a,b} = \frac{Cov(A,B)}{\sigma_a \sigma_b}$$

The correlation coefficient $\rho_{a,b}$ can have values ranging from -1 to 1 inclusive as illustrated in Figure C.7.

Covariance can be written in terms of the correlation coefficient:

$$Cov(A,B) = \rho_{a,b} \sigma_a \sigma_b$$

If there are more than two variables then there can be several covariances; for example,

$$\begin{aligned} \text{Var}(A1+A2+A3) = & \text{Var}(A1) + \text{Var}(A2) + \text{Var}(A3) + 2\text{Cov}(A1, A2) \\ & + 2\text{Cov}(A1, A3) + 2\text{Cov}(A2, A3) \end{aligned}$$

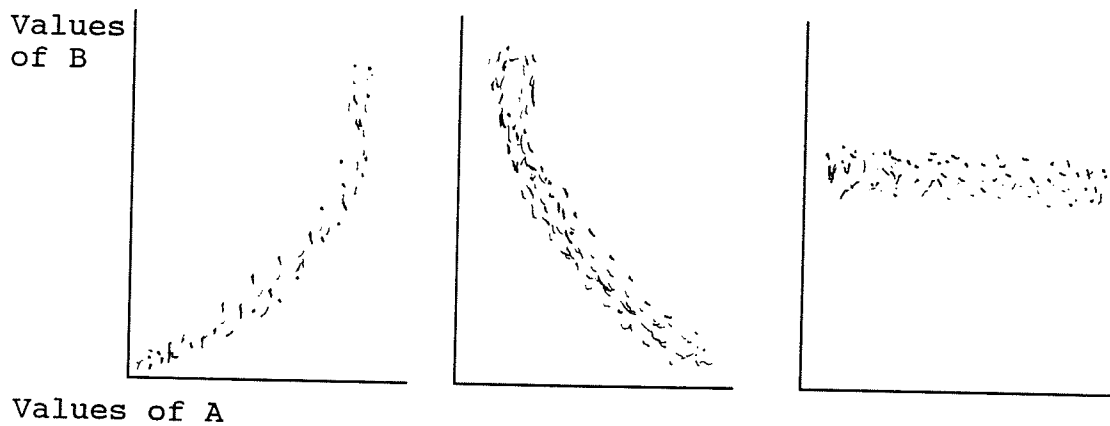


Illustration 1 Illustration 2 Illustration 3

Figure C.5: Three Basic Relationships of Two

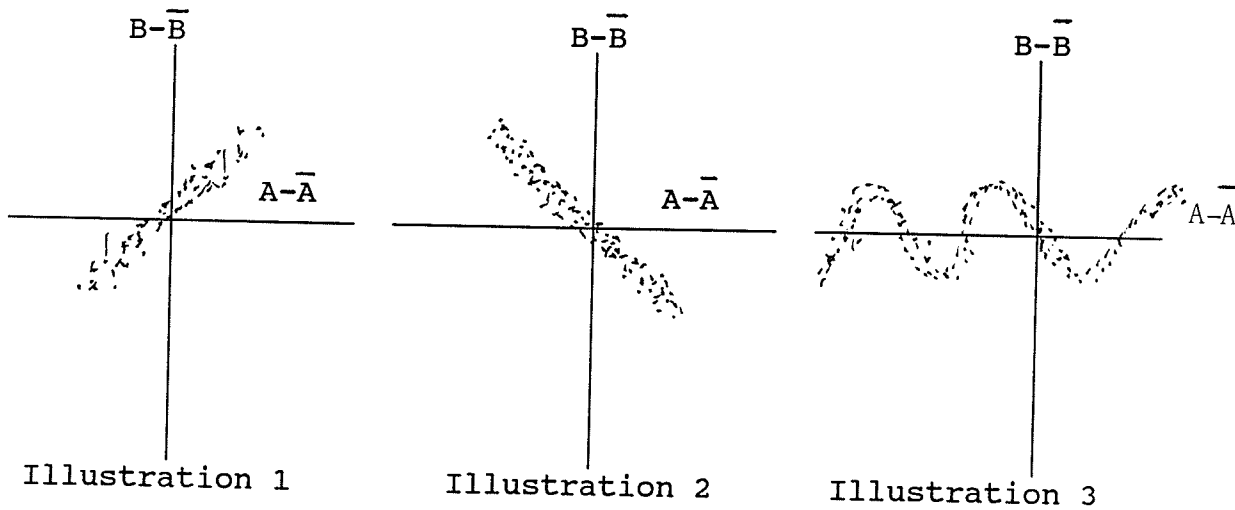


Figure C.6: Average of the Products for Three Basic Relationships of Two Random Variables

If the returns of two securities are perfectly correlated i.e., they always move together, the correlation coefficient $\rho_{a,b} = 1$. If correlation is less than perfectly positive or

negative, overall risk is reduced through diversification. Through diversification, portfolio risk may be reduced below the risk of each individual security making up the portfolio. It is for this reason that portfolio diversification is so important and which has probably contributed to the growth of investment funds which offer even the smallest investor a chance to hold a share of a diversified portfolio of securities.

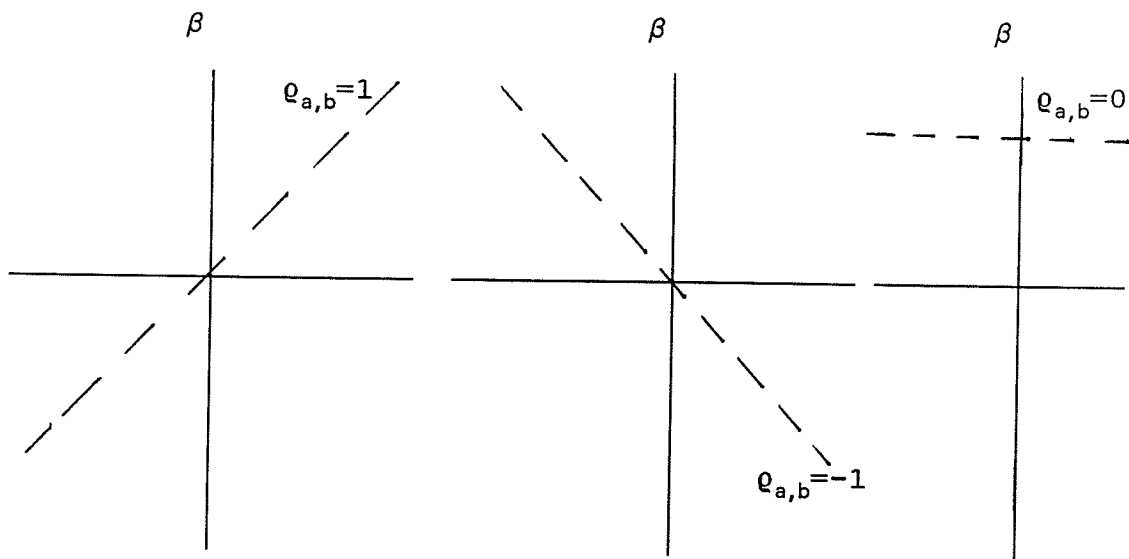


Figure C.7: Correlating Coefficients for Three Basic Relationships of Two Random Variables

CAPITAL MARKET LINE

The line PRQ (Figure C.4) designates the Capital Market Line (CML) which represents the continuum of possible portfolios an investor could construct from R borrowing and lending at rate P. As graphed in Figure C.4, the CML is the

true efficient frontier for it dominates the efficient frontier of the opportunity set. The CML is the locus of the maximum rates of return for each risk class and represents the opportunity foregone by investing in less efficient investments. Can one define the CML by its intercept and slope where the vertical intercept, which is the pure interest rate, can be viewed as the price of immediate consumption or the reward for waiting.

Each point on the CML is a unique value for $E(r)$ and σ . The risk class of the investment is determined by σ . The $E(r)$ is the cost of capital appropriate for that particular risk class.

DIVERSIFICATION

A question of considerable importance for the individual investor is the degree to which total portfolio risk varies with the addition of further assets to a given portfolio. Markowitz's important contribution to the understanding of risk was to point out that a relatively small number of stocks will provide adequate diversification if the covariance between the securities is small and especially if small and negative.

Markowitz efficient diversification is the combining of

securities with less than perfect positive correlation in order to reduce risk in a portfolio without giving up any of the portfolios return. The lower the correlation of the securities in a portfolio the less risky the portfolio will be generally. Simply stated, this means that to obtain true diversification the securities in question must not be dependent on the same independent variable to determine their market action. In other words securities must be diversified not by names of industries but instead by the influences which make them fluctuate. Portfolio management would be greatly aided if a stock listing were developed classifying stocks as to their dependency on various independent variables. Markowitz⁸² discusses diversification stating that:

...it implies the "right kind" of diversification for the "right reason". The adequacy of diversification is not thought by investors to depend on the number of different railway securities for example, would not be as well diversified as the same size portfolio with some railroad, some public utility, mining, various sorts of manufacturing, etc. The reason is that it is generally more likely for firms within the same industry to do poorly at the same time than for firms in dissimilar industries.

Similarly, in trying to make variance small it is not enough to invest in many securities. It is necessary to avoid investing in securities with high covariances among themselves.

Markowitz diversifications affect on risk is illustrated in Figure C.8. Given two securities and their unique

⁸² Markowitz, op. cit., p. 89.

characteristics one is concerned with finding the optimal proportions which they should be combined to form an investment portfolio. As derived earlier, $E(r)$ is just a linear combination of the individual security returns. The standard deviation σ , is a linear function if and only if the portfolio's securities are perfectly correlated, $\rho_{ab} = +1$, which is representative of the situation where risk is least minimized. If the two securities returns were perfectly negative correlated, $\rho_{ab} = -1$, risk would be completely removed if the two securities were properly combined. Figure C.8 shows that as ρ_{ab} become smaller it takes on a saucer shape assuming a minimum at some point.

Markowitz diversification⁸³ reduces the amount of risk without reducing return. Naive diversification, not placing all your eggs in one basket or spreading your risks, may reduce risk as well but what it will not generally do is minimize risk as it ignores the correlation between securities.

⁸³ Originally published in W. Sharpe's article, "Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk," The Journal of Finance, September, 1964, p .

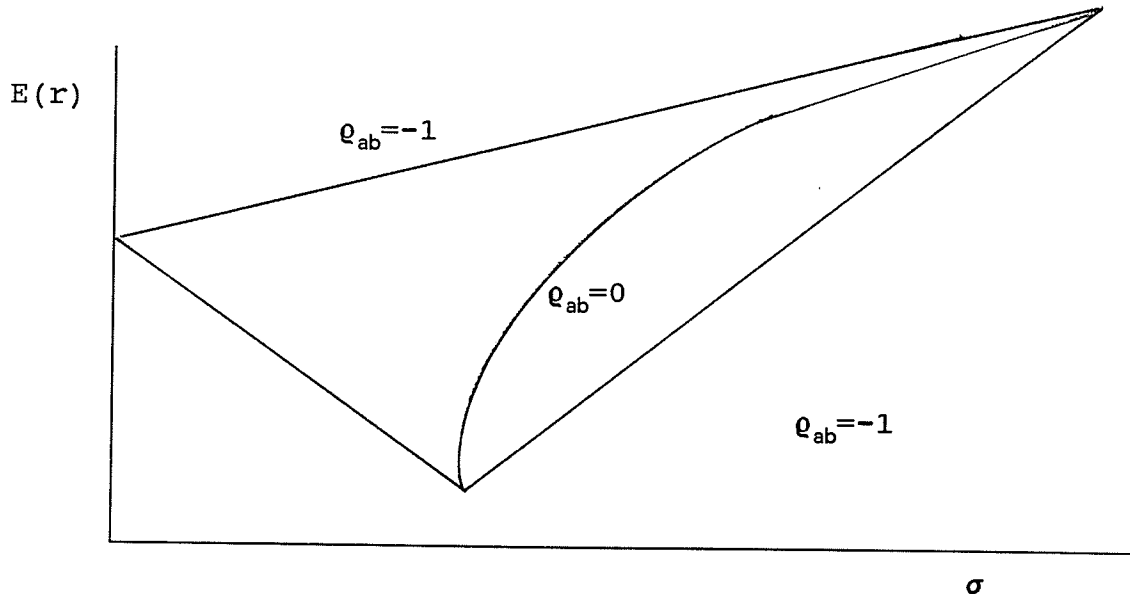


Figure C.8: Markowitz Diversification

CRITICISMS AND SHORTCOMINGS

To this point the underlying foundations of portfolio analysis have been presented, albeit a cursory presentation. However it is important to point out at this juncture that there are criticisms and shortcomings that should be discussed.

It is assumed in portfolio analysis that investor utility is determined strictly by the first two statistical moments of the probability distribution of returns.⁸⁴ As a

⁸⁴ The moments of a probability distribution are statistical measures that define the distribution. The first moment about the origin for a probability distribution of returns is the same thing as its expected value or

simplification, the third and fourth moments are ignored in the analysis which is a cause for criticism of portfolio analysis. By ignoring the third and fourth moments it is contended by some that the portfolio-analysis model wastes information that may be pertinent to an investor. Generally, most distributions of return for securities tend to be symmetrical and consequently possess third moments of zero. It can be debated if any pertinent information is really lost. It is not clear what fourth moments measure and how they affect investor utility thus measurement of the fourth moment is not necessary until further research can determine its usefulness.⁸⁵

Portfolio analysis rests heavily on the assumption that the variance, or standard deviation, of return is the correct

mean and is a measure of location for the distribution.

$$E(r) = \sum_{i=1} P_i r_i \quad (1)$$

The second statistical moment is a synonym for variance which measures the distributions dispersion or wideness.

$$\begin{aligned} \sigma_i^2 &= E(r_i - E(r))^2 \\ &= \sum P_i (r_i - E(r))^2 \end{aligned} \quad (2)$$

The third moment is a measure of the skewness of the distribution while the fourth moment is a measure of the peakedness in a probability distribution.

Generally, portfolio analysis assumes that utility is a function of the first two moments - namely $E(r)$ and σ^2 .

⁸⁵ J. Mossin, "Optimal Multiperiod Portfolio Policies", Econometrica, 1966, pp. 215-218.

indicator of portfolio risk. No conclusive evidence to support this hypothesis has been published although the data provided by Sharpe tends to support σ as a measure of risk.⁸⁶ However, when one considers the wide diversity of investments it is debatable whether one can aggregate risks from all origins into a single measure of variability and find a portfolio with the lowest risk at the desired level of return. The role of the Markowitz or Sharpe theory in analyzing a retiring farm-operators alternatives is in identifying the efficient portfolios of non-farm securities and providing insight regarding the effects of diversification.

Portfolio analysis can be demonstrated to be appropriate if the utility functions for wealth and rates of return are quadratic. It is suggested, that sometimes, the utility of return function for a risk-averter assumes the quadratic form $U = a + br - cr^2$, where a , b , and c are constants (Figure C.9).

The utility of wealth function is quadratic too, for it a linear transformation of the utility-of-returns function. Figure C.10 depicts the utility of wealth function for a risk-averter which has the form $U = g + hW - KW^2$

⁸⁶ Markowitz, op. cit., pp. 416-417.

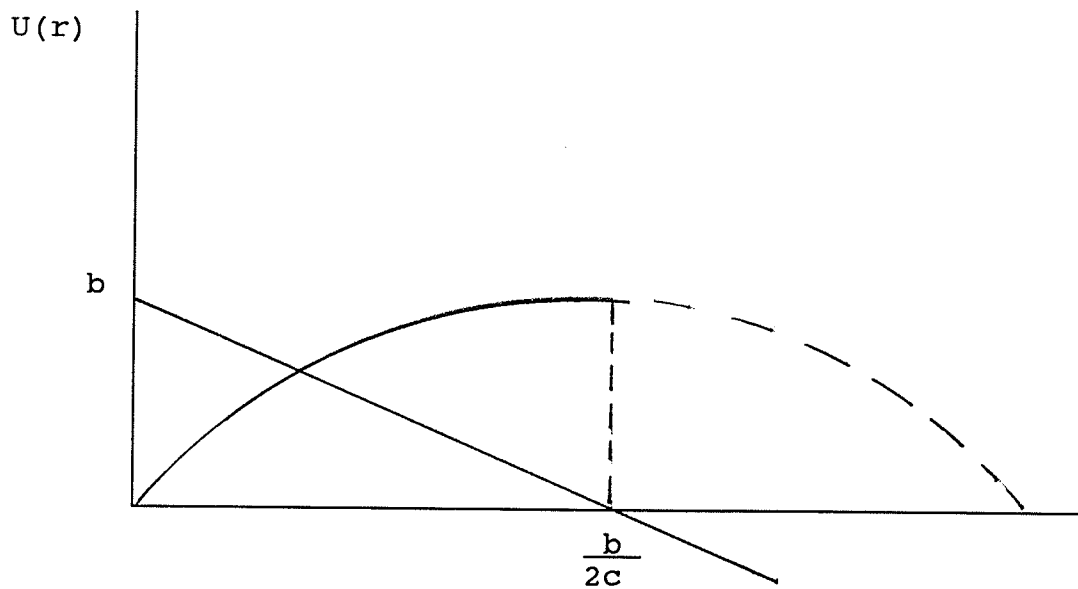


Figure C.9: Quadratic Utility of Returns Function

The marginal utility functions (MU) are $dU/dr = b - 2cr$ and $dU/dw = h - 2KW$ for returns and wealth respectively implying MU is negative for $r > b/2c$ and for $W > h/2K$. One interprets these results to mean that investors dislike a rate of return larger than $b/2c$ or would have an aversion to more wealth greater than $h/2K$. In order to circumvent this anomaly academics stipulate that the analysis be restricted to the range where $dU / dr > 0$ and $dU/dw > 0$). In other words only the portion of the utility function with non negative MU is relevant.

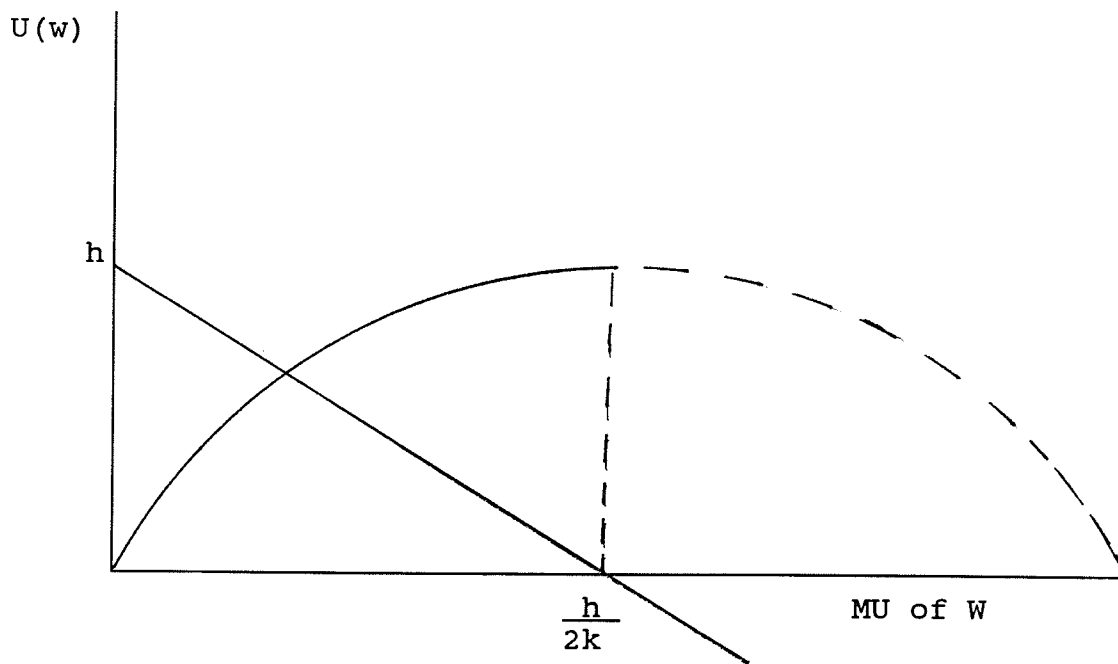


Figure C.10: Quadratic utility of Wealth Function

It has been suggested that problems involving negative MU and utility function restrictions occur because quadratic utility functions are assumed when perhaps they should not be.⁸⁷ Expected utility can be maximized for any utility function so long as it has positive but diminishing MU and if the distribution of returns are of a two parameter distribution. It is however, not so unrealistic to assume that a quadratic utility of returns function has an upper bound for in the "real world" investors are not observed paying large sums for small chances at an infinitely large return.

⁸⁷ J. Mossin, "Optimal Multiperiod Portfolio Policies", Econometrica, 1966, pp. 215-218.

CONCLUSION

Portfolio selection theory involves the compilation of a set of expected net returns and their associated risk levels. In the context of this research, it is the varying proportions of the farm firm production and external (off-farm) investment program comprising the farm firm portfolio which are relevant.

Portfolio selection theory can be utilized as an empirical tool to aid farm firm decision-makers in their investment selection. Those enterprises and assets that indicate high expected returns in addition to high variance of returns would be eliminated from efficient portfolios except those at or nearing the peak of the E-V frontier.

Conversely, those investments with low returns and low variance would either be eliminated or found at the lower region of the E-V frontier.

Portfolio analysis, in addition to aiding the farm firm decision maker in his selection of investments, can also be employed to indicate the extent of diversification within efficient portfolios of farm firm investments.

APPENDIX D

APPLIED PORTFOLIO SELECTION THEORY

APPENDIX D

APPLIED PORTFOLIO SELECTION THEORY

Generally investments are classified as either equity assets or fixed income assets. Equity assets include investments such as farm real estate, corporate stocks and mutual funds which are characterized by market risk and business risk. Returns to equity assets come in the form of price return and income return. Fixed income assets include investments of the nature of bank deposits, bonds and purchased annuities which possess interest rate risk, purchasing power risk and potential longevity risk. Returns to fixed income assets usually come in the form of income returns.

Farm-operators preparing for retirement must select assets for their retirement portfolio that minimize risk commensurate with the level of expected return. Purchasing power risk, in times of inflation presents the most serious threat to a retirement portfolio. In times of economic depression or recession the retirement portfolio is subject to market risk and negative price returns. Changing economic conditions would require the retirement portfolio to shift its relative proportion of equity and fixed income assets in

response to the economic changes in order to maintain a desirable return.

Once the levels of risk, expected return and the desired proportions of equity and fixed income securities have been decided upon, the farm-operator must then select the appropriate securities. The criteria to be considered are income stability, security of principal and ease of management.

Farm-operators are generally familiar with the investment characteristics of farm assets. They have witnessed, over the long run, a steady increase in land prices and know how to evaluate their assets productivity. Farm real estate is a desirable investment for many farm-operators because of their experience with it and its ease of management. However, if the farm-operators objective is to develop equity apart from the farm firm, then additional land investment would only frustrate the objective. The objective would be further frustrated if the farm operator desired to retire during a period of land value deflation as witnessed in the mid 1980's.

The task of managing an investment portfolio of non-farm securities poses a vexing problem for many farm operators, for generally they have little previous experience with non-farm assets. A survey of farm operators from southern Lower

Michigan showed that a negative attitude prevailed towards stocks, bonds and mutual funds.⁸⁸ These investments were regarded as being too risky relative to farm real estate, land contracts and bank savings accounts. In Canada, however, the concern for equities risk does not appear to be as prevalent for an increasing number of farm-operators are investing in security funds by way of Registered Retirement Savings Plans (RRSPs). Tung and Rust⁸⁹ conducted an analysis of farm operators' participation in RRSPs for the taxation years 1971 to 1974. The study found that the rate of farm-operators' participation in RRSPs was greater than that of the non-farm group. It was also found that an increasing number of farm operators purchased RRSPs during the period studied, which were relatively high farm income years. The authors of the study point out that the actions of farm taxfilers in planning for retirement might be different from that of non-farm taxfilers.

MUTUAL FUNDS

Many of the common investment media which produce returns in the basic forms of interest, dividends and capital gains, can be sheltered in an RRSP. RRSPs provide the additional advantage of an immediate deduction from income of the

⁸⁸ Lee and Brake, op. cit., p. 7.

⁸⁹ Tung and Rust, op. cit., pp. 15-25.

contributions to the plan. Limits are set on the type of RRSP investments primarily to ensure Canadian content. Without being exhaustive, qualified RRSP investments include: cash, Canadian government securities, mortgages, shares and debt securities of Canadian public corporations, and shares and units of Canadian mutual funds.

Mutual funds eligible for RRSPs are the investment vehicle selected for this research as they possess a number of features that offer a possible solution to the problem of managing a retirement portfolio of off-farm securities. Furthermore this study hypothesizes the RRSP's can be a useful tool for intergeneration farm firm transfers. A major difficulty, the disruptive demands on capital when parents wish to retire, is lessened by the use of RRSP's. Funds generated by the farm firm for reinvestment can be placed into an RRSP during the three stages of the farm firm life cycle. Upon retirement of the farm-parents the funds can be withdrawn thereby reducing the large drawings on the farm firm's assets.

Mutual funds are a relatively recent addition to the wide assortment of financial intermediaries in Canada.⁹⁰ The oldest Canadian fund was established in 1931 whereas the first American fund dates to the early 1920's. Mutual funds are a

⁹⁰ G.D. Tuirin and W. R. Waters, A Study of the Canadian Mutual Funds Industry, (Toronto, The Canadian Mutual Funds Industry, 1969), pp. 1-5.

hybrid of the British investment trusts and the American closed end investment company.

The major features offered by mutual funds are professionally managed, diversified investment portfolios that can be purchased in small quantities. By purchasing shares of a mutual fund, the small and inexperienced investor can gain wider diversification in asset holdings than would be possible through direct participation in the stock market. The diversified portfolio and its management can be viewed as two distinct economic commodities. In the selection and development of a portfolio a degree of technical expertise is expended. The small investor benefits from the expertise provided and the diversified investment portfolio.

Mutual fund managements provide continuing supervision of their portfolios as well as access to investment information and periodic counsel. Because of their lack of general expertise in off-farm assets the aforementioned services are of value to the farm operator. A retirement portfolio should be easy to manage. Off-farm investments which do not require extensive analysis prior to purchase and close supervision thereafter are preferable to those that do require detailed initial and ongoing study.

REGISTERED RETIREMENT SAVINGS PLANS

In order to develop an off-farm investment program the farm parents' must allocate their savings into specific investment media. The farm parent's decisions ideally should be made on the basis of the effect of these incremental investments on the risk-return characteristics of their entire portfolio. The effect of the incremental investments will depend firstly on the differential taxation of the different types of investment return and secondly on whether the investments are held or not held in an RRSP.

RRSPs were selected as the investment media for the purposes of this study because of their tax shelter features and because they are composed of professionally managed, diversified investment portfolios. There is a vast array of different investment programmes available for RRSPs. The more common funds include equity funds, mortgage funds, fixed income funds and, guaranteed funds. Each fund has different risks associated with the preservation of capital and return. The large number of funds available and the equally large number of institutions offering RRSPs gives the farm parents the opportunity to compare the risks associated with the preservation of capital and return. Finally, RRSPs were selected as the investment media for this study because they do not require extensive analysis prior to purchase and close

supervision thereafter as would an equivalent direct investment program.