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A SUBSIDY AND TAX APPROACH TO THE REPATRIATION OF CANADIAN INVESTMENT FUNDS

by

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ABSTRACT

The primary purpose of this study is to provide a theoretical framework for repatriation of Canadian investment funds. Attention is focused specifically at identifying the marginal benefits obtained from international diversification.

Portfolio theory generally centers around the discussion of reduction of risk relative to return. Indirect foreign ownership offers reduction of risk relative to returns so that diversification may provide marginal benefits to investors. Thus if risk reduction is a motive it may be possible to devise a subsidy or tax that will offset these marginal benefits. This subsidy would encourage the retention of Canadian investment funds in Canada. Equally important is the need to devise a tax to discourage the entrance of foreign investment funds into Canadian security markets.

The study concludes that such subsidy/tax formulations can be devised by modification of the slope of the capital market line equation. This subsidy/tax approach is developed within a two country framework and is dependent on the choice of an appropriate policy goal and the availability of accurately measured rates of return and variance of returns for the countries involved. The formulations developed are computationally sensitive to the proportions invested in both domestic and foreign securities, the associated rates of returns, and the related variances. While this subsidy/tax would distort international investment patterns determined by individual free choice, the distortion of resource allocation might not be as great as it would be from alternate plans for increasing Canadian ownership of Canadian firms.

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CHAPTER I

INTRODUCTION

Economic benefits from foreign investment in Canada have been large and contribute to the present standard of living. During the late 1950's and early 1960's a surge of foreign investment aroused intense public discussion and to some degree Canadian policy was shaped by the existance of large capital inflows. Most of the concern within Canada in recent years about foreign investment has not been about the inflow of capital itself, but rather about foreign ownership and foreign control of Canadian economic activity. The closeness of the economic ties resulting from foreign investment, as between Canada and the United States, creates many opportunities for Canada. Closeness of economic ties may also create feelings of dependence of the former on the latter and concessionary attitudes towards foreign ownership of Canadian industry.

During the last decade a great deal of concern has been expressed over foreign ownership and control and other related matters. This concern has prompted several commissions, studies, and reports, all of which concern themselves primarily with the issue of direct foreign ownership. The primary concern has been with foreign direct investment, where the foreigner owns sufficient stock or equity, in a Canadian corporation to have voting control. Indirect or portfolio investment (investment in bonds and minority holdings of equity) does not result in legal control of the assets of issuing corporations. Indirect foreign investment is foreign investment without foreign control. This type of foreign ownership has been largely examined as a secondary issue and as a result has

received far less scrutiny. It is to this so called secondary issue that a number of arguments are advanced in this thesis.

Statement of the Problem

Portfolio theory generally centers around the discussion of reduction of risk relative to returns and it is within this general framework that the problem of indirect foreign ownership is addressed. Indirect foreign ownership offers reduction of risk relative to returns, so that diversification may be a motive, since investors can reduce their risk for a prescribed rate of return, through international diversification. If diversification is a motive it may be possible to devise a subsidy or tax that would offset this desire. This subsidy would encourage the retention of Canadian investment funds in Canada. While this subsidy/tax would distort international investment patterns determined by individual free choice, the distortion of resource allocation might not be as great as it would be from alternate plans for increasing Canadian ownership of Canadian firms.

Organization of the Thesis

The initial part of the study defines the terms used and sets the conditions under which the problem will be analyzed.

This is to be followed by a descriptive section which briefly discusses the investment policies of the major institutional and those of individual investors. An attempt is to be made to demonstrate the amount of securities each holds and what proportion of these holdings are foreign securities.

An abbreviated description of the basic elements, the inputs and the limitations of the Expected Return-Variance model opens the

third section of this paper. This is followed by a summary of capital market theory, its inputs, and its limitations. The latter part of this chapter contains a discussion of the adaptation of principles of these models to international diversification, as done by Grubel[1] and Levy and Sarnat[2]. Both of these works are explored within the context of the assumptions required, the inputs and their measurements, and the outputs that emerge. An attempt is also made to show the predictive ability and the deficiencies of the models.

Initially, the fourth chapter provides a definition of terms and basic premises required for the subsidy/tax adaptation of the international diversification model. The adaptation is an extension of the two security Expected Return-Variance model and is explored under a parallel two country assumption. This does not preclude the use of more than two countries in the adaptation. Strict adherence to the multi-country diversification model is not feasible for the majority of investors. Some of the reasons for non-compliance with the model may be as a result of lags in information, total lack of information, foreign investment restrictions, and institutional frictions.

An adaptation of the price of risk reduction formulation for efficient portfolios is used as the basis for devising subsidy/tax formulations in chapter four. The assumptions required for this formulation are also presented in this chapter. In general terms, the

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[1]H.G. Grubel, "Internationally Diversified Portfolios: Welfare Gains and Capital Flows," American Economic Review, (December, 1968), pages 1299-1314.

[2]Haim Levy and Marshall Sarnat, "International Diversification of Investment Portfolios," American Economic Review, (September, 1970), pages 668-675.

argument for the subsidy can be stated quite concisely. Earnings which accrue to Americans who invest internationally are a function of the returns from domestic investment and the returns from foreign investment. Total earnings to the investor are also dependent on the proportions invested in each country's securities. The total risk that such investors must assume is a function of the riskiness of each security in the portfolio (as expressed by the standard deviation returns), the proportion invested in each security and the correlation of returns among the securities in the portfolio. The amount of subsidy necessary to encourage greater Canadian participation in Canadian issues is equal to the gains that Canadian international investors make minus the gains that Canadian investors can make from domestic investment. These gains may be in the form of increased expected returns and/or decreased risk. To make the Canadian investor purchase Canadian security issues the subsidy should replace the extra gains made from international diversification.

The latter part of chapter four contains a tax formulation based on similar principles. The tax formulation presented is designed to discourage foreign participation in Canadian securities. This tax is to be levied on any gains made by foreign investors who diversify into Canadian securities and thus discourage further foreign participation in Canadian security markets.

Chapter five discusses the inputs for the subsidy and tax formulations. Inputs are examined with reference to their measurements, source and limitations.

Chapter six is divided into three major sections. The first section contains graphic descriptions of the portfolios that can be created by using the risk-return relationships from Grubel's and Levy

and Sarnat's articles. This section also discusses the validity of risk-return measures provided by these authors. The second section of this chapter contains sample subsidy calculations after assuming several different Canadian policy goals. The final section of this chapter contains sample tax calculations based on inputs from Grubel's and Levy and Sarnat's articles and on assumed foreign investment levels in Canada.

The final chapter of this thesis is divided into three major parts. The first part summarizes the whole thesis while the second part is limited to drawing conclusions and summarizing the impact that the subsidy/tax could possibly have on foreign investment and Canadian participation in Canadian securities markets. Finally the third part suggests further areas of research so that the true costs and benefits from international diversification can be assessed.

Limitations of the Study

This study is limited to the measures of risk and return as commonly discussed in literature dealing with portfolio theory and capital market theory. For purposes of analyzing gains accruing to international investors it assumes that standard deviation of returns is an adequate measure of risk.

This study is also limited to the use of two empirical studies as a source of data for returns and standard deviations. To date, little empirical work has been devoted to measurement of effects of international diversification within the framework of the expected return-variance model.

Additionally, a substantial amount of relevant data had to be

obtained from one major study on the Canadian securities market, since disclosure in this field is very limited. Normal sources for such information only contained aggregated data that was not useful for the purpose of this paper.

CHAPTER II

CANADIAN INVESTORS AND THEIR INVESTMENT POLICIES

This chapter is divided into two major sections. The first section discusses the extent of investment by individuals with reference to their income class. It also draws on observations made in a recent Canadian securities market study. The second and larger section briefly discusses the investment policies of the major institutional investors. An attempt is made to provide a value for the size of their foreign security holdings.

Individuals and Their Investment Policies

In 1967 the Toronto Stock Exchange commissioned The Faculty of Administrative Studies at York University to undertake a study of "The Supply of, and Demand for, Canadian Equities". A preliminary "Conspectus" of this study was published and released by the Toronto Stock Exchange in 1968.[1] The final two volume version was published in 1970 and stated that the objective of the study was firstly, to determine the present supply of publicly traded Canadian stocks and the sources of new shares coming to the market; and secondly, to ascertain who are the persons and institutions holding Canadian stocks and to identify those characteristics of such shareholders that might provide some indication of their future demands for stocks.[2]

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[1] The Canadian Securities Course, Sponsored by the Investment Dealers Association of Canada, Toronto 1, Ontario: 112 King St. West, (1969), page 265.

[2] The Supply of, and Demand for, Canadian Equities, A Study Commissioned by the Toronto Stock Exchange, Toronto: The Toronto Stock Exchange, (1970), Vol. 1, page 3.

The Toronto Stock Exchange Study disclosed that individual Canadians owned directly, at the end of 1966, approximately $14 billion or almost 40 per cent of the total market value of all listed Canadian stocks.[3] Indirect ownership, through financial intermediaries, would add an additional $3.2 billion or 9 per cent of all listed Canadian stocks.

This Study goes on to state that Canadians are also substantial holders of foreign stocks. In 1966, Canadians directly held approximately $2 billion in market value of foreign stocks in their portfolio. Indirect holdings, via the three major financial intermediaries, accounted for an additional $1 billion. At the end of 1966, foreign stocks made up 15 per cent of the total Canadian individual investment in listed stocks.

To show differences in Canadian individual investment portfolios, the Study classified Canadian and foreign stock holdings according to the individual income classes. These are shown in Table 2-1.

TABLE 2-1[4]

Stock Holdings of Canadian Investors by Income Groups

Income Class $	Canadian Stocks %	Foreign Stocks %	All Stocks %
25,000 and over	33	45	34
10,000 - 25,000	31	26	30
Under 10,000	36	29	35
Total	100	100	100

[3]Ibid, page 21.

[4]Ibid, page 21.

The above table shows that investors in the $10,000 and over income classes comprise more than 70 per cent of Canadians who hold foreign stocks and 64 per cent of the holdings of Canadian stocks. This may indicate that the higher income investor probably has a greater opportunity to purchase foreign securities and thereby diversify his portfolio.

The Study also classified dividend recipients into income groups to indicate different investment policies. This classification revealed that individuals in the lower income groups (below $10,000 per annum) composed approximately 78 per cent of the recipients of Canadian dividends.[5] A lower per centage (22 per cent) of dividend recipients in higher income groups indicates that these individuals comprise a smaller part of the population. It could also indicate that individuals in higher income groups invest in issues that have greater capital appreciation prospects and lower dividend payouts. Such an investment policy may be plausible because these investors have high incomes with which to carry on a certain life style without drawing on investment income.

To gain a greater insight into the stock-holdings of Canadian individuals, the Study went on to examine the level of such holdings over time by a number of characteristics: income, occupation, age, sex, and geographic location. To make the levels more meaningful, comparisons were made with similar American surveys. Observations made by the Study, relevant to the subject matter in this section of the thesis, are included below:

1. Income levels in both Canada and the United States have been

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[5]Ibid, page 22.

increasing and that as incomes increase, investment incomes increase, but at a slower rate. Furthermore, the proportion of individuals in higher income groups in Canada is lower than in the United States.

2. There are a higher proportion of dividend recipients in the $10,000 to $25,000 income bracket in Canada than in the United States. This may indicate that the Canadian investors in this income class are more conservative than their American counterparts.

3. The concentration of Canadian stock holdings is largely in higher income groups. Table 2-1 shows that 64 per cent of these holdings are in the $10,000 and over income groups. These groups received approximately one third of the Canadian dividend income per annum. It is almost certain that such a level of dividend income can only be achieved by individuals in fairly high income groups.

4. Based on reported tax returns, the Study showed that the proportion of Canadians receiving dividends is increasing (5.3% in 1955 to 7% in 1965). The Study did not differentiate between dividends from investment in Canadian issues or investment in American issues.

The above general comments serve to outline the fact that Canadian investors come from relatively higher income groups than do their American counterparts. Since these higher income groups are smaller than their American counterparts, the amount of funds they invest is considerably smaller.

Institutional Investors and Their Investment Policies

Some institutional investors may purchase any securities which they feel are profitable while others are generally confined to purchases of a regulation predefined set of securities. The four major Canadian financial institutions (investment funds, pension funds, life insurance companies, fire and casualty insurance companies) are not large in relation to the total market value of all listed stocks but are large in absolute size. Both domestic and foreign holdings of their portfolios are increasing rapidly.

1. Investment Funds

The term investment funds or companies is generally applied to both open-end and closed-end funds. Capital is raised through the sale of shares and is used to purchase a diversified list of stocks and/or bonds for income appreciation. Investment fund operations are based on the principle of diversification and continuous supervision by experienced managements.

Open-end funds are primarily portfolio investors who purchase relatively small proportions of stock of any one company and trade their investments quite frequently. Closed-end funds on the other hand purchase large blocks of a company's stock, and stock turn over is not as pronounced. As these funds have different investment objectives they will be examined separately.

(a) Mutual or Open-End Funds

Mutual funds have expanded very rapidly during the last decade and have become a significant factor in the equity market. This growth is shown in Table 2-2. This table shows that mutual funds have increased

their total assets by four fold within the eight year period from 1958 to 1966. Mutual funds hold approximately 85 per cent of their total assets in stocks. They increased their stock holdings from $370 million in 1958 to $1.8 billion in 1966.[6]

The Toronto Stock Exchange Study goes on to state that:[7]

> "By the end of 1966 all open-end funds held about 1.9 billion in stock with over $660 million in foreign (virtually all United States) common and preferred stocks. These amounts represent 56% and 31% respectively of the assets of open-end funds. At the end of 1967 total assets were $2.3 billion, with 41% in Canadian stocks and 45% in foreign stocks."

This tremendous growth in foreign holdings of mutual funds has meant an increase of $521 million in the market value of foreign stock holdings. During this same period holdings in Canadian stocks had increased by $518 million in market value.

Rapid development of mutual funds has made them an important force among Canada's major investing institutions. Funds have grown not only in numbers but in variety. Table 2-3 shows that mutual funds have increased their assets approximately 157 fold whereas population increased only 1.8 fold in the twenty-two year period listed. During this same period, personal disposable income and net savings increased approximately 4.7 times and 6.8 times, respectively.

Mutual funds have also increased their concentration in the holdings of Canadian common stock. This concentration has been largely limited to the purchases of common stock in the 101 largest listed Canadian companies. The percentage mutual fund holdings of these Canadian

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[6]Ibid, page 138.

[7]Ibid, page 141.

TABLE 2-2

Total Assets of Canadian Open-End Investment Funds[8](1)
(dollar amounts in millions)

	Total Assets $	Increase in Assets $	Increase in Assets %	Stock Index % Changes (2)
1958	433			+33
1959	561	128	29.6	+ 8.5
1960	615	54	9.6	+ 4
1961	846	231	37.6	+33.5
1962	966	123	14.5	- 7
1963	1,183	214	22.1	+14.5
1964	1,586	403	34.1	+25
1965	2,041	455	28.7	+ 5.5
1966	2,153	112	5.5	- 8.5

Notes: (1) Fund of Funds, Non-Resident Owned Funds and Bond Funds have been excluded.

(2) Based on average of the Toronto Stock Exchange Index and Dominion Bureau of Statistics Investors Index.

Source: Financial Post Survey of Investment Funds, 1963 and 1967.

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[8]Ibid, page 139.

companies' common stock has increased from 75.2 per cent in 1962 to 79.2 per cent in 1966.[9] The Study explains that:

> "It therefore appears that as the funds increase their Canadian stock holdings they continue to invest in the largest companies and for diversification they purchase stock of United States companies.....In 1966 the fund had only 30% of their foreign stock portfolio in the common stocks of the largest 59 foreign companies listed on the New York Stock Exchange."[10]

A substantial proportion of mutual fund holdings in foreign securities are concentrated in a few large companies. By the end of 1967 Canadian open-end investment funds had more money invested in United States stocks than they had in Canadian stocks. This represents a substantial change in investment policy (in 1962 funds had seven times the investment in Canadian common stocks as they did in foreign stock).[11]

Approximately 60 per cent of their foreign portfolio investment is in the common stock of 51 large corporations.[12] This $400 million of investment in foreign stocks can be divided between major industries as shown in Table 2-4.

Canadian mutual funds tend to diversify by purchasing American securities but, as Table 2-4 shows almost half of the investment in foreign stocks is involved in office equipment and airlines. These industries are very poorly represented in listed Canadian exchanges.

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[9] Ibid, page 143.

[10] Ibid, page 142.

[11] Ibid, page 152.

[12] Ibid, page 152.

TABLE 2-3

How Mutual Funds Have Grown[13]

	Total Mutual Fund Assets ($ Million)	Population (Million)	Annual Personal Disposable Income ($ Billion)	Annual Personal Net Savings ($ Million)
1947	17	12.6	9.7	494
1950	59	13.7	12.7	662
1955	250	15.7	18.2	850
1961	844	18.2	26.0	1,509
1962	926	18.5	28.2	2,331
1965	1,880	19.8	34.7	3,098
1969	2,678	22.0	46.4	3,388

(b) Closed-End Funds

These are investment companies whose original capital is acquired through sales of the company's own stocks, debentures and possibly preferred shares. Unlike open-end funds, closed-end funds operate with this original capital and retained earnings. Portfolio holdings of closed-end funds are similar to those of open-end funds except that in absolute terms, holdings are smaller. Data on their holdings is not readily available.

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[13]Amy Booth, How to Invest in Mutual Funds, A Series Reprinted from The Financial Post, Maclean-Hunter Limited, (1970), page 5.

TABLE 2-4

Mutual Fund Distribution of Investment in Foreign Stocks[14]

Industry	% in Industry Stocks
Oil	7
Metals and Mining	6
Aerospace	4
Automotive	4
Drugs and Cosmetics	5
Electrician and Electronics	9
Office Equipment	23
Photography	7
Rubber	2
Textiles	3
Other Manufacturing	1
Airlines	23
Railways	4
Utilities	1
	100

[14] The Supply of, and Demand for, Canadian Equities, op cited, page 153.

2. Pension Funds

Pension funds have grown rapidly during the post war years and are important not only in terms of total assets but also in terms of the amounts they have invested in stocks. Private (non-government) pension plans are either insured or trusteed plans. Trusteed plans are those which have funds administered by a trustee other than an insurance company or the Government Annuities Branch.[15]

All retirement funds are involved in long term obligations and relatively predicable payouts. Consequently investment policy dictates that these plans participate in long term securities.[16] Any difference in investment policy between plans is seldom as a result of statutory restrictions, but rather reflect differing trustee attitudes towards investments. Individual pension plans in Canada vary widely in their proportionate holdings of common stock, from nil to 42 per cent (for the 47 pension funds responding to a survey carried out by the Pension Plans Section of the Dominion Bureau of Statistics).[17] Pension funds in Canada in 1967 had an average of approximately 27 per cent of their assets (at book value) invested in stocks.[18]

Noninsured pension plans have increased their stock holdings substantially since 1960. At book value, in 1966 these holdings had

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[15]Ibid, page 101.

[16]Ibid, page 104.

[17]Ibid, page 105.

[18]Ibid, page 107.

increased to 19 per cent of their assets.[19] Between 1961 and 1966, holdings of Canadian and Non-Canadian stocks increased $431 million and $137 million, respectively.[20] Increases in stock holdings have been largely at the expense of fixed payment asset holdings. For this same five year period, the proportion of Non-Canadian common and preferred stock holdings had increased approximately three times whereas holdings of Canadian common and preferred stock holdings had increased by two fold.[21]

The Toronto Stock Exchange Study carried out a survey on the stock portfolios of the large pension funds in Canada and found that their stock holdings in the 101 largest Canadian listed companies accounted for approximately 93 per cent of their total common stock holdings in 1966.[22] This survey was limited to pension funds with assets, at book value, over $5 million.

Holdings of foreign stocks of the 47 funds, answering to the survey, amounted to $175 million in 1966.[23] This is a substantial change from the $50 million held in 1962. By 1966 all noninsured funds held approximately $320 million or 4.5 per cent of their total assets at market value of foreign common stocks. Foreign stock holdings were highly concentrated in the office equipment industry which is poorly represented on Canadian exchanges.

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[19]Ibid, page 109.

[20]Ibid, page 114.

[21]Ibid, page 16.

[22]Ibid, page 122.

[23]Ibid, page 125.

3. Life Insurance Companies

Life insurance companies are the largest institutional investors of personal savings in Canada. From 1962 to 1965 the holdings of Canadian life insurance companies increased from $131 million to $240 million. Their holdings of United States common stocks increased from $206 million to $250 million for the same period.[24]

A comparison of the lists for 1962 and 1966 of the ten most commonly held stocks by life insurance companies revealed very little change in composition between these two periods. This is one indication that life insurance companies do not change the composition of their portfolios in the same magnitude as do mutual funds. The main change in the lists are changes in the rank order of holdings.

Foreign stock holdings of life insurance companies were about $618 million at book value in 1966.[25] During the period 1955 to 1965 holdings of foreign common stock increased fractionally while holdings of Canadian common stock had more than doubled.[26]

4. Fire and Casualty Insurance Companies

Fire and casualty companies invest in the same types of securities as life insurance companies, but since they only invest underwriting profits the amount they invest is not very large. All Canadian fire and casualty companies are subject to the Canadian and British Insurance Companies Act. Foreign counterparts are subject to the Foreign Insurance

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[24]Ibid, page 158.

[25]Ibid, page 163.

[26]Ibid, page 164.

Companies Act. All fire and casualty companies buy more preferred and common shares than do insurance companies and usually purchase shorter term bonds for liquidity. Between 1945 and 1966, stock holdings of these companies had increased uniformly at the expense of holdings of fixed income securities.[27]

Foreign and Canadian Stock Holdings of Major Investors

The magnitude of Canadian funds invested in Canadian and foreign securities can be approximated by summarizing the holdings of individuals and the major institutional investors. A summary of these holdings is shown in Table 2-5. This table shows that holdings of foreign common stock accounted for 15.8 per cent of total holdings (domestic holdings amounted to 84.2 per cent).

TABLE 2-5

Summary of Canadian Investments at Market Value in 1966 (in billions)[28]

	Domestic	Foreign
Individual Investors		
Direct	14.4	2.0
Institutional Investors		
Investment Funds	1.8	0.52
Pension Funds	1.11	0.32
Life Insurance Companies	0.25	0.47
Fire and Casualty Insurance Companies	-	-
	17.56	3.31
Total	20.87	

[27]Ibid, page 175.

[28]Ibid, Page 175.

Summary

The major source for this chapter was "The Supply of, and Demand for, Canadian Equities". Addition of the values for individual investor direct holdings and institutional investors shows that approximately 84.2 per cent of the holdings are in Canadian securities while the remaining 15.8 per cent of the holdings are in foreign securities. The value for the amount invested in foreign securities is only approximate since the Study did not provide figures for foreign holdings of all institutional investors. This value is reasonably close to the 15 per cent figure the Study provided for the foreign holdings of securities for Canadian individuals.

The Study also states that individual and most institutional investors have been increasing their foreign security holdings until they were at the levels indicated above 1966. Furthermore, the study implies that foreign holdings are likely to increase with time.

CHAPTER III

SUMMARY OF BASIC INPUTS

Introduction

This chapter is divided into three major sections. The first section outlines the basic elements, formulation, inputs required, and limitations of the expected return-variance portfolio selection model. The second section summarizes the assumptions required, the analysis, and limitations of Capital Market Theory. The final section discusses Grubel's[1] and Levy and Sarnat's[2] application of the expected return-variance model on an international basis. This section involves a discussion of the assumptions, the author's application of the portfolio selection model and its limitations.

The Expected Return-Variance Model

It can be safely assumed that an investor purchases securities in the anticipation of earning a return in the future. Generally, returns can be considered in regard to two dimensions. One is the form, whether it be capital appreciation or dividends; the other is the specific time period involved before such returns are realized. For simplicity it is sufficient to define return as the price difference of a security plus any dividends or interest over a one year period, all ex-

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[1]H.G. Grubel, "Internationally Diversified Portfolios: Welfare Gains and Capital Flows," American Economic Review, (December, 1968), pages 1299-1314.

[2]Haim Levy and Marshall Sarnat, "International Diversification of Investment Portfolios," American Economic Review, (September, 1970), pages 668-675.

pressed as a ratio of the original price of the security.

Unfortunately, return is not the only factor influencing the investment decision; the uncertainty of the return expected from investment in securities is also important. The fact that some doubt may exist as to the actual return, implies that the investor will be subject to some degree of uncertainty or risk. Using the above elements (return and risk), Markowitz proposed a model for portfolio selection commonly referred to as the E-V model (Expected Return-Variance).[3] The basis for this model and its subsequent modifications is based on diversification.

1. Basic Elements

(a) Formulation

Pioneering work in the area of portfolio selection was done by H. Markowitz. Markowitz suggested the criterion of "Portfolio Efficiency".[4] He focused attention on choosing from an approved list of securities, a second set of securities, that satisfied a dual investment criteria. The dual investment criteria are (1) highest expected return for a given level of risk and (2) lowest level of risk for a given level of return. Use of such criteria leads to a choice of a whole family of portfolios, usually referred to as the "Efficient Portfolio". The efficient frontier divides the risk-return space, as shown in Figure 3-1, into the locus of attainable and non-attainable portfolios. Any port-

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[3]Harry Markowitz, Portfolio Selection, Cowles Foundation Monograph 16, New York: John Wiley & Sons Inc., 1959, page 4.

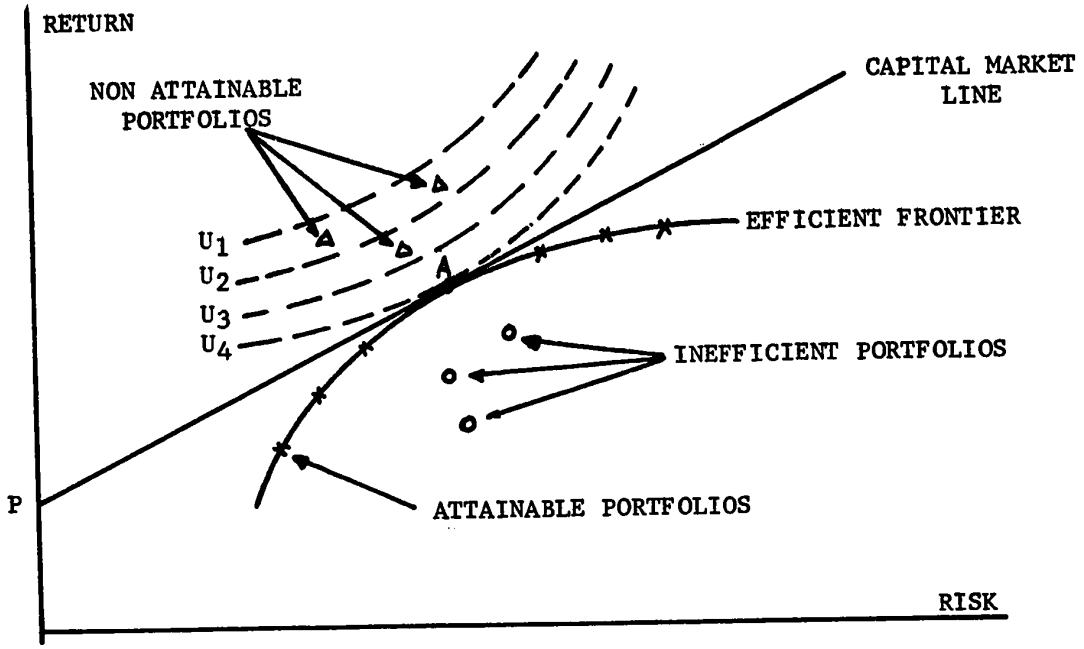
[4]Harry Markowitz, "Portfolio Selection," Journal of Finance, 7.77-91, (March), 1952. A more complete development appeared in Harry Markowitz, Portfolio Selection: Efficient Diversification of Investments, New York: John Wiley & Sons Inc., 1959.

folios to the left of the efficient frontier are not attainable.

Tobin introduces utility curves into the analysis and arrives at a choice of the optimum portfolio mix at a point of tangency between the utility function and the efficient frontier.[5]

FIGURE 3-1

Optimum Portfolio Mix



Sharpe[6] and Lintner[7] extend the model presented by Markowitz and Tobin and show how equilibrium prices are attained in the capital market where there is a choice between a combination of risky assets and a risk-

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[5]J. Tobin, "Liquidity Preference as Behaviour Towards Risk," The Review of Economic Studies, (February, 1958), pages 65-86.

[6]William F. Sharpe, "Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk," The Journal of Finance, (September, 1964), pages 425-442.

[7]John Lintner, "Security Prices, Risk and Maximal Gains from Diversifications," The Journal of Finance, (December, 1965), pages 587-612.

less asset. This model shows that the alternate combinations of assets are efficient since the investor has the choice of trading riskless for risky securities or in effect moving along the capital market line between point P and point A. Point P, the pure rate of interest, indicates the rate of return an investor could earn by having all of his funds committed to a portfolio composed of riskless assets. Point A indicates the rate of return (for a given level of risk) that an investor could earn by investing in a portfolio composed of risky assets. Points on the line between P and A indicate the returns and risk of portfolios composed of various proportions of risky and riskless assets. Returns and risk from portfolios composed of larger proportions of risky assets would plot closer to A and conversely returns and risk from portfolios composed of larger proportions of riskless assets would plot closer to P. The slope of the capital market line indicates that rate at which risky assets are traded for riskless assets. It shows how much risk must be assumed for a given increase in return.

2. Inputs to the Model

The basic Markowitz model is concerned with the efficient diversification of portfolios. The model can be expressed somewhat more concisely if the following variables are considered:

x_i = the proportion of investment funds invested in security i

E_i = the expected return of security i

S_i = the variance of returns of security i

C_{ij} = the correlation coefficient between the returns of security i and security j

The fundamental model consists of four equations.

Expected portfolio returns are given by:

$$E = \sum_{i=1}^{N} x_i E_i$$

and portfolio variance by;

$$S^2 = \sum_{i=1}^{N} \sum_{j=1}^{M} x_i x_j S_i S_j C_{ij}$$

To insure that the total portfolio is invested,

$$\sum_{i=1}^{N} x_i = 1$$

While the constraint:

$$0 \leq x_i \leq 1$$

prohibits negative investment or short selling. The problem now consists of maximizing returns subject to minimizing variance and being totally invested.

3. Limitations of Markowitz/Sharpe/Lintner Models

As in the case with all theoretical models, the various diversification models deviate from the conditions of the real world. The following discussion enumerates some of the difficulties and limitations of the Markowitz or E-V (Earnings-Variance) model when it is used as a portfolio selection technique.

1. The model is subject to the problem of the underlying utility assumptions. Aversion to variance implies that a quadratic utility function characterizes investor performances. A quad-

ratic utility curve implies decisions based only on expected return and variance. This does not allow for much latitude for expressing differences in investor performances. If portfolios with radically different prospects are considered by an investor, too much reality may be omitted if his decision is assumed to depend on expected return and standard deviation of return.

2. Use of the model brings about measurement problems with mean, variance and correlation. Mean, variance and correlation are ex ante concepts in this context. Historical observations may not be representative of the future. Attempts to supplant or supplement historical data have involved the incorporation of subjective judgements, with a host of related research problems. Little work has been done to date in linking measures of mean and variance to forecasting models.

3. Information or "frictions" are suppressed when the model is employed. The model ignores commissions, costs of obtaining investment information and portfolio revision strategy.

4. Investors are assumed to be acting on common information, so that the market's response to a particular security can be characterized by a single set of parameters (risk and return).

5. Use of a capital market line assumes that investors can borrow or lend at a single rate of interest, in any amount. In the real world, the rate changes with the amounts borrowed or lent. Taking away the assumptions of equal borrowing and lending rates leads to considerable modification of the capital market line, making it linear over some ranges and curving over other ranges.

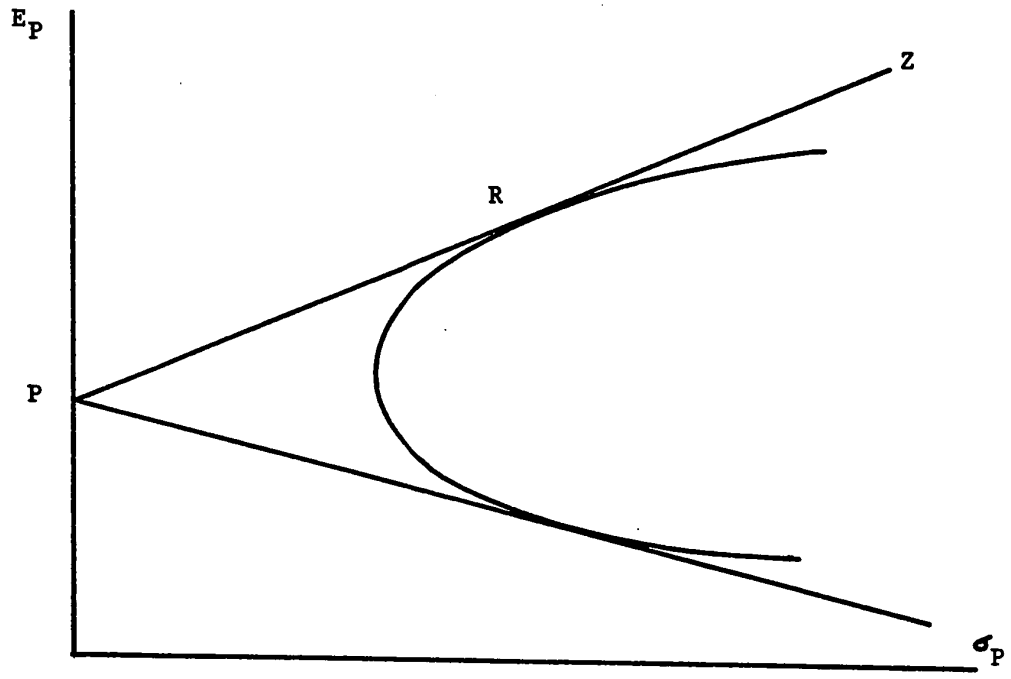
In addition to this, the model does not differentiate between tye types of potential returns. For example, some investors may be primarily interested in dividend income while others may be interested in share appreciation.

4. Operation of the Markowitz/Tobin Model

Any investor, given predictions about risky securities (expected return, variance, and correlation coefficient), the pure rate of interest, and the ability to borrow or lend at that rate will face a situation similar to the one shown in figure 3-2. Every point along PRZ can be obtained by borrowing or lending (or neither) and by placing all investment funds in a portfolio composed entirely of risky securities (point R).

FIGURE 3-2

The Capital Market Line



The line PRZ is called the capital market line. Its slope indicates the trade-off between expected return and risk. The slope shows the amount that can be gained in expected returns for a given increase in risk.

The equation of the capital market line can be written as:[8]

$$(3\text{-}1) \qquad E_p = P + r_e\sigma_p$$

where E_p = expected return of the portfolio

P = pure rate of interest

r_e = price of risk reduction for efficient portfolios

σ_p = standard deviation of riskiness of the portfolio

Rearranging this equation shows that the price of risk reduction for efficient portfolios can be written as:

$$(3\text{-}2) \qquad r_e = \frac{E_p - P}{\sigma_p}$$

The numerator of the above equation shows the excess expected return for assuming risk while the denominator shows the amount of risk the investor must assume. The price of risk reduction is the amount of return that must be foregone for a specific reduction in risk.

International Adaptations

The Markowitz/Sharpe/Lintner Mean-Variance model has been adapted to international investment by Grubel[9] and Levy and Sarnat.[10]

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[8]Ibid, page 85.

[9]H.G. Grubel, op cited, pages 1299-1314.

[10]Haim Levy and Marshall Sarnat, op cited, pages 668-675.

In a later article Grubel and Fadner extended the diversification argument to include diversification among industries on an international basis.[11] Lee also analyzes the movement of capital between the United States and Canada with reference to interest rate difference.[12]

All of the above studies employ international stock market correlation coefficients. The basic premises of the Markowitz/Sharpe/Lintner Mean-Variance model have been outlined above and further expansion on the precise operations of their model would be outside the scope of this paper.

Grubel and Fadner explain the interdependence of international equity markets with two influences not encountered by American assets. Firstly, returns on foreign assets are influenced by business cycles, natural and man-made catastrophies and government policies whose effects are felt most strongly in the economics of the affected countries. Secondly, capital values of assets change due to exchange rate fluctuations which in turn influence the variance of returns on foreign assets. They state that international trade and factor movements tend to equalize average rates of return in all countries and that international diversification benefits are likely to accrue primarily from the reduction expected return variance due to the above two factors.

Lee expands the expected return-variance model to deal with

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[11] H.G. Grubel and Kenneth Fadner, "The Interdependence of International Equity Markets," The Journal of Finance, (March, 1971), pages 89-94.

[12] C.H. Lee, "A Stock Adjustment Analysis of Capital Movements: The United States - Canadian Case," The Journal of Political Economy, (Volume 77, 1969), pages 512-523.

portfolios rather than single assets as alternative investment opportunities. He indicates that reduction in risk, by holding a diversified portfolio, depends only on the existance of a less-than perfect but positive or a negative correlation between the rates of return of individual securities (portfolios).

Grubel's and Levy and Sarnat's articles will be analyzed in the following section as their results are to be used in the adaptation for subsidy and tax calculations.

1. Grubel-Internationally Diversified Portfolios: Welfare Gains and Capital Flows[13]

Grubel states that international diversification of portfolio provides a new source of world gains and that these gains are different from traditional "gains from trade" and gains from increasing productivity.

(a) Assumptions for the Analysis

For purposes of analyzing the extent of welfare gains and capital flows, Grubel makes the following assumptions for his static model:

(i) A world consisting of two independent countries.

(ii) Wealth can be held in three forms: real assets, money, and bonds (analogous to common stocks).

(iii) Full employment exists in each country.

(iv) The existance of an initial portfolio balance.

(v) That trade does not affect the returns or variance of returns from holding real assets and money.

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[13]H.G. Grubel, op cited, pages 1299-1314.

(vi) And implicitly, by using the Markowitz formulation, a quadratic utility function for which expected return and variance are adequate measures for portfolio selection.

(b) The Grubel Analysis

Using Markowitz's model, Grubel demonstrates the extent of welfare gains from international diversification via "bond" (analogous to common stock) movement between two countries. In keeping with the dual criterion of the E-V model, he shows that diversification does not change expected returns but reduces riskiness of a multi-security portfolio as compared to the one asset portfolio. To demonstrate the range of possible gains to American investors from international diversification, Grubel compiled estimates of the rates of returns from portfolio investment in common stock market averages of 11 major countries, covering the period from January 1959 to December 1966. For each of these countries he collected the following monthly observations: indexes of common share prices, dividend yield on the shares in the index, and the dollar exchange rate. From this data, he calculated the annual rate of return from capital gains due to common stock price and exchange rate changes under the assumption that dividends are reinvested each month in fractional shares at current prices and that interest was compounded annually. Calculation of the average rate of return was done using the geometric mean for 95 monthly rates. The relevant figures, for the purposes of this paper, are included in Table 3-1.

Rates of return and standard deviations in this table do not have allowances made for withholding taxes or transaction costs. Grubel states that these calculations also suffer from the weakness that due to indivisibilities, transaction costs and limited portfolio sizes, it is

almost impossible for anyone to hold portfolios as represented by the indices.

Using principles of the E-V model, Grubel shows that diversification among the assets of eleven countries would permit investors to attain higher rates of return or lower variances of the portfolios, than they would have earned had they invested in the market index portfolios of their home country. The magnitude of the gain is inversely dependent on the correlation of returns of the indices amount countries whose indices are included in the portfolio.

TABLE 3-1

Rates of Return and Standard Deviation from Investing in Canadian and United States Capital Market Averages for the Period 1959 to 1966[14]

Country	Per Cent Per Annum	Standard Deviation	Correlation With U.S.A.
United States	7.54	47.26	1.000
Canada	5.95	41.19	0.7025

Sources: The share price index for the United States is Moody's Industrial Average of Common Stocks from Moody's Inds. Manual, June 1967. The share price index for Canada is the industrial series from the Toronto Stock Exchange Supplement Booklet No. 2, The Toronto Stock Exchange, January 15, 1966.

[14]Ibid, page 1304.

2. Levy and Sarnat - International Diversification of Investment Portfolios[15]

Levy and Sarnat base their arguments on the premise that the degree to which diversification can reduce risk depends upon the correlations among security returns. If correlations are low diversification would eliminate most risk. With proper diversification a portfolio of domestic stocks is protected from that risk attributed solely to individual securities. But, it is still subject to the risk which is attributed to fluctuations in the general economic activity, a risk common to all securities in the economy. If swings in the general economic activities of different countries are not in phase, it is possible to reduce even the common risk by including in a portfolio a combination of foreign securities. That is, if the coefficient of correlation between the rates of return of a combination of domestic securities is less than one, the variance of the return of the total portfolio can be smaller than the variance of the return of a combination of domestic securities only. As long as the correlation coefficient is less than one, the necessary condition for gainful diversification between the two combinations of securities exists.

(a) Assumptions

Levy and Sarnat make the traditional Markowitz assumptions implicitly by using the E-V model to compute the optimal portfolio. They also assume that the arithmetic mean adequately describes the mean rate of return for each country.

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[15]Haim Levy and Marshall Sarnat, op cited, pages 668-675.

(b) The Levy-Sarnat Analysis

The degree to which diversification can reduce risk in a portfolio depends upon the correlation among security returns included in the portfolio. Levy and Sarnat demonstrate this fact by collecting the mean rates of return on common stocks and their standard deviations for twenty-eight countries for the period from 1951 to 1967. They define the annual rate of return for each country as the percentage change in the dollar value of the common stock index for a given country. The indices used are adjusted for any changes in exchange rates. The mean and standard deviation of the countries' stocks which are relevant for the purposes of this thesis are included in Table 3-2.

TABLE 3-2

Mean Rates of Return and Standard Deviations of Common Stocks for Canada and the United States for the Period 1951 to 1967[16]

Country	Per Cent Per Annum	Standard Deviation	Correlation With U.S.A.
United States	12.1	12.1	1.000
Canada	8.6	14.3	0.810

Sources: Calculated from common stock indices and exchange rates for each of the countries appearing in various issues of the IMF's International Financial Statistics.

Levy and Sarnat define an efficient international portfolio as a combination of investments in various countries which either maximizes

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[16]Ibid, page 669.

the rate of return, given the variance, or minimizes the variance given the rate of return. They find the locus of efficient portfolios by finding the investment proportions which minimizes the variance of the portfolio for given expected rates of return. To find the optimal portfolio Levy and Sarnat introduce a market opportunity line. With this type of analysis a different optimal portfolio is obtained for each different interest rate.

Levy and Sarnat derive optimal portfolios composed of the stocks represented by the United States index and stocks represented by the indices of other countries which have a low correlation with the United States index. In the portfolios obtained, the Canadian index does not enter the efficient set because of its relatively low return, relatively high risk, and high correlation (0.81) with the United States index.[17]

Levy and Sarnat state that the composition of the optimal portfolios raises serious questions regarding the degree of imperfection in international capital markets. They maintain that in the absence of artificial barriers the optimal portfolio would contain all countries' securities. The authors conclude that:

> "The ex post results, which show other combinations to be dominant, suggest that restrictions on international trade and/or capital flows have a significant effect on the pattern of security returns and permits inefficient markets to persist."[18]

3. Predictive Ability of the International Models

A full investor implementation of the Grubel or the Levy and Sarnat modification of the E-V model would produce startling effects on

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[17]Ibid, page 674.

[18]Ibid, page 675.

world capital flows and consequently internationally diversified investment. By extending the framework that both articles have laid out and adding the elimination of information lags, capital would flow readily between countries.

Examination of the portfolios created in both articles indicates the existance of market disequilibriums. In the case where a country's rate of return and variance are dominated by all other countries' rates of return and variances, the presumed availability of international diversification would imply market disequilibrium. Investors could not be expected to persist in holding the dominated securities unless a relative price adjustment took place. As we shall see, Levy and Sarnat suggest that Canadian securities are externally dominated. In this respect, the model becomes weak in its predictive ability.

Summary

The expected return-variance model proposes portfolio selection on the basis of a dual criteria; expected returns and standard deviation of returns. It involves diversification to reduce risk with the result of creating an efficient portfolio. Extension of this theory has introduced the concept of the capital market line. This line indicates the risk return relationship of various risky portfolios. Its slope shows the amount of return that may be obtained for assuming a given level of risk.

Using the concept of the E-V model along with capital market theory, Grubel and Levy and Sarnat have explored the implications of international diversification. Each article presents different rates of returns, standard deviations, and correlation coefficients. Both

articles show the gains from international diversification by composing portfolios consisting of several countries' common stock indices.

CHAPTER IV

SUBSIDY/TAX FORMULATIONS

Transition for Subsidy/Tax Formulation

The purpose of this chapter is to describe a subsidy/tax formulation designed to leave Canadian investors in essentially the same financial position when they restrict their investments to Canadian securities as when they diversify investments internationally. The purpose of this subsidy is to encourage the retention or repatriation of Canadian investment funds.

A simultaneous part of the problem is to devise a tax formulation that will discourage the entrance of foreign (primarily American) portfolio investment funds into Canada. Technically, the tax formulation is necessary to hold demand for domestic securities constant. This tax formulation will also be based on the premise that risk can be reduced and returns can be increased through international diversification.

Subsidy/tax policy moves can lead to predictive results about Canadian and foreign investment behaviour if the marginal benefit from international diversification is identified. Marginal benefit identification is required for subsidy/tax formulations because the principle by which a subsidy would be applied or a tax would be levied, would be as a marginal offset to marginal benefit derived from international diversification.

Identification of the marginal benefit can also demonstrate the plausibility of the Grubel/Levy-Sarnat international diversification model. Failure to exploit high marginal benefits or investor acceptance of negative marginal benefits is behaviour inconsistent with the pre-

dictive model.

The adaptation to be presented is an extension of the two security case of the Expected Return-Variance model. The model developed is based on two country diversification (Canada and the United States). This implies that multi-country diversification is not an available alternative to investors of these countries. The model is simple and probably realistic in that bi-lateral security market transactions exist between Canada and the United States, but do not appear to exist, in substantial magnitude, between Canada and other countries or the United States and other countries.

Assumptions Required

Development of the model requires that the following assumptions be made:

1. The supply of investment funds for stocks in each country is fixed. This implies that demand for securities will also be fixed.
2. The supply of securities in each country is fixed.
3. Overall security prices are fixed.
4. The historical rates of return and variances on all stocks are fixed.
5. Since returns and stock price ratios are assumed fixed, implicitly the overall yield on securities is fixed.
6. Finally, the riskless rate at which investors may borrow or lend is fixed.

Purpose of Assumptions

The above assumptions allow isolation of the issue of international diversification, where returns are held constant and risk is allowed to change only by diversification. Holding security prices constant allows the benefit from international diversification to be directly manifested in reduced risk-return relationships (i.e., international diversification will result in decreased risk for a given or constant return).

Fixing the supply of investment funds and thus not permitting changes in security prices, ensures that yields on securities will not be altered because of additional investment funds entering the securities market. Keeping yields constant allows identification of risk reduction benefits from diversification. Fixing historical returns permits ex post measurement of the marginal benefits upon the establishment of the correlation coefficient between international returns.

The riskless rate of return is held constant to allow an invariant terminus of capital market lines. This constant rate provides a time span over which marginal benefits can be measured and thus permits identification of risk-return reduction on investor opportunity sets.

Fixing the prices of securities makes the analysis partial in character. A fuller analysis would reflect that increased efficiency in the security market would probably elicit new investment funds and security issues. By rendering common stock investments relatively more attractive, increased efficiency would likely disturb the riskless rate of return.

A fixed supply of American and Canadian common stock assumption alleviates the problem of accounting for increased security issues

arising from greater security market efficiency. This assumption solves the problem of changing returns and standard deviations arising from the introduction of new securities into the investors attainable set. It simplifies measurements of marginal benefits by insuring reference points and the current investor position does not change during the measurement period.

Consequences of Violating Assumptions

Allowing the supply of investment funds to change will change the overall yield on securities. Such changes will alter the riskless rate of return and destroy the marginal benefit measurement. Changes in the riskless rate may make funds shift from risky to riskless securities with the result that new market equilibrium may evolve. Changes in the riskless rate will vary the terminus for subsequent marginal benefit measurement since the intercept of the capital market line will change. Furthermore the effect of the subsidy/tax formulation will be difficult to assess because some capital movement will be as a result of different yields in both risky and riskless securities and other capital movements will be as a result of the subsidy/tax application.

Removing the fixed supply of securities assumption will alter the effects of the subsidy/tax formulation. Assuming the demand for securities remains constant, an increase in the supply will lower security prices and raise returns. The converse will occur if the supply of securities is decreased. Supply changes will modify the slope of the capital market line making it difficult to trace marginal benefits arising from diversification and implicitly invalidate subsidy/tax applications.

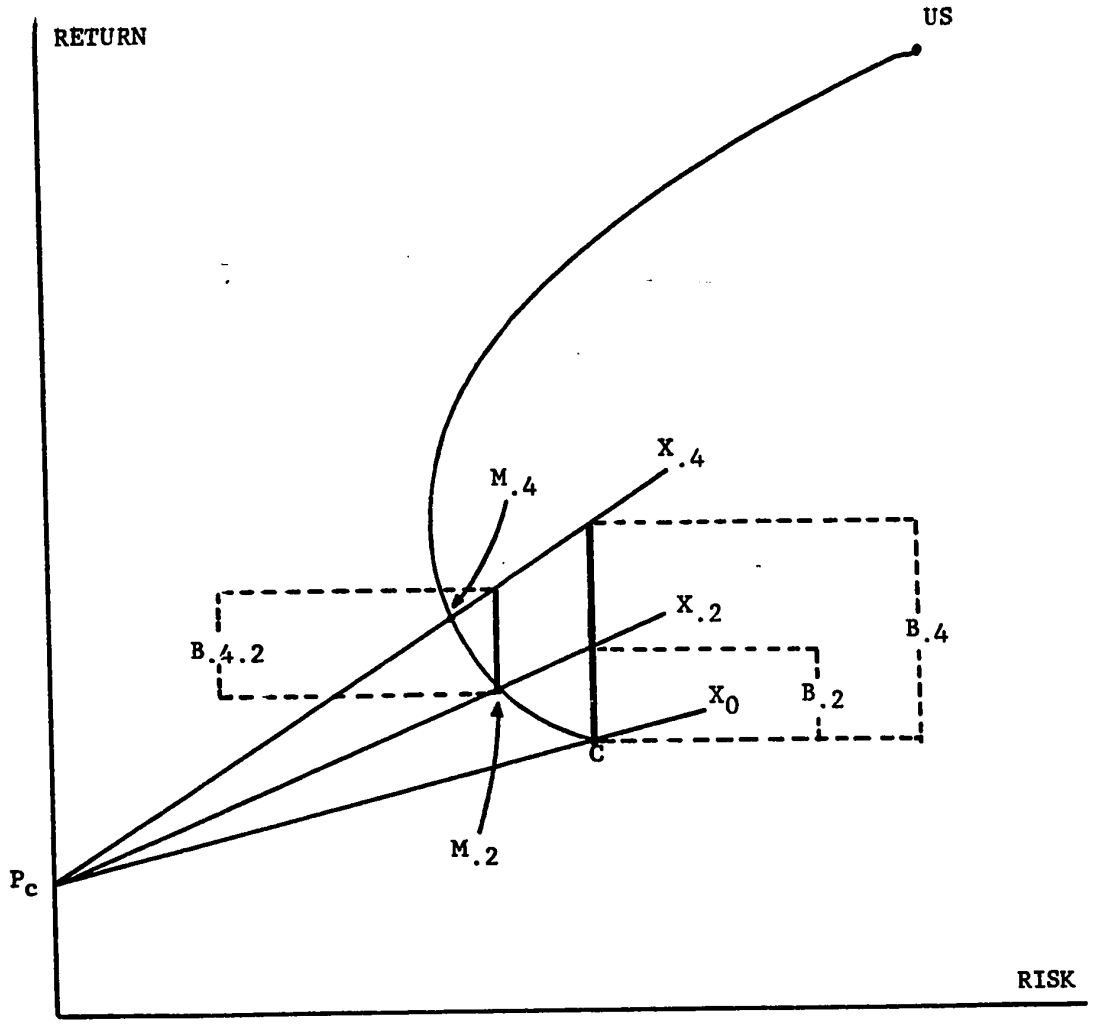
Changes in security prices will affect the overall returns and subsequent risk calculations so that new efficient portfolios will be composed. An alteration of overall returns may cause changes in the riskless rate with the result that funds may flow into riskless securities if the return becomes more attractive or out of riskless securities if the return drops substantially. Again any of these rate changes will modify the slope and/or intercept of the capital market line thus invalidating the marginal benefit measurement necessary for the subsidy/tax calculation. Abstraction of the general equilibrium effects will likely result in under-repatriation according to the desired Canadian ownership level. This subsidy/tax approach to repatriation will tend to repatriate less funds than desired because the formulation does not consider any other investment criteria. It only considers returns and standard deviation and does not consider such factors as liquidity and marketability. Furthermore, some of these foreign investment advantages may be more imaginery than real.

Subsidy Formulation

The theoretical formulation to be employed can be represented diagrammatically. Figure 4-1 shows the performance of all-Canadian and all-United States (fully domestically diversified) portfolios within a risk-return space. Points C and US depict all-Canadian and all-American portfolio performances, respectively. The curve CUS represents the locus of portfolio combinations attainable by varying the proportions of the two national portfolios. The curve is defined by the additive properties of return and risk, and by Canadian-United States correlation coefficient of returns.

FIGURE 4-1

Subsidy Formulation



P_c represents the riskless Canadian interest rate. The line P_cX_o represents the opportunity set attainable by Canadian investors who borrow and lend at the riskless Canadian rate and who are limited to an all-Canadian portfolio. Line $P_cX_{.2}$ represents the efficient boundary for Canadian investors limited to a portfolio composed of 20 per cent United States securities and 80 per cent Canadian securities. $M_{.2}$ represents the risk and return of such a portfolio. Similarly, line $P_cX_{.4}$ represents the opportunity set for Canadian investors limited to a portfolio composed of 40 per cent United States securities and 60 per cent Canadian securities. $M_{.4}$ represents the risk and return of this portfolio.

For purposes of establishing a subsidy, a reference point must be chosen. The reference point is a predefined policy goal allowing a certain degree of Canadian investor participation in foreign securities. For example the policy goal may state that up to 5 per cent of Canadian investment funds may be invested in foreign securities. Similarly a policy goal may be outlined that does not permit any Canadian participation in foreign securities. This policy goal or reference point may be any point on the curve CUS. For convenience of explaining the benefit gained through diversification the point C is arbitrarily chosen. Later on, a different reference point will be used to show that the marginal benefit obtainable through greater diversification can be measured as long as a reference point or subsidy policy goal is shown.

To observe the benefits from international diversification: consider the distance $B_{.2}$ in Figure 4-1. This distance represents the amount by which the rate of return on an all-Canadian security portfolio would have to be increased if the Canadian investor were to attain the

same opportunity set as he could obtain through diversification with a portfolio composed of 20 per cent American securities and 80 per cent Canadian securities. The distance $B_{.2}$ represents the subsidy that would have to be paid to the Canadian investor to compensate him for not investing in a portfolio consisting of 20 per cent American securities and 80 per cent Canadian securities but rather being restrained to an all-Canadian securities portfolio. Similarly, the distance $B_{.4}$ represents the benefit obtainable by a Canadian investor capable of constructing a portfolio consisting of 40 per cent American securities and 60 per cent Canadian securities as opposed to the benefit obtainable by an investor restricted to an all-Canadian securities portfolio. $B_{.4}$ would represent the subsidy payable to the Canadian investor restricted to an all-Canadian portfolio.

To extend the explanation of subsidy formulation a different reference point or policy goal is assumed. It is assumed the new policy allows up to 20 per cent participation by Canadian investors in American securities. Furthermore, it is assumed that currently Canadians are constructing portfolios of 40 per cent American securities and 60 per cent Canadian securities. To achieve the national policy objective, without prohibitive legislation, it is necessary to subsidize the Canadian investor by the amount shown as $B_{.4.2}$ in Figure 4-1. This amount may be regarded as the marginal benefit Canadian investors derive from investing in portfolios composed of 40 per cent American securities and 60 per cent Canadian securities as compared to the 20-80 per cent distribution that the policy outlines. Thus it can be shown that, regardless of the reference point chosen (the policy permitting a certain degree of foreign investment by Canadians), a subsidy policy can be

designed to compensate the Canadian investor for not diversifying above the nationally desired level.

The diagrammatic subsidy formulation can also be explained algebraically by using a modification of Sharpe's capital market model. Sharpe has shown that the slope of the capital market line indicates the trade-off between expected returns and risk (in order to increase expected return, the investor must assume more risk).[1] Thus the slope indicates the expected return that can be obtained if more risk is accepted.

The analysis of Sharpe's capital market line can, in the macro-(Tobin) sense, identify an investor opportunity set. The equation of this opportunity set can be written in slope-intercept form as:

$$(4\text{-}1) \quad E_p = P + r_e \sigma_p$$

where: E_p = expected return from an efficient portfolio

P = pure rate of interest

r_e = price of risk reduction for efficient portfolios

σ_p = the standard deviation of the portfolio

Alternately, the slope of the opportunity set can be written as:

$$(4\text{-}2) \quad r_e = \frac{E_p - P}{\sigma_p}$$

which is a rearrangement of (4-1). The numerator describes the portfolio returns in excess of the pure rate of interest for assuming risk.

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[1] William F. Sharpe, op cited, page 84.

The denominator indicates the amount of risk assumed. With reference to previous geometry, equation (4-2) can express the slope of the lines P_cC, $P_cX_{.2}$, and $P_cX_{.4}$ in Figure 4-1.

If we assume, from the Canadian investor's viewpoint, that expected returns can be classified as expected returns from investment in Canadian securities and expected returns from investment in United States securities then portfolio returns can be written as:

$$(4\text{-}3) \quad E_p = \alpha_1 E_c + (1-\alpha_1) E_{us}$$

where E_c and E_{us} are expected returns from investment in a cross section (market portfolio) securities and investment in a market portfolio of American securities respectively. The proportion of Canadian funds invested in Canadian securities is represented by α_1 and the residual, the amount invested in American securities is given by $1-\alpha_1$. If we assume that α_1 is assigned a value of one, that is the Canadian investment policy calls for having all Canadian investment funds invested in Canadian securities, (4-3) reduces to:

$$(4\text{-}4) \quad E_p = E_c$$

which staces that expected returns from a Canadian market portfolio are equal to expected returns from investment in Canadian securities.

Variance of a portfolio consisting of two country's securities will be subjected to more complicated forms of risk measurement. Risk will now be measured as the sum of the risk incurred from investment in Canadian issues, plus the risk encountered from American securities investment, plus the risk arising from the correlation of the two investments. This diversified risk can be written as:

$$(4\text{-}5) \quad \sigma_p = \sqrt{\alpha_1^2 V_c + (1-\alpha_1)^2 V_{us} + 2(\alpha_1)(1-\alpha_1)\ \text{Cov.}_{us,c}}$$

where: V_c = variance of returns from Canadian securities

V_{us} = variance of returns from United States securities

$\text{Cov.}_{us,c}$ = covariance of returns between Canadian and United States securities ($\text{Cov.}_{us,c} = \sigma_c \times \sigma_{us} \times \rho$).

Each of the above variances are weighted by the proportion of funds invested in the country's securities. Again if we assume the value of α_1 to be one (4-5) reduces to:

$$(4\text{-}6) \quad \sigma_p = \sigma_c$$

which states that risk of an all-Canadian market portfolio is equal to the standard deviation of returns from investment in Canadian securities.

In the case where α_1 is equal to one, that is all Canadian investment funds are invested in Canadian securities and letting P_c (the pure rate of interest in Canada) equal P, the slope of line $P_c X_o$ can be written as:

$$(4\text{-}7) \quad r_p^c = \frac{E_c - P_c}{\sqrt{V_c}}$$

by substituting (4-4) and (4-6) into (4-2). Similarly, if α_1 is assumed to have any positive values other than one, as in the case of an internationally diversified portfolio, the slope of the relevant boundary line for the unconstrained case can be written as:

$$(4\text{-}8) \quad r_e^c = \frac{\alpha_1 E_c + (1-\alpha_1)E_{us} - P_c}{\sqrt{\alpha_1^2 V_c + (1-\alpha_1)^2 V_{us} + 2(\alpha_1)(1-\alpha_1)\ \text{Cov.}_{us,c}}}$$

where: r_e^c = the price of risk reduction for Canadian investors.

Benefits from diversification can be measured by subtracting the value of (4-7) from the value of (4-8) and multiplying the result by the standard deviation of the "desired" portfolio. The term desired portfolio refers to a portfolio composed of a specified proportion of American securities (where the value of $1-\alpha_1$ in this new portfolio is less than the value of $1-\alpha_1$ in the present portfolio) and an increased proportion of Canadian securities (the size of α_1 is increased). The amount of benefit obtained from increased international diversification is equal to the subsidy that must be paid to Canadian investors who are restricted to foreign security participation as outlined by the proposed value of α_1 in the desired portfolio. This subsidy can be calculated from:

$$(4\text{-}9) \quad \text{Subsidy} = \sigma_D \left[\frac{E_p - P_c}{\sigma_p} - \frac{E_D - P_c}{\sigma_D} \right]$$

where: E_D = the expected returns of the desired or chosen portfolio

σ_D = the standard deviation of the desired portfolio

The term $\frac{E_p - P_c}{\sigma_p}$ in (4-9) can represent any level of diversified portfolio performance. The term $\frac{E_D - P_c}{\sigma_D}$ can represent either a diversified portfolio, a portfolio composed of all-Canadian securities, or a portfolio composed of what are thought to be politically desirable proportions of foreign and domestic securities. The value obtained from substituting (4-7) and (4-8) into (4-9) is the amount by which the rate on an all-Canadian security portfolio would have to be increased, through subsidy to Canadian security holders, if the portfolio were to attain the same opportunity set as the Canadian investor could obtain through diversification.

Tax Formulation

The tax formulation being presented is designed to reduce American participation in Canadian security markets. This tax formulation is designed to encourage the withdrawal of American funds from Canadian security markets in the same magnitude as Canadian investment funds being repatriated into Canadian securities markets. The tax will seek to withdraw American funds to make room for Canadian subsidized funds.

If the tax is to contribute to repatriation of Canadian investment funds, it must be linked to the subsidy formulation. The link between the subsidy and tax formulation arises from the dollar amount of funds that the subsidy will repatriate; this is the same amount of foreign funds that the tax must displace. The dollar value of funds that the subsidy attracts can be calculated by finding the difference between the amount of Canadian funds previously invested in American securities and the amount of Canadian funds invested in American securities after the subsidy. This can be concisely written as:

$$(4\text{-}10) \quad Sub_{\$} = h_c\,(1-\alpha_1) - (1-\alpha_1')$$

where: $Sub_{\$}$ = the amount of Canadian dollars the subsidy attracts

h_c = the total market value of investments by Canadians

$(1-\alpha_1')$ = amount of Canadian funds invested in American securities after the subsidy is applied

The amount that the tax formulation must displace so as not to create pressure on security prices is the same as the amount of Canadian funds attracted times the exchange rate or:

$$(4\text{-}11) \quad Tax_{\$} = Sub_{\$}\ (\text{exchange rate})$$

where: $Tax_{\$}$ = the amount of American dollars the tax must displace.

Calculating the value of $Tax_{\$}$ permits finding a new value for $1-\alpha_2$ or:

$$(4\text{-}12) \quad (1-\alpha_2') = (1-\alpha_2) - \frac{Tax_{\$}}{K_{us}}$$

where: K_{us} = the total market value of investments by Americans

$(1-\alpha_2)$ = the proportion of American funds invested in Canadian securities before Canadian taxation

$(1-\alpha_2')$ = the proportion of American funds to remain after taxation

The tax rate to be levied on American funds can be obtained by finding the difference in the slopes of the opportunity set lines for different levels of American participation in Canadian securities. Prior to making the tax decision the slope of the American opportunity set could be written as:

$$(4\text{-}13) \quad r^e_{us} = \frac{E_{us} - P_{us}}{\sigma_{us}}$$

where: r^e_{us} = the price of risk reduction (the slope of current American participation opportunity set

E_{us} = the expected earnings of the current American diversified portfolio

σ_{us} = the standard deviation of the current American diversified portfolio

P_{us} = the pure rate of interest in the United States

Formula (4-13) permits calculation of the current or before tax participation level of American investors in Canadian security markets. After deciding how many American dollars must be displaced from the Canadian market to accommodate the subsidized Canadian funds, the slope of the new American opportunity set can be written as:

$$(4\text{-}14) \quad r^{e'}_{us} = \frac{E'_{us} - P_{us}}{\sigma'_{us}}$$

where: E_{us}' = the expected earnings of an American portfolio whose value of $1-\alpha_2$ was reduced to $1-\alpha_2'$

σ_{us}' = the standard deviation of this new American diversified portfolio

The slope of the capital market line tangent to the new efficient frontier (with decreased American participation) will be greater than the previous participation level capital market line. (This observation will be valid as long as American returns are greater than Canadian security returns and American variances are less than Canadian security return variances).

The tax to be levied on American participation in Canadian security markets can now be obtained by substituting the values of (4-13) and (4-14) into (4-15).

(4-15) $$\text{Tax} = \sigma_{us}' \left[r_{us}^{e'} - r_{us}^{e} \right]$$

Formula (4-15) expresses the difference in slope between capital market lines tangent to the respective efficient frontiers arising from different American participation levels. Multiplication of the slope difference by the standard deviation changes this slope difference to a per cent rate which can be applied as a tax against returns American investors earn by diversifying into Canadian security markets.

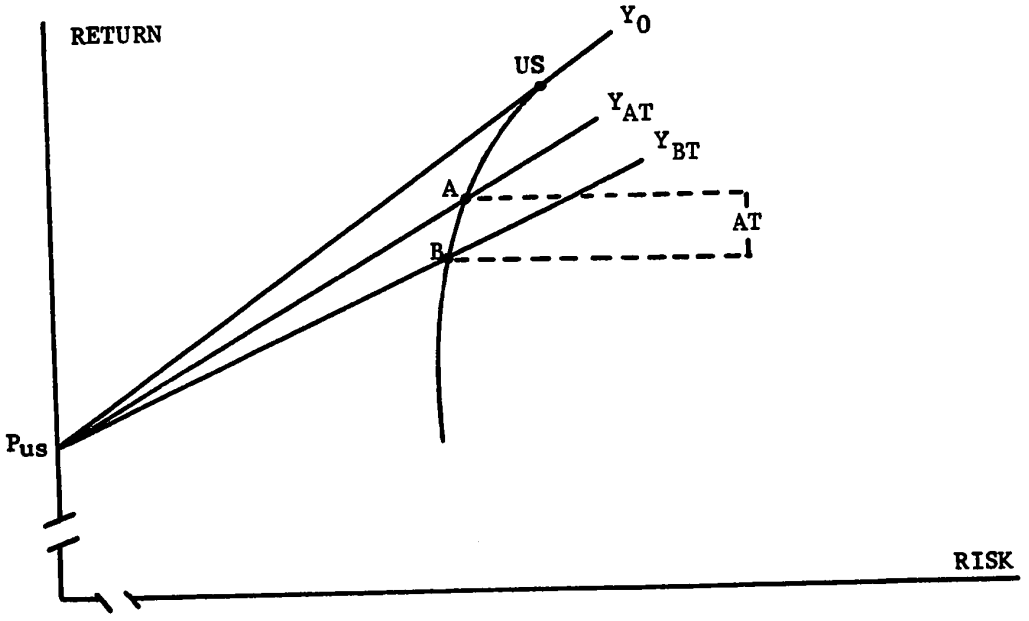
The choice of tax rates is uniquely determined by the size of the subsidy applied to Canadian investment funds. It is not possible to directly calculate a tax rate once the subsidy rate is specified because the values of $1-\alpha_2$ and consequently the expected earnings and standard deviation of the new American diversified portfolio are unknown. An intermediate step is necessary to calculate these two unknowns. Once

the value of $1-\alpha_2$ is found the values for the expected returns and standard deviation can be obtained. New values for the expected return and standard deviation are necessary to calculate the slope of the new opportunity set line. The difference in slopes between the new and old opportunity set lines represents the tax rate to be levied on American funds in Canadian security markets.

This tax formulation can also be represented diagrammatically. Figure 4-2 shows the performance of all-Canadian and all-United States fully diversified portfolios within a risk-return space. The curve CUS again represents the locus of portfolio combinations attainable by varying the composition of the two national portfolios. P_{us} represents the riskless United States interest rate. The line $P_{us}Y_o$ depicts the opportunity set attainable by United States investors who borrow and lend at the riskless United States rate.

FIGURE 4-2

Tax Formulation



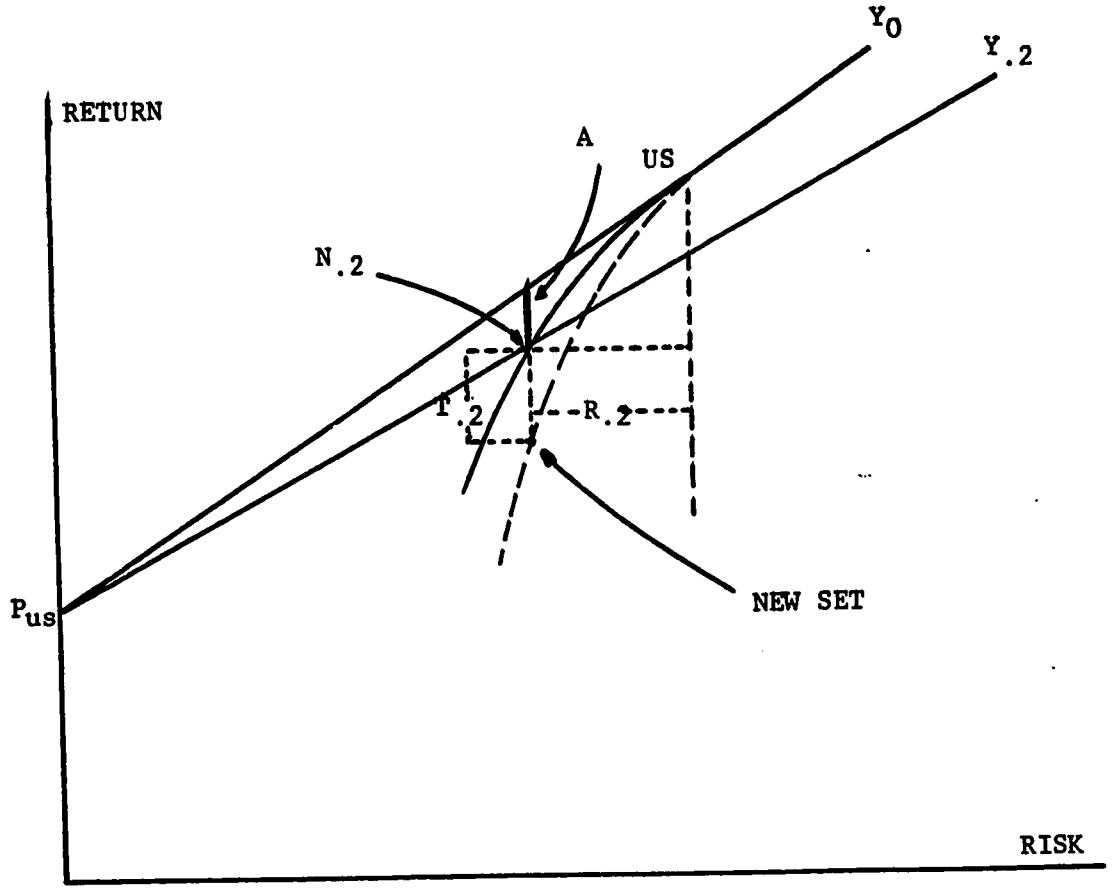
Line $P_{us}Y_{BT}$ represents the opportunity set currently being attained by American investors who participate in Canadian security markets. If we assume that the subsidy to Canadian investors repatriates AT dollars, then an equal amount of American funds must be displaced from the Canadian security market if security prices are not to rise. This means that the dollar value of $1-\alpha_2$, or the portion of American funds invested in Canadian securities, must be reduced by the amount AT. Reduction of $1-\alpha_2$ changes the slope of the opportunity set line (the new opportunity set line is now $P_{us}Y_{AT}$). The difference between the slopes of the lines $P_{us}Y_{BT}$ and $P_{us}Y_{AT}$ is the tax required to reduce American participation in Canadian securities.

Taxation will move the foreign investor off the curve C US and will create a new set of investment opportunities. It appears unlikely that American investors will diversify into Canadian securities (if American securities strictly dominate Canadian securities with respect to returns and risk) because American investors can reduce their total portfolio risk, at a smaller loss of expected returns, by exchanging risky for riskless securities (moving towards P_{us} along $P_{us}Y_o$). Taxation creates a new set of risky securities which are a far more costly method of risk reduction than exchanging risky for riskless securities. This condition is shown in Figure 4-3.

Distance A represents the cost of reducing risk $R_{.2}$ by exchanging risky for riskless securities. $T_{.2}$ plus A represents the cost of reducing risk by diversifying into Canadian securities ($T_{.2}$ is the Canadian tax and A is the opportunity cost of not diversifying via movement down the capital market line). This condition will be examined more closely with reported measurements in Chapter 6.

FIGURE 4-3

New Investment Set



Summary

The subsidy formulation designates the amount by which the rate of return on all Canadian security portfolio will have to be increased if the portfolio were to attain the same opportunity set as the Canadian investor could obtain through diversification into United States securities. The subsidy formulation presented is computationally sensitive to the size of Canadian participation in United States securities, the expected returns from Canadian and United States securities, the variance of the expected returns and the covariance of these returns.

The tax formulation presented is sensitive to both the size of subsidy and the size of American participation in Canada. The level of taxation is uniquely determined by the amount of subsidy applied to Canadian investment funds. The effect of the tax will decrease the yield on Canadian securities to American investors and thereby encourage the withdrawal of foreign investment capital. At the same time, subsidies to Canadian investors participating in Canadian securities will increase effective yields to Canadians. These subsidies will also serve to repatriate Canadian funds to replace withdrawn foreign capital. Simultaneously application of the subsidy to Canadian investors and of the tax of foreign investors will have a minimal effect on Canadian security prices because the size of the total funds invested in Canadian securities will not be changed. The only aspect that will change is the national origin of such funds (Canadian funds will replace American funds).

CHAPTER V

INPUTS FOR SUBSIDY AND TAX FORMULATIONS

This chapter will be devoted to the discussion of variables used in calculating subsidies for Canadian investors who diversify abroad, and for calculating taxes for foreign investors who invest in listed Canadian securities. It will include the references from which the variable was obtained, its size, a brief discussion on the measurement of the variable and a discussion of the possible inaccuracies involved in the measurement of the variable. Where applicable, an alternate data source will be provided.

The Distribution of Canadian Investment Funds

The proportion of Canadian funds invested in Canadian securities can be approximated by summarizing the holdings of individuals and various institutional investors discussed in Chapter II. A summary of Canadian holdings of both foreign and domestic stocks is shown in Table 2-5. From the table, the current value of α_1, the proportion of Canadian funds invested in Canadian securities is calculated to be approximately 0.842. The proportion of Canadian funds invested in United States securities, $1-\alpha_1$, is 0.158. The dollar values for α_1, and $1-\alpha_1$, are \$17.56 and \$3.31 billion, respectively.

The Distribution of United States Investment Funds

The Toronto Stock Exchange Study reported that the total market value of United States listed stock at the end of 1966 was approximately

$530 billion.[1] If we accept the market value of all listed Canadian securities as being $36 billion of which 40 per cent is foreign owned and further assume that this ownership is primarily American, then approximately $14.4 billion of American funds are invested in Canadian securities.[2] Since the market value of all listed American securities is $544.4 billion, the $14.4 billion invested in Canadian securities represents 2.55 per cent of total American investments. Therefore $1-\alpha_2$ is approximately 0.0255 and α_2 is approximately 0.9745.

The Pure Rate of Interest in Canada (P_c)

For the purpose of this thesis, the pure rate of interest in Canada will be assumed to be the discount rate of three month treasury bills. These discount rates are shown in Table 5-1. The discount rate on 90 day treasury bills is used because it minimizes the problem of term structure and forward rates. The data shown in the table is quoted on tender in per cent per annum in the appropriate currency.

Using the time period included in Levy and Sarnat's article the average pure rate of interest in Canada between 1951 and 1967 was 3.02%. For the period 1959 to 1966, as used by Grubel, the average pure rate for interest was calculated to be 3.8%.

The Pure Rate of Interest in the United States (P_{us})

The pure rate of interest in the United States is assumed to be the discount rate of three month treasury bills. These discount rates

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[1] The Supply of, and Demand for, Canadian Equities, A Study Commissioned by the Toronto Stock Exchange, Toronto: The Toronto Stock Exchange, (Vol. 1A., 1970), page 4.

[2] Ibid, page 8.

TABLE 5-1

Discount Rate on Treasury Bills

(Three Month Bills On Tender in Per Cent Per Annum: Data Defined in Country Notes) 1951-1967[3]

Year	United States P_{us} %	Canada P_c %
1951	1.55	.80
1952	1.77	1.07
1953	1.94	1.69
1954	.95	1.44
1955	1.74	1.62
1956	2.66	2.92
1957	3.26	3.76
1958	1.84	2.29
1959	3.42	4.80
1960	2.94	3.32
1961	2.38	2.82
1962	2.78	4.00
1963	3.16	3.57
1964	3.55	3.74
1965	3.95	3.97
1966	4.88	5.00
1967	4.33	4.60

[3] IMF's International Financial Statistics, Various Issues.

are shown in Table 5-1. The average pure rate-of interest calculated when the Grubel time period (1959-1966) was used was 4.46 per cent. Using Levy and Sarnat's time period (1961-1967) the average pure rate of interest was 2.77 per cent.

Expected Returns from Investment in Canadian Securities (E_c)

To demonstrate the gains from diversification accruing to American investors from international diversification, Grubel measured the rates of return from portfolio-investment in common stock market averages for eleven major countries for the period January 1959 to December 1966.[4] For the purposes of this thesis, only Canada and the United States are considered. Grubel found that the per annum return on investment in Canadian securities for the period 1959-1966 was 5.95 per cent.

To obtain the rates of return for the eleven major countries in his article, Grubel used the geometric mean of 95 monthly returns for each of the major countries. The index from which Canadian returns were calculated was obtained from the industrials series of the Toronto Stock Exchange, Supplement Booklet No. 2.

In computing the geometric return, Grubel assumed that dividends are re-invested in fractional shares under current price, and that changes in foreign exchange rates are the only risks of international diversification. Grubel did not adjust returns for withholding taxes nor transaction costs.

To examine the potential gains accruing from international diversification, Levy and Sarnat calculated mean rates of return on common

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[4]H.G. Grubel, "Internationally Diversified Portfolios: Welfare Gains and Capital Flows," American Economic Review, (December, 1968), page 1305.

stocks and their standard deviation for twenty-eight countries for the period 1951 to 1967.[5] They defined the annual rate of return for each country as the percentage change in dollar value of its index of common stocks. The indices were adjusted to reflect any changes in exchange rates during the period. To obtain the mean rate of return for each country, Levy and Sarnat computed the arithmetic mean of the annual returns. Common stock indices and exchange rate statistics were obtained from various issues of the International Monetary Fund's International Financial Statistics. For purposes of this thesis, only returns from Canadian and American investment will be considered. Levy and Sarnat calculated that the average annual rate of return from investment in Canadian common stock was 8.6 per cent.

To measure changes in the Canadian common stock index, the IMF employs daily averages of Thursday quotations in Montreal and Toronto stock exchanges for three months and three and twelve month averages thereafter. Indices are weighted by the value of shares outstanding and adjusted at annual intervals for share dividends rights or similar actions.

Levy and Sarnat state that the use of the arithmetic mean on the historical rates of return imparts an upward bias to the returns. They justify the use of this upward bias, because the rates of return have a downward bias owing to the neglect of dividends. All rates of return are also adjusted for changes in exchange rates.

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[5]Haim Levy and Marshall Sarnat, "International Diversification of Investment Portfolios," American Economic Review, (September, 1970), pages 668-675.

Expected Returns from Investment in United States Securities (E_{us})

Grubel has calculated the average historical annual rate of return from investment in United States securities to be 7.54 per cent per annum for the period 1959 to 1966.[6] As previously mentioned, this return was calculated from capital gains due to common stock price and exchange rate changes. He assumed that dividends are reinvested each month in fractional shares at current prices. Grubel did not adjust for withholding taxes or transaction costs.

The share price index for United States securities was obtained from Moody's industrial average of common stocks from Moody's Industrial Manual, June 1967.[7] Moody's industrial averages are weighted arithmetic means of stock prices.[8] They are weighted by the number of shares currently outstanding of each component stock relative to the original number of shares of each stock. Stock splits and stock dividends are automatically adjusted for. Moody's average carried with it the implication of no portfolio reallocation among stocks in the average. Each stock is assumed purchased in dollar amounts proportional to its aggregate market value relative to the aggregate value of all other stocks in the sample.

Levy and Sarnat computed an arithmetic mean of 12.1 per cent for investment in United States securities for the period 1951 to 1967.[9]

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[6]H.G. Grubel, op cited, page 1304.

[7]Ibid, page 1304.

[8]Henry A. Letane and Donald Tuttle, Security Analysis and Portfolio Management, New York: The Ronald Press Company, 1970, pages 170-171.

[9]Haim Levy and Marshall Sarnat, op cited, page 669.

The arithmetic mean is again deliberately used to offset the downward bias from neglecting dividends. These authors obtained their raw data from the IMF's International Financial Statistics. This publication uses a weighted aggregate index based on quotations in New York, as compiled by Standard and Poor's Investors Service, to calculate common stock indices.[10] The major weakness of Levy and Sarnat's measurement is that they have used the arithmetic mean to adjust for neglect of dividends.

Standard Deviation of Returns from Canadian Securities (σ_c)

Grubel has calculated the standard deviation of returns from investment in Canadian securities. He found that for an arithmetic mean return of 5.95 per cent per annum the standard deviation was 41.19 for the period 1959 to 1966.[11]

In their study, Levy and Sarnat calculated the annual rate of return from investment in Canadian securities to be 8.6 per cent and that the standard of this return was 14.3 per cent.[12]

The difference between the variances calculated in the separate articles can be accounted for in two ways. Firstly, Grubel used the Toronto Stock Exchange Industrials Index while Levy and Sarnat employed statistics from both Toronto and Montreal Stock Exchanges, thus different inputs were used. Secondly, both studies involved different time periods (Grubel, 1959-1966 and Levy and Sarnat, 1957-1967).

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[10]Ibid, page 669.

[11]H.G. Grubel, op cited, page 1304.

[12]Haim Levy and Marshall Sarnat, op cited, page 669.

Standard Deviation of Returns from United States Securities (σ_{us})

For investment in American securities, Grubel has calculated a historical per annum rate of return of 7.54 per cent with a standard deviation of 47.26 for the period 1959 to 1966.[13] As previously mentioned this risk measure was not adjusted for war, confiscation or exchange restrictions.

Levy and Sarnat computed the mean rate of return and standard deviation for American investments. For the period 1957 to 1967, they found that the arithmetic mean return for investment in United States securities was 12.1 per cent per annum with a standard deviation of 12.1 per cent.

Correlation of Returns Between Canadian and United States Securities (ρ)

Grubel has calculated correlation coefficient between Canadian and American security returns to be 0.7025 for the period 1959 to 1966.[14] He noted that the correlation coefficient is statistically significant at the 5 per cent level.

Levy and Sarnat calculated the correlation coefficient between Canadian and American security returns to 0.81 for the period 1951 to 1967.[15]

Grubel computes the correlation coefficient between Canadian and American returns from the data supplied from the Toronto Stock Exchange and Moody's Industrial Manual, respectively. Levy and Sarnat compute

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[13]H.G. Grubel, op cited, page 1304.

[14]H.G. Grubel, op cited, page 1304.

[15]Haim Levy and Marshall Sarnat, op cited, page 674.

their correlation coefficient from a much larger set of observations for a long time period. They used the data as supplied by quotations from the Toronto and Montreal exchanges and the Standard and Poor's Composite Index of 500 stocks.

Summary

The data discussed in this chapter is summarized in Table 5-2. As this table shows, two values are provided for many of the variables. Differences between values are largely explained in sources of raw material, assumptions used, computational methods and the different time periods involved.

Data from this table will be combined with the subsidy/tax formulations developed in Chapter IV to provide approximate values for subsidies and taxes.

TABLE 5-2

Data Summary

Variables	Value of Variables	Source and Comments
α_1	0.842	TSE Study
$1-\alpha_1$	0.158	TSE Study
α_2	0.9745	TSE Study
$1-\alpha_2$	0.255	TSE Study
P_c	3.02 %	IMF, Arithmetic mean for Levy and Sarnat's time period 1951-1967
	3.87 %	IMF, Arithmetic mean for Grubel's time period, 1959-1966
P_{us}	2.77 %	IMF, Arithmetic mean for Levy and Sarnat's time period, 1951-1967
	4.46 %	IMF, Arithmetic mean for Grubel's time period, 1959-1966
E_c	8.6 %	Levy and Sarnat
	5.95 %	Grubel
E_{us}	12.1 %	Levy and Sarnat
	7.54 %	Grubel
V_c	204.49	Levy and Sarnat
	1696.6161	Grubel
V_{us}	146.41	Levy and Sarnat
	2233.5076	Grubel
$\rho_{us,c}$	0.81	Levy and Sarnat
	0.7025	Grubel

CHAPTER VI

SAMPLE SUBSIDY/TAX CALCULATIONS

This chapter will be composed of three major sections. The first section will be devoted to describing the efficient frontiers that can be constructed using data from Grubel's[1] and Levy and Sarnat's[2] articles. It will be shown that the predictive ability of this data is highly questionable with regards to benefits from international diversification, especially from the American investor's viewpoint.

The second section of this chapter will contain sample subsidy calculations. These subsidy calculations will be based on the formulation devised in chapter four and will use the data described in chapter five. Various reference point assumptions will be employed to show that subsidy formulation is workable as long as a reference point is shown.

The third section of this chapter will contain sample tax calculations based on the formulation presented in chapter four. Data for these calculations will be drawn from the discussions in chapter five. Sample tax calculations will be made with the objective of eliminating present American participation so as to make more investment opportunities for Canadian investors. This section will also show that American participation in Canadian securities, using the data provided indicates market disequilibrium.

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[1] H.G. Grubel, op cited, pages 1299-1314.

[2] Haim Levy and Marshall Sarnat, op cited, pages 668-675.

Diversification Among Canadian and American Securities

This sub-section illustrates portfolios that can be obtained by combining Canadian and American securities. Portfolios are formed on the assumption that the proportions invested in each country are changed by 10 per cent each time. Expected return and standard deviation were calculated every time the proportions were changed. This 10 per cent change factor was chosen for computational ease and is not meant to describe actual investment activity. It is adequate for describing the range of efficient portfolios. In addition to these sample portfolios, returns and standard deviations were calculated of approximate values of α_1 and α_2.

Table 6-1 contains the returns and standard deviations of thirteen portfolios which are composed of various proportions of Canadian and United States investment funds. Returns and standard deviations were calculated on the basis that returns from investment in Canadian securities and United States securities were 5.95 per cent and 7.54 per cent respectively, and standard deviations for Canadian and United States investments were 41.19 and 47.26 respectively.[3]

Returns and standard deviations from Table 6-1 are plotted in Figure 6-1. This graph shows the relationship of the pure interest rate in Canada and the pure interest rate in the United States to the calculated portfolios. The graph indicates that portfolios composed of high per centages of American securities dominate portfolios composed of a high per centage of Canadian securities.

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[3]H.G. Grubel, op cited, page 1304.

TABLE 6-1

Calculated Portfolios Based on Grubel's Data[4]

	Portfolio Composition		Portfolio	
	Canadian Securities %	United States Securities %	Returns %	Standard Deviation
1.	0	100	7.540	47.26
2.	2.55	97.45	7.499455	46.78*
3.	10	90	7.381	45.53
4.	20	80	7.222	43.98
5.	30	70	7.063	42.68
6.	40	60	6.904	41.61
7.	50	50	6.745	40.82
8.	60	40	6.586	40.31
9.	70	30	6.427	40.08
10.	80	20	6.368	40.16
11.	84.2	15.8	6.201	40.28**
12.	90	10	6.109	40.53
13.	100	0	5.950	41.19

*measured American diversified portfolio composition.

**measured Canadian diversified portfolio composition.

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[4]H.G. Grubel, Ibid, page 1304.

Detail A shown in Figure 6-1 is expanded and shown in Figure 6-2. Figure 6-2 shows the gains Canadian investors obtain from diversification into American securities. Gains to Canadian international investors are in the form of reduced standard deviation (risk) and increased returns. This graph also indicates that all portfolios below point D are inefficient because higher returns for the same amount of risk can be obtained by greater Canadian diversification into American securities.

Table 6-2 contains a second set of sample portfolios calculated from Levy and Sarnat's data.[5] Again portfolio compositions were varied 10 per cent at a time with the exception of the second and eleventh entries whose composition is based on approximate values of α_1 and α_2.

Data from Table 6-2 is shown graphically in Figure 6-3. Figure 6-3 depicts the efficient frontier that can be formed by the various combinations of Canadian and American securities. The efficient frontier is shown in relationship to the pure rates of interest in both countries in the relevant risk-return space. Detail B is expanded in Figure 6-4 to show the measured portfolios of both Canadian and American investors. Investigation of the data in Figure 6-4 reveals that Canadian investors can reduce portfolio risk and increase returns by diversification into American securities. With references to Levy and Sarnat's data and the approximate proportion invested in American securities, Figure 6-4 shows that Canadians gain 0.553 per cent in returns and 0.66 per cent in decreased risk through diversification compared to an all Canadian portfolio. Use of Grubel's data indicates that gains accruing to Canadians are 0.251 and 0.91 per cent, respectively.

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[5]Haim Levy and Marshall Sarnat, op cited, page 674.

FIGURE 6-1

Efficient Frontier-Grubel

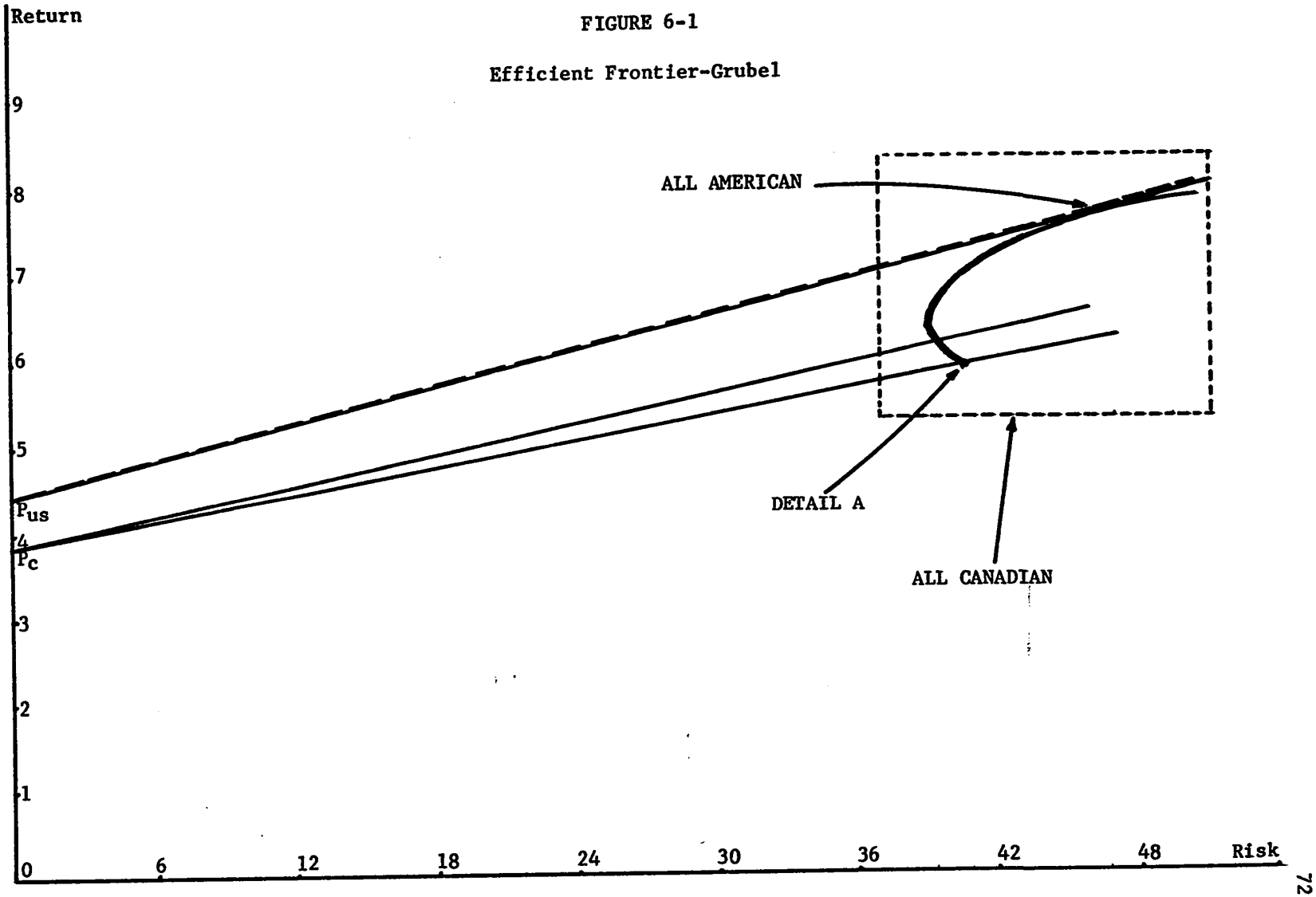

FIGURE 6-2

Detail A

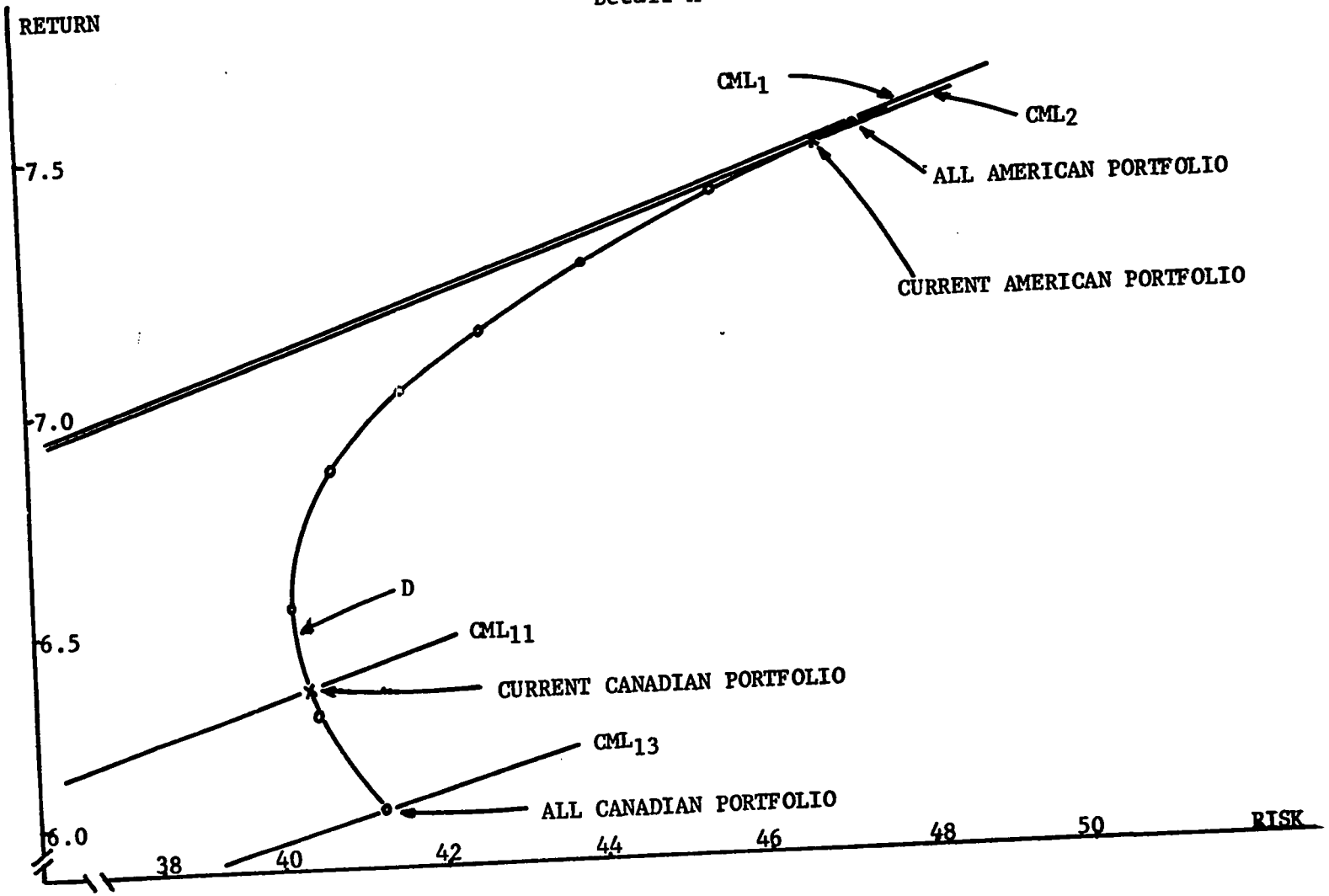

TABLE 6-2

Calculated Portfolios Based in Levy and Sarnat's Data[6]

	Portfolio Composition		Portfolio	
	Canadian Securities %	United States Securities %	Returns %	Standard Deviation %
1.	0	100	12.10	12.10
2.	2.55	97.45	12.09	12.083*
3.	10	90	11.75	12.08
4.	20	80	11.40	12.12
5.	30	70	11.05	12.21
6.	40	60	10.70	12.35
7.	50	50	10.35	12.55
8.	60	40	10.00	12.82
9.	70	30	9.65	13.13
10.	80	20	9.30	13.47
11.	84.2	15.8	9.153	13.64**
12.	90	10	8.95	13.87
13.	100	0	8.60	14.30

*measured American diversified portfolio composition.

**measured Canadian portfolio composition.

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[6]Haim Levy and Marshall Sarnat, op cited, page 669.

FIGURE 6-3

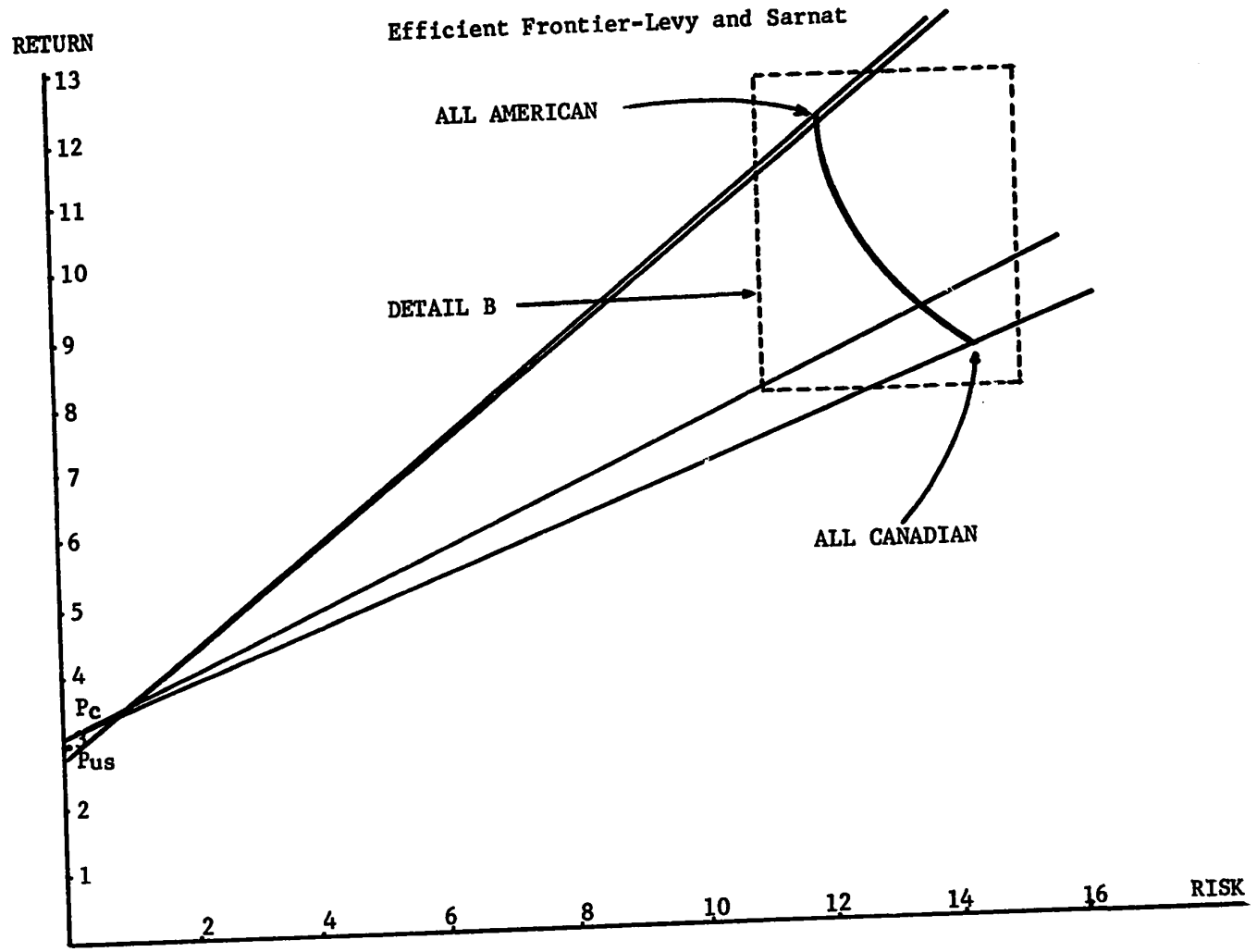
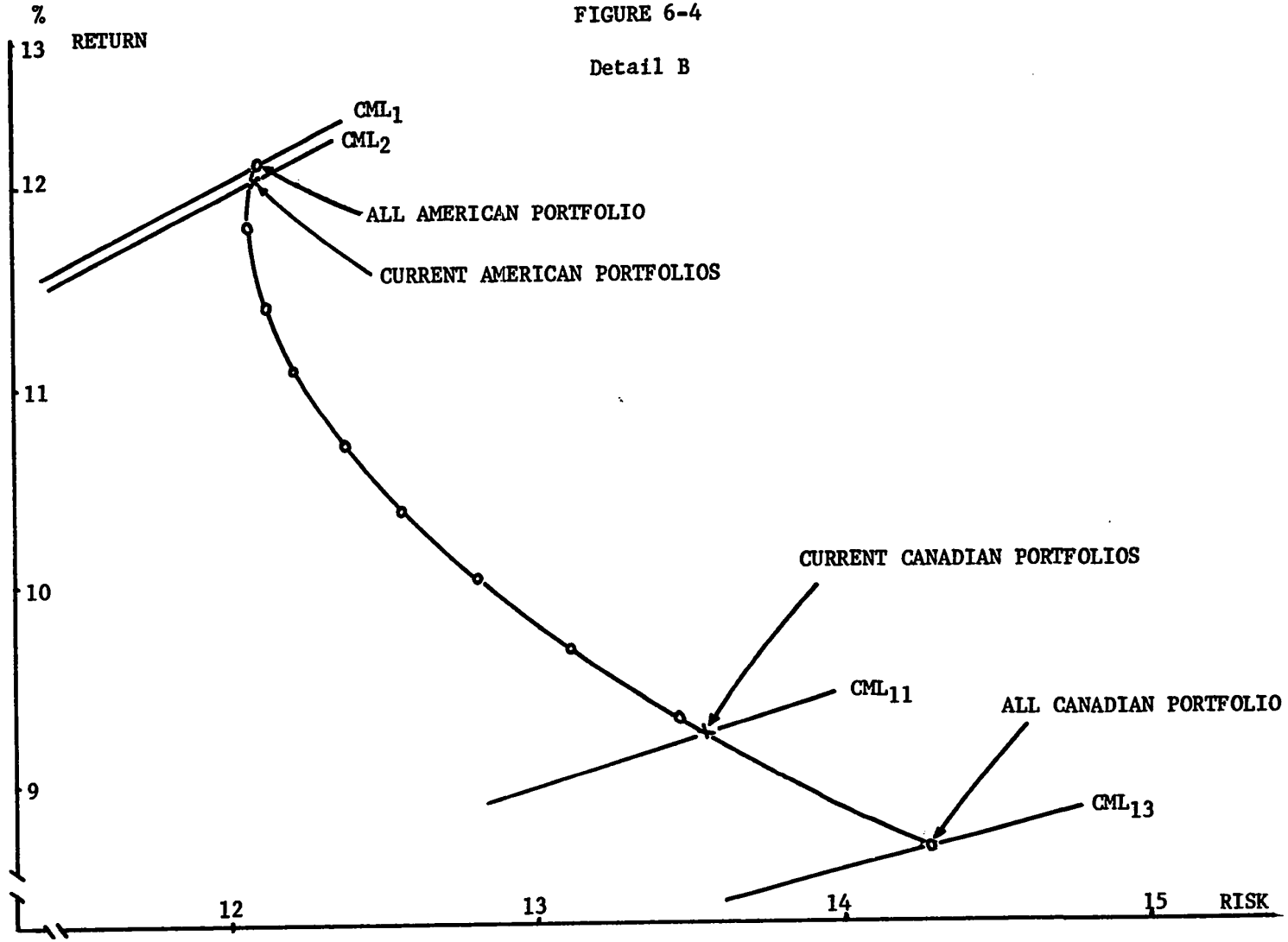

Efficient Frontier-Levy and Sarnat
RETURN
13
12
11
10
9
8
7
6
5
4
Pc
Pus
2
1
ALL AMERICAN
DETAIL B
ALL CANADIAN
2
4
6
8
10
12
14
16
RISK

FIGURE 6-4

Detail B



American diversification into Canadian security markets presents a different situation. Grubel's data indicates that American investors, at their present diversification level ($1 - \alpha_2 = 0.0255$), must give up a return of 0.041 per cent per annum to gain a reduction of 0.48 in risk, when compared to returns and risk of an all-American portfolio. Levy and Sarnat's calculations reveal that those investors must give up a return of 0.01 per cent per annum for a risk reduction of 0.017 per cent, when compared to an all-American portfolio. Figures 6-2 and 6-4 illustrate that the above action of American investors is not rational or that severe market disequilibriums exist. In all cases with the data presented, American investors could reduce risk at a lower cost by trading risky for riskless American securities (move to the left along CML_1) rather than reduce risk by diversifying into Canadian security markets at a much higher return reduction. It is unlikely that American investors would not recognize this situation and therefore the data that Grubel and Levy and Sarnat present should be accepted cautiously.

An additional initial deterent to American diversification into Canadian securities is the current American Interest Equalization Tax. This tax is imposed on the acquisition, by a United States person, of a stock or a foreign issue which is acquired from a foreign person. The tax on the stock transaction is a flat 11.25 per cent of the stock's actual value on the date of transfer.[7] This tax is only an initial deterent because it raises the initial purchase price of the security. The tax paid is a "sunk" cost and is not used in computing the rate of

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[7]United States Code Annotated, Title 26, Internal Revenue Code, Section 4917.

return on the stock at some later date. It is a sunk cost because the American investor can not recover it upon sale of the stock and therefore the value of the stock to the American investor is the market price. Because of the sunk nature of the tax, the tax does not discourage ownership of Canadian securities by American investors after the initial tax payment so that the American investor may continue to participate in Canadian security markets in the fashion as the Canadian investor.

Sample Subsidy Calculations

Using the subsidy formulation developed in chapter four and the data discussed in chapter five, several sample subsidies will be presented in this section of chapter six.

Briefly, the subsidy is calculated by finding the difference between "effective" capital market lines and multiplying this difference by the standard deviation. In review, the formulation is:

(6-1)

$$\text{Subsidy} = \sigma_D \left[\frac{E_p - P_c}{\sigma_p} - \frac{E_D - P_c}{\sigma_D} \right]$$

where: σ_D = standard deviation of the desired portfolio

E_p = expected returns of current portfolio

σ_p = standard deviation of the current portfolio

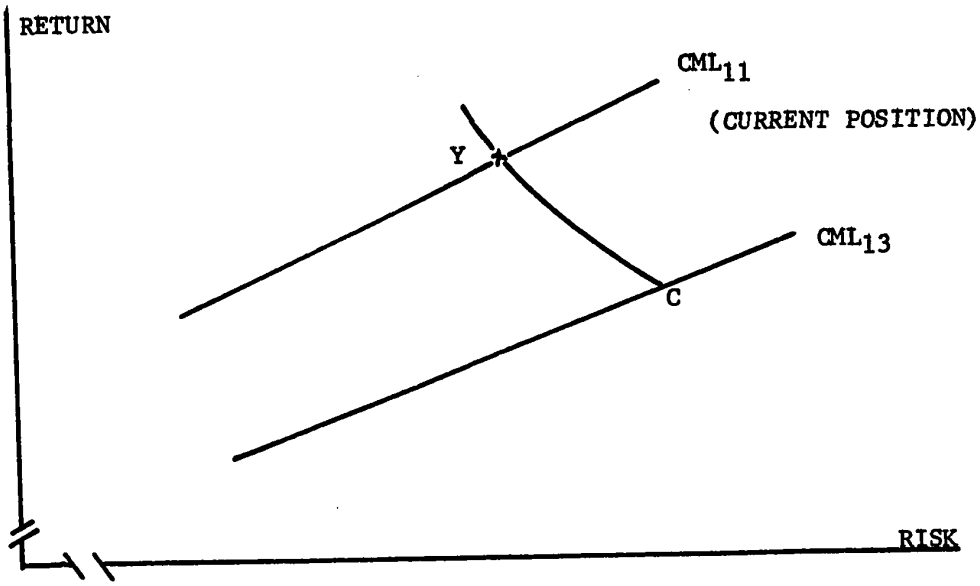
E_D = expected returns of the desired portfolio

P_c = pure rate of interest in Canada

Figure 6-5 shows the lower end of the curve C US from Figure 6-2. The tables following, based on Grubel's calculations, list the characteristics of the various points shown in Figure 6-5. The pure rate of interest calculated for the time period Grubel uses is 3.87 per cent.

FIGURE 6-5

Sample Subsidy Calculations - Grubel



Position C		Position Y	
α_1	= 1.0	α_1	= 0.842
$1-\alpha_1$	= 0.0	$1-\alpha_1$	= 0.158
E_c	= 5.95	E_y	= 6.2012
σ_c	= 41.19	σ_y	= 40.28

Value of E_c and E_y indicate the expected returns of the various portfolios, whereas σ_c and σ_y indicate the riskiness of these respective portfolios. The proportion of Canadian funds invested in Canadian securities is given by the value of α_1, and the residual, $1-\alpha_1$, indicates the proportion of Canadian funds invested in United States securities.

The amount of subsidy required to attract Canadian funds back to Canadian security markets can be calculated by substituting the appropriate values into equation (6-1).

For example if we assume that the desired position is C, where all Canadian investment funds are to be invested in Canadian securities, and the current position is Y, where 15.8 per cent of Canadian funds are invested in foreign securities, substitution into equation (6-1) yields a subsidy of 0.3134 per cent. This subsidy would provide Canadian investors in Canadian securities with a total return of 6.2634 per cent with a standard deviation of 41.19.

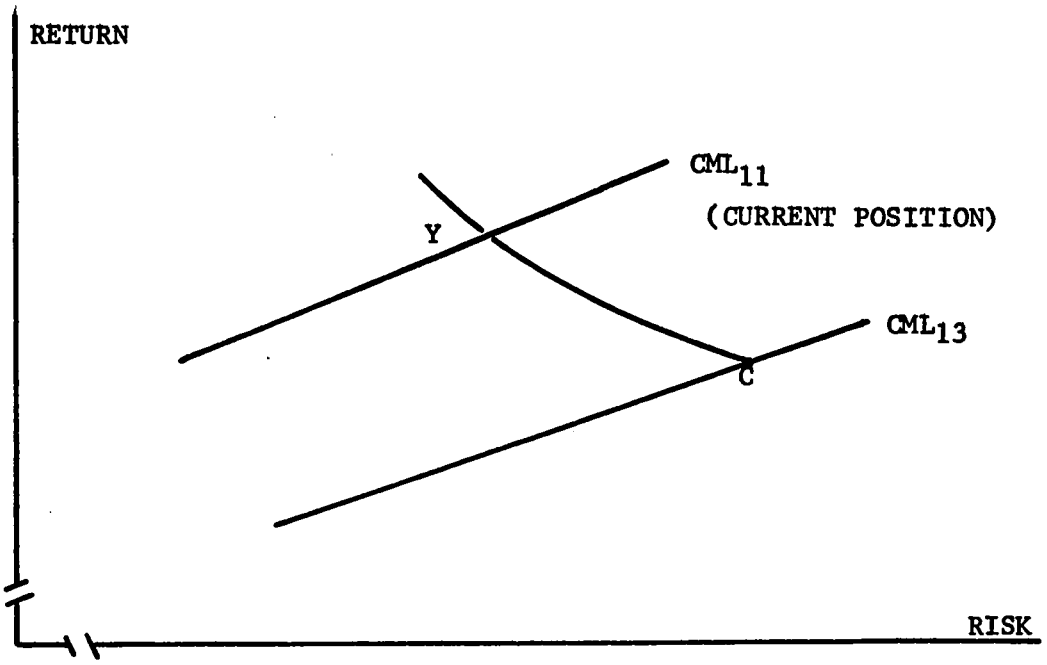
Use of Levy and Sarnat's data for calculations produces subsidies of different size because basic inputs are different. Figure 6-6 shows the lower end of the Curve CUS from Figure 6-4. Values for the various portfolio compositions shown in Figure 6-6 are listed in the table following the diagram. The variables in the table have the same definitions as in the previous subsidy calculations. The pure rate of interest used with Levy and Sarnat's data is 3.02 per cent. Again the sample subsidy calculations are obtained by substituting the appropriate values into equation (6-1). If we assume that the desired investment policy goal requires that all Canadian funds are to be invested in Canadian securities and the current situation is where 15.8 per cent of Canadian funds are invested in American securities, substitution of the appropriate value into (6-1) yields a subsidy of 0.9929 per cent. The total yields the Canadian investor would earn by being restricted to an all-Canadian portfolio would be 9.5929 per cent with a standard deviation of 14.30.

In the sample calculations, subsidization provided a higher total yield than the current diversified portfolio. The subsidy provides a higher yield than investors could normally earn by diversification but at a risk level no greater than the risk of the all-Canadian portfolio.

This type of subsidy will bring Canadian investment dollars home to be invested in Canadian securities.

FIGURE 6-6

Sample Subsidy Calculations - Levy and Sarnat



Position C		Position Y	
α_1	= 1.0	α_1	= 0.842
$1-\alpha_1$	= 0.0	$1-\alpha_1$	= 0.158
E_c	= 8.6	E_y	= 9.30
σ_c	= 14.30	σ_y	= 13.47

Sample Tax Calculations

Calculation of taxes, to be levied on American participation in Canadian security markets, are linked to the sample subsidy calculations presented above. Taxation is necessary to reduce the yields accruing to Americans and thereby discourage further participation and secondly, to open new investment opportunities to the subsidized Canadian capital.

The amount of tax to be levied on American investors is governed by the amount of American dollars that must be displaced. This can be done by solving:

$$(6\text{-}2) \qquad Sub_{\$} = h_c \ (1-\alpha_1) \ - \ (1-\alpha_1') \tag{6-2}$$

by substituting values for the variables as previously defined in equation (4-10). Substitution yields a dollar value for the subsidy of $3.31 billion (if all Canadian funds invested in foreign securities are to be repatriated). Converting to American funds by assuming an exchange rate of 1.02, yields a value of $3.3672 billion. This is the amount of American funds that must be displaced from Canadian security markets. To find the new value of $1-\alpha_2$, that is American participation in Canadian securities it is necessary to substitute the amount of American dollars that must be displaced into equation (6-3).

$$(1-\alpha_2') = (1-\alpha_2) - \frac{Tax_{\$}}{K_{us}} \tag{6-3}$$

Equation (6-3) is the same as equation (4-12). Substitution shows that $1-\alpha_2'$ equals 0.01932. Calculation of expected returns and standard deviation using Grubel's data and a new value of α_2' equal to 0.9868 yields returns of 7.51 per cent and a standard deviation of 46.877. Finding the difference in the slope of the opportunity set line where α_2 equals 0.9745 and the slope of the opportunity set line where α_2 equals 0.9868 and multiplying this difference by 46.877 yields a tax of 0.00352378 per cent.

Similarly deciding to repatriate all Canadian funds invested in American securities, and using Levy and Sarnat's rate of return and

standard deviation data, shows that a tax rate of 0.9856 per cent must be levied on American funds in Canada. This tax rate would leave American diversified portfolios with a 11.8737 per cent rate of return and a standard deviation of 12.1141 per cent.

In both sample tax calculations, the market disequilibrium argument is evident. American investors could reduce risk by trading risky American securities for riskless American securities at a smaller rate of return reduction than they can by diversifying into American securities. In all cases taxation would produce new investment sets to the right of the present efficient frontier. It is unlikely that American investors would not recognize this "cheaper" method of risk reduction, therefore Grubel's and Levy and Sarnat's measurements of rates of return and standard deviation should be accepted with some caution.

Summary

Portfolios illustrated in this chapter indicate that portfolios composed of a high per centage of American securities dominate portfolios composed of a high per centage of Canadian securities. This raises serious questions as to the reason why Americans diversify into Canadian security markets and also whether the measurements that Grubel and Levy and Sarnat provide, are reasonably accurate.

Sample subsidy and tax calculations were based on the above data, therefore their magnitude is only as realistic as the original data. This chapter has shown that a subsidy/tax formulation can be made workable if data is available and a policy goal is chosen. Both subsidy and tax formulations are computationally sensitive, to the proportion of

funds invested in a country's securities, to the expected returns of a country's securities, to the related standard deviation and to the pure rate of interest in the country. The tax formulation is directly linked to the subsidy calculation and therefore the resultant tax rate is sensitive to the amount of Canadian funds being repatriated.

CHAPTER VII

SUMMARY

Summary of the Paper

The main purpose of this thesis is to address the problem of the flow of Canadian investment funds abroad and simultaneously the problem of indirect foreign ownership resulting from foreign participation in Canadian securities markets. The flow of Canadian investment dollars into foreign security markets aggravates the problem of foreign ownership of Canadian business. If these Canadian funds could be attracted to Canadian securities, they could supplant some of the current foreign purchases of Canadian securities. In addressing the above problem this paper attempts to formulate a subsidy applicable to Canadian investors and simultaneously a tax for foreign investors. Both descriptive and deductive methods are used to integrate the principles of the Expected Return-Variance model with international diversification to obtain subsidy/tax formulations.

The magnitude of Canadian dollar flows can be partially evaluated by examining the extent of foreign security holdings of both individuals and institutional investors. All institutional investors over the past decade have increased their size and the size of their foreign security holdings. The extent of their foreign security participation depends largely on their obligations which, in turn, dictates their investment policies.

The Expected Return-Variance model sets the basic framework in which the subsidy/tax problem is examined. Attention is given to the measures of return and risk with respect to their adequacy and measure-

ments. Limitations such as measurement of values, the static nature of the model and the cost of using the model are noted.

Sharpe's capital market model is also summarized in an effort to develop the foundation for developing subsidy/tax formulations. Relevance of the capital market line, with reference to trading risky for riskless securities, is indicated and provides the core for establishing a risk return relationship.

Grubel's and Levy and Sarnat's works are discussed as an example of adaptation of the mean-variance model on an international basis. Both articles use different indexes for measuring the returns and risks, and both concede that they have under estimated the inherent risk. The different time periods used also increase the differences in measures of rates of return and variances of return for Canadian and American investments.

Sharpe's equation for the price of risk reduction provides the basis for the subsidy/tax formulation. This adapted formulation is developed on a two country assumption. Assumptions are also made regarding a fixed supply of securities and a fixed supply of investment funds to allocate to these stocks. The subsidy developed is an attempt to compensate Canadian investors for increased returns and reduced risks they might otherwise benefit from by investing internationally. The subsidy is formulated with the purpose of keeping Canadian dollars in Canada. Simultaneously, a tax formulation is devised to discourage the further entrance of United States investment monies into Canadian security markets. It is designed to decrease the effective yields that American investors currently gain from participation in diversifying into Canadian securities issues and free Canadian securities for Canadian

investment.

Inputs necessary for the subsidy and tax formulations are discussed to show the magnitude of the problem. Limitations of the present data are indicated so that the calculations derived are not considered to be entirely realistic. It is also felt that some standardization in measurement of returns and risk in each country involved, is necessary so that the costs of the subsidy program may be more realistically determined. Probably the most consistant expectation of the data examined is the fact that a relatively high correlation of returns exists between Canada and the United States. This phenomena appears obvious because of the high degree of United States ownership in Canadian industries. The data used also indicates that for most time periods considered, the pure rate of interest in Canada has tended to be generally higher than in the United States.

Data assembled from Grubel's and Levy and Sarnat's articles was used in sample subsidy and tax calculations. Again the different basis on which the rates of return and standard deviations were calculated lead to different subsidy and tax rates. At this point, it becomes increasingly difficult to trace the data through to the final subsidy or tax calculations. What these sample calculations do is to provide a validity control of the formulations developed.

Closer examination of Grubel's and Levy and Sarnat's data, when it is employed in tax calculations, reveals a curious market disequilibrium if the data is accepted at face value. It is unlikely that American investors would not recognize this "disequilibrium", therefore, Grubel's and Levy and Sarnat's measurements of rates of return and variances must be accepted cautiously.

Conclusions

The major conclusion of this thesis is that if the goals of Canadian policy are to try to restrain the entrances of foreign investment funds, specifically United States funds, then a subsidy can be devised to accomplish this goal. At the same time it is not enough to restrain foreign capital from participating in Canadian securities markets, but it is also necessary to replace this departing capital.

Capital replacement can be aided by the provision of a subsidy to all Canadian investors on a proportional basis. The subsidy would have to be large enough to bid Canadian investment funds away from what are now more attractive foreign investment opportunities. The subsidy should be designed to account for gains made in the form of increased returns and reduction in risk through international investment. The subsidy formulation presented in the main body of this paper is designed with these factors in mind. It attempts to accomplish these objectives by using differences in rates of return, differences in standard deviation as a measure of risk and the pure rate of interest as they exist between nations. Even though the subsidy formulation presented above explicitly deals with two countries, its basic formulation does not preclude using a larger number of variables. Essentially the addition of more variables would increase computational problems but the final result would be equally valid.

The tax formulation presented in preceeding chapters is also based on the premise that risk can be reduced and returns can be increased through international diversification of investment funds. For these reasons the tax formulation is designed to be sensitive to the gains made in return and reduction of risk. The tax formulation is the

second vital link in increasing Canadian ownership of Canadian industry. Taxing away gains the foreign investor makes in Canada will discourage future foreign investment and may possibly lead to the withdrawal of foreign investment. Such activity would "make room" for Canadian investment dollars with a minimal amount of distortion of resource allocation.

Further Areas of Research

There are innumerable areas for future study which this author uncovered while researching the literature for this thesis. Three areas in particular that relate to the Canadian security ownership area are:

1. Objective research into the areas of indirect foreign investment is required so that realistic costs and benefits of foreign ownership may be more accurately measured. This study would be similar to the recent Toronto Stock Exchange Study but would deal explicitly with the degree of foreign ownership of Canadian security issues. In addition to this, the study would examine in substantial detail, the extent to which Canadian investors, both individual and institutional, purchase foreign securities. Some attempt should also be made toward measuring the factors that influence their choice.

2. A study is required to establish a standardization method for measuring rates of return and risk among countries. Possibly an international organization such as the International Monetary Fund could research the area of establishing a standardization index for measuring the performance of security markets in countries functioning under the market system. This type of

a standardized index could certainly aid intelligent portfolio selection and, as a result, a more efficient allocation of resources.

3. Additional measures of risk, other than variances, are required to improve the investors decision model. The inadequacy of variance or semi-variance becomes even more evident when international diversification is to be examined. Variance, as a measure of dispersion of expected returns, does not account for such international risks as confiscation, war, or investment restrictions.

This paper suggests the most attractive policy to be the offering of incentives to Canadian investors who are currently participating in American securities. It appears to be superior to a possible alternative of restricting the access of Canadian investors to United States security markets. This latter approach would presumably lead to more Canadian investment in Canadian issues but may also lead to a disturbance of resource allocation. The argument presented in this thesis proposes to minimize such distortions. A policy of encouraging Canadian equity participation can also be supported on the grounds that it does not compel the Canadian investor to purchase Canadian shares and indirectly encourages Canadian companies to issue shares without compelling it to do so. Canadian investors with a strong preference can continue to satisfy that preference. It can be expected that some Canadian investors would do so, for no set of incentives are likely to provide Canadians with the range of investment opportunities present in the United States. Furthermore, it is not felt that it is desirable to force Canadians completely out of United States markets.

The above suggested approach requires careful investigation and measurement in determining the costs to Canadians of foregoing what appear to be presently more profitable "greener pastures". The application of subsidies (taxes) to encourage greater Canadian ownership of Canadian securities warrants careful consideration because the further economic development is closely linked to securities and capital markets.

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