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presented by

Carl B. McGowan, Jr.

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A STUDY TO DETERMINE THE EFFECTS OF FLOATING FOREIGN EXCHANGE RATES ON THE RISKINESS OF MULTINATIONAL ENTERPRISES

By

Carl B. McGowan, Jr.

A DISSERTATION

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ABSTRACT

A STUDY TO DETERMINE THE EFFECTS OF FLOATING FOREIGN EXCHANGE RATES ON THE RISKINESS OF MULTINATIONAL ENTERPRISES

By

Carl B. McGowan, Jr.

Research, performed prior to the collapse of the International Monetary Fund in 1973, suggests that there are benefits to multinational diversification. None of these studies have analyzed the impact that the new international monetary system has had on this relationship.

This study develops a model for expected returns for a multinational firm. These returns can be divided into three parts: (1) returns on domestic investments, (2) returns on foreign investments, and (3) returns from changes in foreign exchange rates. Analysis of covariance is used to test if the beta coefficients for a group of multinational firms have changed and, if so, in which direction. Multinational firms are defined as those firms having real investments in six or more countries. Firms in the Fortune 500 Directory of Manufacturing Firms were divided into three groups: (1) Firms with six or more real investments overseas, (2) Those that had no overseas investments, and (3) Those with one to five overseas investments. Portfolio betas were then compared for the period from January, 1967 to December, 1970 to the period from January, 1973 to December, 1976

to determine if the betas changed. The former period is one under the fixed exchange rate system, and the latter period is one of floating exchange rates. The domestic firms were used to determine if changes in betas might have occurred because of changes in the overall market risk-return relationship.

The results of this study indicate that multinational firms have become less risky, as measured by beta, while domestic firms have become more risky. These results are consistent when other factors such as industry, proportion of foreign sales, size of firms, and number of countries in which investments are made, are examined.

Now that the international monetary system has changed and foreign exchange rates are more volatile, the riskiness of multinational firms might be expected to be higher causing their betas to rise. The results of this study do not support this conclusion. Two reasons are posited for this. First, it may be that multinational firms are less risky because of other factors that have a greater impact on multinational firms than the change in the international monetary system. If the domestic environment has become more risky, multinational firms would be less influenced by these factors because their assets are diversified across countries and not all subject to these adverse effects. Domestic firms, which do not mitigate against the increased domestic risk with foreign investment, must absorb the total increase in risk. This could explain why multinational firms have become less risky in absolute terms as well in relation to domestic firms.

A second possible explanation of the impact of the change in the international monetary system is the method by which foreign

exchange rate changes are determined. Under the fixed rate system, the ultimate decision to change the foreign exchange rate was made in the political arena. Thus, although all economic factors might indicate that a foreign exchange rate parity change was necessary, for political reasons, no parity change would be made until the situation became so serious that a traumatic change would be required. Estimated foreign exchange rate changes would have riskiness with respect to economic predictions and uncertainty with respect to political changes. Under the floating rate system, the political impact and the uncertainty of that impact on exchange rates is reduced. Therefore, although foreign exchange rate changes are now more volatile, they are less uncertain.

ACKNOWLEDGMENTS

I would like to acknowledge all of the assistance and guidance for this dissertation from all of the faculty and doctoral students at Michigan State. Dr. Jeffrey Towle was particularly helpful in the early development of my dissertation. Dr. Richard Simonds was very helpful in developing the model and research design. Both were helpful in the writing and the presentation of the dissertation. I would, also, like to acknowledge the help of Dr. Alden Olson, my dissertation chairman, who provided me with guidance and direction throughout the development, execution and completion of my dissertation. I would like to thank Mrs. Jo McKenzie who eliminated many problems for me by typing my dissertation although I will retain credit for any remaining errors or omissions.

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CHAPTER I

Introduction

This chapter will describe the international monetary system in the post-World War II period, how the system came about, and how it collapsed. Both fixed and floating foreign exchange rate systems and their advantages and disadvantages will be described. The impact of foreign exchange rates on multinational firms will be detailed. Finally, the problem that arises from this new international monetary system and how to analyze the impact of this problem upon multinational firms will be discussed.

The International Monetary System

The contemporary international monetary system has its origins in the post-World War I period.[1] At that time, each country tried to revive its economy by increasing exports and limiting imports. Imports were to be restricted by raising high tariff walls. Exports were to be encouraged by devaluing the local currency which would make imports relatively more expensive and exports relatively cheaper. However, this outcome assumes that the trading partners of the country do not react in the same manner. In fact, most countries created very high

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[1]Thomas Willett, Floating Foreign Exchange Rates and International Monetary Reform, Washington: American Enterprise Institute, 1977, p. 2.

tariff barriers and devalued their currencies. The high tariff barriers reduced world trade and the continual devaluations helped to create higher inflation. These two actions helped to cause an almost total disruption of trade during the interwar period.

Largely to preclude a similar situation after the Second World War, representatives of the major trading nations met in August, 1944 at Bretton Woods, New Hampshire.[2] The objectives of this meeting were: (1) to promote European economic recovery, (2) to promote international trade, and (3) to develop a viable international monetary system. These objectives were to be achieved through three organizations - the International Bank for Reconstruction and Development, the International Trade Organization, and the International Monetary Fund - IMF.

The IMF had four goals. First, all major currencies should again be convertible into gold. Second, exchange rate stability should be attained. The third objective was to provide a mechanism by which orderly foreign exchange rate changes could be made. The final objective was to create a system of international monetary reserves to be used by countries having temporary foreign exchange outflows.

After all countries had returned to full convertibility, the permanent mechanisms of the IMF were to come into full use. Foreign exchange stability was to be enforced by intervention in the currency market by the appropriate government at specified points. Originally, when a currency moved more than plus or minus 1.0% from its stated par value, the government was required to support the market, i.e., buy or

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[2]Richard Hays, Christopher M. Korth, and Manucher Roudani, International Business: An Introduction to the Multinational Firm, Englewood Cliffs, NJ: Prentice-Hall, 1972, p. 149.

sell its currency to maintain or return to par. An intervention range was used rather than a specific value. This recognizes the fact that many factors influence foreign exchange rates, particularly in the short run, and that foreign exchange rates will normally fluctuate somewhat.

The IMF provides a stabilization fund for countries experiencing temporary or seasonal pressures on their currencies. This fund is composed of the international monetary reserves and potential reserves maintained by members at the IMF. The primary monetary reserves are gold, hard currency, and special drawing rights. The gold is part of the original membership contribution each country makes in joining the IMF. Hard currency is accumulated by countries through international trade. Special drawing rights are fiat money created by the IMF to increase international liquidity. Countries may draw on their reserves in order to meet foreign exchange shortfalls or build reserves for future needs.

Conditional reserves are composed of currency swaps and loans. In a swap, Country A has too much currency B and Country B has a shortfall of currency A. Country A trades its excess currency B until a specified future date by which time the disequilibrium should be corrected. The swap is a short term effort to allow a temporary disequilibrium to be bridged without a permanent exchange rate adjustment. Loans are temporary between the IMF, or a second country, and the country with the currency deficit. Both swaps and loans may place requirements, designed to alleviate the cause of the disequilibrium, on the country receiving the loans.

The final source of reserves is special loans from the IMF or lender countries. As a country needs additional loans, restrictive

covenants become more onerous. Thus, a country must voluntarily correct its disequilibrium or face externally devised solutions.

An alternative is a parity change. In theory, a country, must first request permission to change its exchange rate if a permanent disequilibrium exists. However, because market pressures react very quickly, this request is usually a de facto devaluation. IMF approval is a formality.

In the immediate post-war period, international trade was hampered by the destruction of the European economies and by the fact that the United States held virtually all of the available foreign exchange reserves of the world.[3] Because of sales of our war material to the allies for gold and on credit, most gold and hard currency was in or owed to the United States. United States trade deficits were needed to help rebuild the European and Japanese economies. The dollar was overvalued in order to encourage the United States to import foreign ods to stimulate foreign economies and to reduce exports by making U.S. goods more expensive and less competitive.

After these objectives were met, the deficit became a burden rather than a boon. Capital outflows occurred for several reasons: U.S. multinational enterprise direct investment, foreign aid grants, forgiveness of war debts, and military expenditures. In addition, the relative inflation rate of the United States was higher than the rates of her primary trading partners. The overvalued dollar caused a weakening of the U.S. trade balance and gave European and Japanese

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[3]Fred H. Klopstock, "The International Status of the Dollar," Essays in International Finance, Princeton, NJ: Princeton University Press, 1957, p. 1.

traders a competitive advantage.

The U.S. deficit could not go on indefinitely, and more and more pressure was exerted on the U.S. to control the dollar. Yet, as a key currency, the dollar could not be devalued, except by changing its price in terms of gold. Since U.S. trade partners would not revalue their currencies, raise their value vís-a-vís the dollar to reflect their added strength, the dollar was revalued and made inconvertible by Nixon in August, 1971. Still, a good many disequilibria occurred in the international economy and all currencies were eventually forced to float.[4]

Fixed Exchange Rates - Advantages and Disadvantages

The primary advantage of fixed rates is that rates are certain, at least in the short term. Within the specified bands determined through the IMF, rates are fixed. Reducing the likelihood and size of a foreign exchange loss facilitates and promotes international trade.[5]

There are several disadvantages to a fixed rate system. The structure needed to maintain the fixed rate system is expensive. All countries with convertible currencies must maintain large foreign exchange reserves to support temporary disequilibria, and a structure such as the IMF must be maintained to coordinate and control the fixed system.

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[4]"International Payments Imbalances and the Need for Strengthening Financial Arrangements," A Report to the Joint Economic Committee, 87th Congress, 1st Session, U.S. Government Printing Office, Washington, 1961.

[5]Rita M. Rodriguez and Eugene E. Carter, International Financial Management, Englewood Cliffs, NJ: Prentice-Hall, 1976, p. 72.

A politically important disadvantage of fixed rates is that to correct an incorrectly valued currency requires a dislocation of the local economy. In terms of the quantity theory of money, the money supply multiplied by the velocity of money is equal to the average price in the economy times the number of transactions completed. Both of these equal the total output of the economy. In order to cover a trade deficit, a country must export goods or foreign exchange which reduces the money supply. Assuming that the velocity of money and the number of transactions are fixed, a decrease in the money supply causes a decrease in the price level. Deflation causes a relative increase in international competitiveness for the deflating country's goods which increases exports and decreases imports. The net effect is to return the balance of payments to an equilibrium level. In the interim, the local economy deflates and this increases unemployment. This latter effect has political ramifications. Government is loathe to create unemployment - votes for the opposition. Thus, governments are tempted to support an artificially high foreign exchange rate in order to buffer the local economy. However, in the long run, the foreign exchange rate must move to its real equilibrium value.

Floating Exchange Rates - Advantages and Disadvantages

Floating rates have two advantages. The rates are established in a market place rather than in a political arena. Second, adjustments for disequilibria occur in the foreign exchange rate and not in the local economy. In a floating rate system, rates are determined by currency dealers reacting to supply and demand conditions rather than politicians reacting to political needs. Dealers in New York, London,

Zurich, Bonn, etc. adjust prices according to excesses of supply or demand for a currency. If more people wish to sell a currency than wish to buy it, the price will fall until supply equals demand. This will have the same effect as deflating the local economy without affecting the employment rate. The result will be that the price of goods in the devaluing currency will cost less because the price of local currency falls. It takes fewer units of nonlocal currency to buy goods. Thus, exports are raised. Because it costs more of the local currency to purchase foreign currency, the price of imports rises and total imports fall.

The disadvantages of floating rates are uncertainty about future foreign exchange rates, increased volatility of foreign exchange rates, and the increased cost of hedging. Research indicates that floating foreign exchange rates are more volatile than fixed rates and that foreign exchange rates cannot be predicted in the short run because changes in the rates are a random walk.[6] The effect of this increased volatility on multinational firms is aggravated by the new reporting requirement of FASB-8. Previously, firms could choose the method of translation of subsidiary financial statements and offset losses or gains with a contra account which would reduce the effects of short term currency movements. FASB-8 requires that firms use the temporal method of translation and report gains and losses as they occur, quarterly.

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[6]Ian H. Giddy and Gunter Dufey, "The Random Behavior of Flexible Exchange Rates: Implications for Forecasting," Journal of International Business Studies 6 (Spring 1975):1-31; William R. Folks, Jr. and Stanley R. Stansell, "The Use of Discriminant Analysis in Forecasting Exchange Rate Movements," Journal of International Business Studies 6 (Spring 1975):33-50.

Economic Impact of Foreign Exchange Rate Changes

There are two types of gains and losses - transactions and translations. Transactions effects occur because currencies are exchanged at different rates. First, assume that a firm sends $1000 to a subsidiary and exchanges the follars for 1000 local currency (LC). The exchange rate is $1:1LC, initially, but changes to $1:2LC. When the 1000 LC are repatriated, they will only purchase $500. This is a transaction loss of $500.

A translation loss occurs because succeeding financial statements of a subsidiary are translated at different rates. The temporal method of translation requires that accounts be translated at the foreign exchange rate in effect when the event occurred and gave rise to the account. Exhibit 1 shows the effect of a foreign exchange devaluation of local currency on the reported financial statements of a subsidiary. If the local currency devalues from $1:1LC to $1:2LC, the value of the firm's assets in dollars will decrease by $100. This decrease will be offset by a decrease in liabilities of of $50 and a decrease in owner's equity of $50. The income statement effect, when translated at the new rates, will be a $50 loss rather than a $200 gain. If there are no changes in the foreign exchange rate, the parent company reported income would rise by $200 from foreign operations. With foreign exchange effects, parent reported income will be decreased by $100. This loss would have to be reported immediately, even if the decrease is temporary. If the foreign exchange rate returned to the previous level and then rose 50%, there would be a $500 gain. This gain and the previous loss would be offsetting and total reported income from multinational operations for the two periods would be $400.

EXHIBIT 1

Multinational Operations
Balance Sheet
December 31, 19XX[7]

Assets	(1)	(2)	(3)	(4)
Cash	100	100	50	(50)
Inventory	100	100	50	(50)
Fixed Assets (net)	70	70	70	
Total Assets	270	270	170	(100)
Liabilities and Owners' Equity				
Current Liabilities	100	100	50	(50)
Owners' Equity	170	170	120	(50)
Total Liabilities	270	270	170	(100)

(1) value in local currency
(2) value in dollars if the exchange rate is $1:1 LC
(3) value in dollars if the exchange rate is $1:2 LC
(4) foreign exchange losses

Multinational Operations
Income Statement
Year Ending December 31, 19XX[7]

		(1)	(2)	(3)	(4)
Sales		4000	4000	1:.75	3000
Less:	Cost of Goods Sold	600	600	1:1	600
	Depreciation Expense	200	200	1:1	200
	Other Operating Expenses	2800	2800	1:.75	2100
	EBIT	400	400	1:.75	100
LESS:	TAXES (50%)	200	200	1:.75	150
	Net Income	200	200		(50)

(1) value in local currency
(2) value in dollars if the exchange rate is $1:1 LC
(3) translation rate if the exchange rate is $1.2 LC
(4) value at the new translation rate

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[7] David Norr, "Currency Translation and the Analyst," Financial Analysts Journal 32 (July-August 1976):46-54. John K. Shank, "FASB Statement 8 Resolved Foreign Currency Accounting - Or Did It," Financial Analysts Journal 32 (July-August 1976):55-61.

However, because the effects must be reported quarterly, reported earnings are more volatile than they would have been if only permanent changes were reported.

A multinational firm can, to some extent, offset foreign exchange effects by reducing exposure and by hedging, i.e., purchasing forward foreign exchange contracts. These may create additional real costs if the firm uses either method to offset translation losses just to reduce variability in reported earnings. Most firms do attempt to minimize variability in reported earnings from foreign exchange effects, i.e., have zero foreign exchange gains or losses.[8]

If a firm anticipates that 200,000 LC dividend will be paid in ninety days and if there are no foreign exchange parity changes, the 200,000 LC will purchase $200,000 at a foreign exchange rate of $1:1LC. The firm, to protect its dividend, purchases a forward contract at a rate of $1:1.11LC. If the actual exchange rate is $1:2LC, the firm would lose $100,000 without the contract - 200,000 LC times .5 $/LC. With the contract, the firm loses $20,000 - 200,000 LC times .9 $/LC. To protect an anticipated transaction, the $20,000 might be well spent. However, if the firm purchased the same contract to offset a translation loss, the firm would be losing $20,000 to offset a paper loss only. This would be disadvantageous to the firm in cash flow terms.

If a firm increases local currency debt or local minority interests, foreign exposure to foreign exchange effects is reduced because decreases in asset values are offset by decreases in liability

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[8]Michael Jillings and William R. Folks, Jr., "The Emergence of the Foreign Exchange Risk Management Function," Working Paper 2, Foreign Exchange Risk Management Project, Center for International Business Studies, University of South Carolina.

values. However, local funds may be more expensive than U.S. funds, even after foreign exchange effects. If the firm in Exhibit 1 had current liabilities of 200 LC and 70 LC in equity, the decrease in current asset value of $100 would be offset by a decrease in local currency liabilities of $100. No foreign exchange loss would be reported. Thus, the firm would be paying a higher interest charge to avoid a paper loss. Raising local equity offsets foreign exchange effects but, also, reduces the firm's control and flexibility - another real cost to offset a paper loss. Either of these actions would reduce the cash flow or control of the subsidiary with no increase in real benefits.

The Problem

The question of whether or not multinational diversification is useful in reducing risk has been dealt with extensively.[9] This research

[9]Agmon, Tamir. "Country Risk - The Significance of the Country Factor to Share Price Movements in the United Kingdom, Germany, and Japan," Journal of Business (January, 1973), pp. 24-32.

Agmon, Tamir. "The Relations Among Equity Markets in the United States, United Kingdom, Germany, and Japan," Journal of Finance (September, 1972), pp. 839-856.

Grubel, Herbert G. "Internationally Diversified Portfolios: Welfare Gains and Capital Flows," American Economic Review (December, 1968), pp. 1299-1314.

Grubel, Herbert G. and Kenneth Fadner. "The Interdependence of International Equity Markets," Journal of Finance (March, 1971), pp. 89-94.

Lang, Larry Ross. "The Effects of a Corporation's Multinational Diversification on its Common Stock Holders' Return and on their Risk Exposure," Unpublished Doctoral Dissertation, Michigan State University, 1973.

Lessard, Donald R. "World National, and Industry Factors in Equity Returns," Journal of Finance (May, 1974), pp. 379-91.

Lessard, Donald R. "International Portfolio Diversification: A Multivariate Analysis for a Group of Latin American Countires," Journal of Finance (June, 1973), pp. 619-33.

indicates that, for a given rate of return, multinational firms have a lower level of risk. However, there has been a structural change in the international monetary system that has reduced the usefulness of previous studies. The international monetary system has changed from a fixed system under the Bretton Woods agreement to a floating system. Since the floating system has created greater volatility of exchange rates, this should impact on the riskiness of multinational firms. However, most studies have been done with data only up to 1971 or have used later data but ignored the change in the international monetary system. This study is an attempt to determine if the change in the international monetary system has impacted on multinational firm riskiness as measured by beta.

Levy, Haim and Marshall Sarnat. "International Diversification of Investment Portfolios," The American Economic Review (September, 1970), pp. 668-75.

Rugman, Alan M. "Risk Reduction by International Diversification," Journal of International Business Studies (Fall/Winter, 1976), pp. 75-80.

Rugman, Alan M. "International Diversification by Financial and Direct Investment," Journal of Economics and Business (Fall, 1977), pp. 31-37.

Severn, Alan. "Investor Evaluation of Foreign and Domestic Risk," Journal of Finance (May, 1974), pp. 545-50.

Solnick, Bruno H. "International Pricing of Risk," Journal of Finance (May, 1974), pp. 365-78.

Solnick, Bruno H. "Why not Diversify Internationally," Financial Analysts Journal (July-August, 1974), pp. 48-54.

Solnick, Bruno H. "An International Market Model of Security Price Behavior," Journal of Quantitative and Financial Analysis (September, 1974), pp. 537-54.

Research Design

This study will try to isolate the impact that floating foreign exchange rates has had on multinational firms. Two groups of firms were analyzed - a group of forty-nine firms that have zero multinational investments and a group of 193 firms with investment in six or more foreign countries. Market risk measures were calculated for each group for two time periods and compared. The first time period, January 1967 to December 1970, was a period of fixed foreign exchange rates under the Bretton Woods agreement. The second time period, January 1973 to December 1976, was a period of floating foreign exchange rates. An analysis of covariance comparing the betas of the multinational and domestic firms before and after the collapse of Bretton Woods was done to see if the betas changed.

Contribution to Finance

The objective of this study is to determine if the change in the foreign exchange system from fixed to floating rates has had an impact on the risk-return relationship for multinational firms. Its contribution will be in assessing the value of multinational diversification since the change in the international monetary system.

CHAPTER II

Literature Review

To test whether multinational firms are now more risky because the international monetary system has changed from a fixed to a floating rate system, it is necessary to explain how common stock returns, and the riskiness of those returns, are affected by multinational diversification. This chapter discusses studies that examined these factors. Several possible alternative explanations for superior performance by multinational firms will be examined, also. Finally, the international asset pricing model will be examined. Proponents of the international asset pricing model contend that investors are not benefited by multinational diversification by domestic firms. If investors can achieve international diversification through portfolio investment, international diversificiation by domestic firms will not be rewarded in the stock market. If the world's stock markets are segmented, then, multinational diversification will be beneficial.

Initial Application

To test whether multinational firms are now more risky, it is necessary to develop a model to explain how common stock returns are determined and how foreign exchange fluctuations ought to affect the riskiness of those returns. The initial application of portfolio theory to multinational investment sought to estimate the potential

gains from such international diversification.[1] Correlations between market indices of eleven different major countries were compared using monthly rate of return observations for the period from January 1959 to December 1966. The monthly rate of return, r, was calculated as follows:

$$r_i = \left[\left(Y_o/12 + \frac{P_1}{P_o}\right)\left(\frac{X_1}{X_o}\right)\right]^{12} - 1.0$$

where,

r_i = the monthly rate of return

Y_o = the annual percentage dividend yield on shares in the index

P_o = the value at the beginning of the period of the common share price index

P_1 = the value of the end of the period of the common share price index

X_o = the dollar exchange rate at the beginning of the period

X_1 = the dollar exchange rate at the end of the period

After the monthly returns were calculated for the period for each index, a correlation matrix among all countries monthly returns was calculated in order to derive variances and covariances for subsequent analysis. In addition, average rates of return, R, were calculated for the period using a geometric mean of the 95 monthly rates of return.

$$R = \left[\prod_{i=1}^{95} (1 + r_i)\right]^{1/12} - 1.0$$

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[1]Herbert Grubel, "Internationally Diversified Portfolios: Welfare Gains and Capital Flows," American Economic Review, 58 (December 1968):1299-1314.

Using the rates of return, variances, and covariances, portfolios of varying size and composition were constructed to create efficient portfolios, i.e., portfolios with minimum risk for a given rate of return or maximum rate of return for a given risk level. When the universe of countries is expanded, the efficient frontier shifts upward, i.e., the rate of return for a given risk level rises. This implies that, by expanding the investment universe, greater returns can be achieved at the same level of risk.

Less Developed Countries

Using a somewhat different measure of return, the impact of investing in less developed countries was tested for the period 1951 to 1967.[2] Rates of return, r_i, were calculated for the major stock indices of twenty-eight countries.

$$r_i = (P_1 - P_o)/P_o$$

where,

r_i = the annual rate of return for each country's index of common stock

P_0 = the value of the index of common stock at beginning of the period

P_1 = the value of the index of common stock at the end of the period

From these rates of return, arithmetic mean rates of return and a correlation matrix among the annual rates of return were calculated for use in further analysis.

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[2]Haim Levy and Marshall Sarnat, "International Diversification of Investment Portfolios," American Economic Review, 60 (September 1970):668-675.

$$R_i = \frac{1}{N} \sum_{t=1}^{n} r_i(t)$$

where,

R_i = the mean rate of return for each country

N = the number of countries in the study (28)

These data were used to calculate a locus of portfolios which minimize the variance of the portfolio for a given expected rate of return. As the number of countries was expanded, the efficient frontier shifted upward, i.e., as the universe of potential investments increases, the rate of return for a given risk level increases, also.

Holding Period Effects

An ex post variance and covariance matrix of returns for 51 Standard and Poor Weekly Index industry subindices, 28 Financial Times Share Indices, and 28 West German Stock Market Indices were compared to test the effects on the correlation between industry and aggregate indices of increasing the holding period used.[3] The time period of the study was from January 1, 1965 to June 30, 1967. This time period was roughly representative for all three markets. The weekly rate of return, r, was calculated by solving the following equation for r.

$$PE_1 = PE_o e^{rt}$$

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[3]Herbert Grubel and Kenneth Fadner, "The Interdependence of International Equity Markets," Journal of Finance, 26 (March 1971): 89-94.

where,

PE_o = Po/Xo = the value of the index for the beginning of week divided by the exchange rate between dollars and the respective currencies

PE_1 = the value of the index at the end of the week divided by the exchange rate at the end of the week

t = the number of days in the observation period (7) divided by 365

r = the annual rate of return with continuous compounding

This time series of rates of return for the 108 assets was used to calculate the variance/covariance matrix.

The longer length holding periods, one and three months, were calculated as moving averages of different length rather than successive asset holding periods of different length. The results indicate that as the holding period length increases, the correlation between indices increases, also.

Foreign Sales

If multinational diversification is beneficial to investors in a firm, earnings variability should be a decreasing function of the proportion of total sales that are foreign. Using this as a hypothesis, Rugman tested the effect that the proportion of foreign sales has on the variability of firms' earnings.[7]

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[7]Alan M. Rugman, "International Diversification by Financial and Direct Investment," Journal of Economic and Business, 29 (Fall 1977):31-37.

$$Var(E/K) = f([F/T], SIZE, IND)$$

Var(E/K) = the total variability of earnings for a firm

F/T = the proportion of total sales that are foreign

SIZE = a size variable for a firm (employees, sales, or assets)

IND = a dummy variable for the industry of the firm

Earnings variability was calculated for 492 firms for the period 1960 to 1969. In addition, regressions were run using industry and size as independent variables to control for these factors.

The study concluded that variability is a decreasing function of proportion of sales but with an $R^2 = .10$. When size and industry were included in the regression, the R^2 rose to .12 and .13 respectively. Although the results of this study are statistically significant, they appear to be limited.

A second study tested size effects using a world market index: The Capital International World Index, which is a market value weighted international index of major securities on the 18 largest stock markets and a United States index - the New York Stock Exchange Index.[8] Returns were regressed for firms divided into deciles according to their proportion of foreign sales for both of these indices at the same time to see if the hypothesis would be confirmed that the higher the proportion of non-U.S. activities, the lower the dependence on the U.S.

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[8]Tamir Agmon and Donald R. Lessard, "Investor Recognition of Corporate International Diversification," Journal of Finance, 32 (September 1977):1049-1055.

country factor. This study examined monthly returns for the period from January 1959 to October 1972. Returns on firms in the U.S. were calculated by dividing dividends during the period plus the ending value of the securities by the beginning value of the securities.

$$R = \frac{D_1 + P_1}{P_o}$$

where,

R_i = the rate of return for the security during the period

D_1 = dividends during the period

P_o = the value of the security at the beginning of the period

P_1 = the value of the security at the end of the period

Firms were grouped in deciles according the proportion of non-U.S. sales and the composite return series of all the firms was regressed against the U.S. index and the world index.

$$R = \alpha + \beta R_{us} + \gamma R_w + E$$

where,

R = the return on a share of the corporation

R_{us} = the return on the NYSE index

R^W = the return on the rest of the world index

β = the relationship between the return on the share and the NYSE index

γ = the relationship between the return on the share and the rest of the world index

α = the intercept term

E = the residual term

This study concluded that as the proportion of foreign sales increases, α increases also which implies a closer relationship to the world index. When β and α were regressed against the proportion of foreign sales, IS, to determine if they are related to IS, the results were as expected b was inversely related to IS and b' was directly related to IS.

$$\beta_i = a + bIS + \mu$$

$$\gamma_i = a' + b'IS + \mu'$$

where,

IS = the international sales ratio

b = the relationship between β_i and IS

b' = the relationship between γ_i and IS

μ = the residual terms

Size Effects

The market model was used to test the effect that size has on multinational firm riskiness for two groups of firms.[9] The first group of firms was composed of seventeen oil firms which are multinational and a second group of eighteen firms of comparable size to the multinational firms which had a low percentage of foreign sales. Monthly and annual rates of return were calculated for the period from 1951 to 1975.

$$Ri = \frac{(P_1 - P_o + D_1)}{P_o}$$

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[9]Ibid., Rugman, Journal of Business and Economics.

where,

Ri = the monthly (annual) rate of return for a firm

P_0 = the value of the firm's share at the beginning of the period

P_1 = the value of the firm's shares at the end of the period

D_1 = the value of any dividends during the period

The market model was used to calculate beta coefficients for both portfolios of firms.

$$R_i = \alpha + \beta iRm + e_i$$

where,

βi = the relationship between Ri and the world market factor

Rm = the return on the world market factor

α = the intercept term

e_i = the residual term

The world market index, Rm, was constructed from the relative GNP weighted annual share price indices taken from the IMF International Financial Statistics. The results of the test indicate that, on average, beta coefficients for the multinational firms were less than beta coefficients for domestic firms indicating that multinational firms are less risky when size of firms is comparable.

Industry Effects

Because industry should affect the required rate of return for a firm, this effect has been examined.[4] Rugman tested the industry effect of multinational diversification and concluded that the effect was consistent across industries, i.e., in all industries, an increase in the proportion of foreign sales for a firm caused a decrease in riskiness, as measured by the variance of total earnings for the firm. However, the explanatory power of this study was very low (average R^2 = .10 without accounting for industry effects and .12 with industry effects).[5]

Grubel and Fadner investigated industry effects, also.[6] The study concluded that as the proportion of foreign activity, [(exports + imports)/total sales], increases the correlation between returns of industry stock market indices increases, i.e., firms in industries with a large proportion of exports or imports to total sales tend to be more highly correlated than industries with a lower proportion. This results because "the greater the industry's involvement in foreign trade, the more sensitive is its profitability to conditions

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[4]Benjamin F. King, "Market and Industry Factors in Stock Price Behavior," Journal of Business, 42 (January 1966):139-170; John D. Martin and Robert C. Klemkosky, "The Effect of Market Risk on Portfolio Diversification," Journal of Finance, 30 (March 1975):147-154.

[5]Alan M. Rugman, "Risk Reduction by International Diversification," Journal of International Business Studies, 7 (Fall/Winter 1976):75-30; _____, "International Diversification by Financial and Direct Investment," Journal of Economics and Business, 29 (Fall 1977):31-317.

[6]Ibid., Grubel and Fadner, pp. 89-94.

throughout the world,"[7] and, hence, the greater is its correlation with other similar industries in the world.

The International Asset Pricing Model

Multinational diversification is beneficial if there are barriers to investment, e.g., restrictions on currency flows, lack of adequate information, or markets that are thin with respect to volume of trading or number of traders. If barriers do exist, the international market structure would be segmented and diversification would be beneficial. Otherwise, markets would be homogeneous, and, therefore, multinational diversification would not be beneficial.

Agmon tested the segmented versus homogeneous markets hypothesis.[10] The study compared market indices and a sample of individual firms in the United States, the United Kingdom, West Germany, and Japan from 1961 to 1966. It was hypothesized that if homogeneous world markets exist, the risk return relationship in all four countries could be similar. If the markets are segmented, the risk/return relationship would be different for each country.

Because of the small sample size for the non-U.S. group, the results of the regression were not statistically significant. However, when comparable samples of U.S. firms of equal size were compared these results were not significant either. The author concluded that these results neither reject nor support the segmented market hypothesis.

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[7] Ibid., Grubel and Fadner, p. 92.

[8] Tamir Agmon, "The Relations Among Equity Markets in the United States, United Kingdom, and Japan." Journal of Finance, 27 (September 1972):839-856.

When indices themselves were compared, though, the results indicated that the relationship between the U.S. market and the other three markets was extremely low supporting the segmented market hypothesis.

Summary

The initial application of portfolio theory to international investment was developed in a two country, two asset model. This model was tested by comparing the efficient frontier developed when investment was expanded to more than one country, in this case, eleven industrial countries. The results indicated that a higher return could be achieved, at the same risk level, if investment is made in multiple countries. When the investment universe was expanded to include less developed countries, the results were consistent with the earlier results, i.e., as the investment expands, return increases, for a given level of risk.

Further studies have been undertaken to determine if these results are influenced by other factors - holding period, size, proportion of international sales, or industry. As the holding period is increased, the correlation between returns in various countries increases. Size does not affect these conclusions. When a group of multinational firms was compared to a group of domestic firms of comparable size and risk, the multinational firms had a higher return. Likewise, these results are consistent across industries.

Not all research attempts to show the benefits of international investment. An alternative approach is based on the international asset pricing model. This approach attempts to show that multinational diversification is not beneficial because there is an integrated world

securities market. This model posits that investors can achieve international diversification through portfolio investment. If there are no barriers to investment, multinational diversification is unnecessary and, therefore, not rewarded in the market. However, the results of this work indicate that the world asset market is segmented. This result implies that multinational diversification could have benefits to the investor.

CHAPTER III

A RETURNS MODEL FOR MULTINATIONAL FIRMS

The objective of this chapter is to develop a model of the returns for multinational firms and to separate those returns into three parts: (1) returns resulting from domestic investment, (2) returns resulting from foreign investment, and (3) returns resulting from foreign exchange changes. The Sharpe-Lintner model is used as a general basis for explaining security returns. Next, a model of returns is developed that shows the effect that multinational diversification has upon expected returns. Finally, the foreign returns for a multinational firm are divided into returns for investment and returns resulting from foreign exchange rate fluctuations.

The Sharpe-Lintner Model

The mean variance model is developed from the work of Markowitz-Sharpe-Lintner.[1] The model follows from the following assumptions summarized in Jensen.[2]

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[1]Harry M. Markowitz, "Portfolio Selection," Journal of Finance (March 1952):77-91; William F. Sharpe, "Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk." Journal of Finance, 19 (September 1964):425-442; John Lintner, "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets," The Review of Economics and Statistics, 49 (February 1965):13-37.

[2]Michael C. Jensen, "Capital Markets: Theory and Evidence," The Bell Journal of Economics, 3 (Autumn 1972):358-359.

1. All investors are single-period, expected utility of terminal wealth maximizers who choose among alternative portfolios on the basis of mean and variance (or standard deviation) of return.

2. All investors can borrow or lend an unlimited amount at an exogenously given risk-free rate of interest, Rf, and there are no restrictions on short sales of any asset.

3. All investors have identical subjective estimates of the means, variances, and covariances of return among all assets.

4. All assets are perfectly divisible and perfectly liquid, i.e. all assets are marketable and there are no transactions costs.

5. There are no taxes.

6. All investors are price takers.

7. The quantities of all assets are given.

With these assumptions, one can show that the expected return for a given investment is determined by the riskless rate of return on a market index, and the degree to which the return for the investment varies with the index. The expected rate of return for investment, i, would be:

$$E(R_i) = R_f + [E(R_I) - R_f] \frac{\text{cov}(R_i, R_I)}{\sigma^2(R_I)}$$

$$= R_f + [E(R_I) - R_f] \beta_i$$

Alternatively,

$$E(R_i) = R_f + r_i \frac{(\rho_{iI}\sigma_i\sigma_j)}{\sigma_I^2} = R_f + r_i (\beta_i)$$

where,

$E(R_i)$ = the expected rate of return for investment i.

R_f = the rate of return for the riskless asset.

$E(R_I)$ = the expected rate of return for index I.

$cov(R_i,R_I)$ = the covariance between the index and investment i.

$\sigma^2(R_I)$ = the variance of index I.

r_i = the risk premium for investment i.

ρ_{iI} = the correlation coefficient of investment i and index I.

σ_i = the standard deviation of the expected return for investment i.

The beta of the investment, the degree to which the investment responds to changes in the index, is of critical importance in determining the expected rate of return for an investment. If all other things are held constant, a change in beta will cause a change in expected return which will cause a change in the value of the investment.

$$\beta_i = \frac{cov(R_i,R_I)}{\sigma^2(R_I)} = \frac{\rho_{iI}\sigma_i\sigma_I}{\sigma_I^2}$$

Beta will change if the variance (standard deviation of investment i changes and all other factors remain constant. The degree and direction of this change is determined by the correlation coefficient between investment i and index I.[3]

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[3]Ibid., Harry M. Markowtiz, pp. 77-91.

Markowitz and Multinational Diversification

The Markowitz model has been applied to international diversification for a two country, two asset case by Grubel.[4] Although Grubel limits his model to financial asset investments, Rugman demonstrates that the model is useful in testing the effects of direct investment.[5] In the context of this model, a multinational enterprise can be viewed as a portfolio of assets in more than one economic and political environment: domestic and foreign. The return on this portfolio of assets would be a linear combination of the returns on the various investments.

$$R_{MNE} = XR_D + (1 - X)R_N$$

where,

R_{MNE} = the rate of return for firm i.

R_D = the rate of return for domestic investments for firm i.

R_N = the rate of return for foreign investments for firm i.

X = the proportion of firm i's assets invested in domestic investments.

(1-X) = the proportion of firm i's assets invested in foreign investments.

The variance of the rate of return of a multinational enterprise, σ^2_{MNE}, is a function of the variability of returns in the separate economies, the proportion of total investment in each economy, and the covariance between return on investment in both economies.

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[4]Herbert G. Grubel, "Internationally Diversified Portfolios: Welfare Gains and Capital Flows," American Economic Review, 58 (December 1968):1299-1314.

[5]Ibid., Alan M. Rugman, Journal of International Business Studies.

$$\sigma^2_{MNE} = (X)^2\sigma^2_D + (1-X)^2\sigma^2_N + 2\ (X)(1-X)\sigma_{D,N}$$

where,

σ^2_{MNE} = the variance of the rate of return on investment for a multinational enterprise.

σ^2_D = the variance of the rate of return on investment in the domestic economy.

σ^2_D = the variance of the rate of return on investment in the foreign economy.

X = the proportion of total assets in the domestic economy.

$(1-X)$ = the proportion of total assets in the foreign economy.

$\sigma^2_{D,N}$ = the covariance of returns in the domestic and foreign economies.

Since the covariance of returns between domestic and foreign investments can be written in terms of standard deviations and the correlation of returns in each economy, the total variance for the firm can be written as a function of these variables.

$$\sigma^2_{MNE} = (\chi)^2\sigma^2_D + (1-\chi)^2\sigma^2_N + 2(\chi)(1-\chi)\sigma_D\sigma_N\rho_{D,N}$$

where,

σ_D = the standard deviation of the rate of return on investment in the domestic economy.

σ_N = the standard deviation of the rate of return on investment in the foreign economy.

$\rho_{D,N}$ = the correlation coefficient between investments in the foreign and domestic economies.

If the variance of returns on investment in both economies is assumed to be 12% and half of the firm's assets are in each country, then,

$$\sigma^2_{MNE} = (.5)^2(12) + (1-.5)^2(12) + 2(.5)(1-.5)(\sqrt{12})(\sqrt{12})\rho_{D,N}$$

$$= \quad 3 \quad + \quad 3 \quad + \quad 6\rho_{D,N}$$

$$= \quad 6 \quad + \quad 6\rho_{D,N}$$

Exhibit 4 shows the effect varying correlations between economies have on the variance of returns for the multinational firm. If the return of assets of both economies is perfectly positively correlated, ($\rho_{D,N}$) = 1, multinational diversification does not reduce the overall variance of returns. Since the correlation coefficients between security markets are less than one, multinational diversification is beneficial to investors. The degree to which investors benefit is inversely related to the correlation coefficient, i.e., as the correlation coefficient decreases, the benefit increases.

Exhibit 4

$\rho_{D,N}$	+ 1	+ .5	0	- .5	-1
σ^2_{MNE}	12	9	6	3	0

$\sigma^2_{MNE} = 6 + 6(\ 1) = 12$

$\sigma^2_{MNE} = 6 + 6(\ .5) = 9$

$\sigma^2_{MNE} = 6 + 6(\ 0) = 6$

$\sigma^2_{MNE} = 6 + 6(-.5) = 3$

$\sigma^2_{MNE} = 6 + 6(-\ 1) = 0$

The example can be extended to show that the betas for firms which are equal in all respects except that one firm is diversified

multinationally should differ. In all cases in which other factors are held constant, the beta for the multinational firm will be lower because the total variance for the firm will be lower as a result of multinational diversification. If $\rho_{D,I} = \rho_{N,I} = .80$ and if the variance of the market index is 7.72%, the multinational firm will have a lower beta than the domestic firm. The variance for the domestic firm is 12% and the variance for the multinational firm is taken from Exhibit 4, assuming that $\rho_{N,I} = .50$

$$\beta_D = \frac{\rho_{D,I}\sigma_D\sigma_I}{\sigma_I^2} = \frac{(.8)(\sqrt{12})(\sqrt{7.72})}{7.72} = 1$$

$$\beta_N = \frac{\rho_{N,I}\sigma_N\sigma_I}{\sigma_I^2} = \frac{(.8)(\sqrt{9})(\sqrt{7.72})}{7.72} = .80$$

where,

β_D = the beta coefficient of a firm with all investment in the domestic economy.

β_N = the beta coefficient of a firm with non-domestic investments.

$\rho_{D,I}$ = the correlation coefficient between the domestic firm's returns and the returns on an index.

$\rho_{N,I}$ = the correlation coefficient between the multinational firm's returns and the returns on an index.

σ_I^2 = the variance of returns for an index.

The Cash Flow Effects of Floating Exchange Rates

If we view the rate of return of the multinational enterprise in terms of capital gains and dividend yield, the rate of return, R_N, is the difference between the asset values at the beginning of the

period, V_0, and the asset values at the end of the period, V_1, plus the dividends during the period, D_1, all divided by the beginning asset value.

$$\tilde{R}_N = \frac{\tilde{V}_1 - V_0 + \tilde{D}_1}{V_0}$$

This return can be further divided into returns on domestic investments and returns on foreign investments.

$$Rn = (X)Rd + (1-X)Rn$$

The rate of return, in local currency, for multinational assets is equal to the terminal value of assets less the initial value of the assets plus dividends for the period, all divided by the initial asset value. All of these terms are denominated in local currency.

$$\tilde{R}^{LC}_N = \frac{\tilde{V}^{LC}_{N,1} - V^{LC}_{N,0} + \tilde{D}^{LC}_{N,1}}{V^{LC}_{N,0}}$$

If the exchange rate between dollars and local currency, (α), is constant over that period, there will be no foreign exchange effect as $V_{N,0}$, $\tilde{V}_{N,1}$, and $\tilde{D}_{N,1}$ will all be converted into dollars at the same rate. However, if (α) changes to (α'), then $V_{N,1}$ and $D_{N,1}$ will be converted at the (α') rate and $V_{N,0}$ will be converted into dollars at the the (α) rate. Thus, the rate of return on multinational assets, in dollar terms, changes because the foreign exchange rate changes.

$$\tilde{R}^{\$}_N = \frac{\alpha'(\tilde{V}^{LC}_{N,1}) - \alpha(V^{LC}_{N,0}) + \alpha'(\tilde{D}^{LC}_{N,1})}{\alpha(V^{LC}_{N,0})}$$

$$\tilde{R}^{\$}_{N} = \frac{(\alpha-\alpha+\alpha')\tilde{V}^{LC}_{N,1} - \alpha V^{LC}_{N,0} + (\alpha-\alpha+\alpha')\tilde{D}^{LC}_{N,1}}{\alpha V^{LC}_{N,0}}$$

$$\tilde{R}^{\$}_{N} = \frac{\alpha(\tilde{V}^{LC}_{N,1} - V^{LC}_{N,0} + \tilde{D}^{LC}_{N,1})}{\alpha V^{LC}_{N,0}} + \frac{(\alpha'-\alpha)(\tilde{V}^{LC}_{N,1} + \tilde{D}^{LC}_{N,1})}{\alpha V^{LC}_{N,0}}$$

$$\tilde{R}^{\$}_{N} = \tilde{R}^{LC}_{N,1} + (1+\tilde{R}^{LC}_{N,1})\left(\frac{\alpha'-\alpha}{\alpha}\right)$$

$$\tilde{R}^{\$}_{N} = \tilde{R}^{LC}_{N,1} + FX$$

The dollar return on foreign assets is determined by the return on assets in local currency plus a foreign exchange factor, FX. The return on assets for the firm is affected by this.

$$\tilde{R}_{MNE} = (X)\tilde{R}_{D} + (1-X)\tilde{R}_{N} + (1-X)FX$$

For example, assume that a firm invests \$100 (2,000)LC) in a foreign country at an exchange rate of \$1:20LC. One year later, the value of the assets is 2200 LC and a 200 LC dividend is paid. If the exchange rate is still α, the return on investment is 20%. If, however, the exchange rate rises (falls) by 5% the new return on investment will be 26% (14%). As the volatility of the exchange rate increases, swings in return due to the foreign exchange factor will increase, also. Thus, if $(\frac{\alpha'-\alpha}{\alpha})$ is a random variable with an expected value of zero and a standard deviation of σ, the rate of return for a multinational will become more variable as the probability that $(\frac{\alpha'-\alpha}{\alpha})$ equals zero decreases. Since it has been demonstrated that changes in the foreign

exchange rate follow a random walk,[6] the return for a multinational firm should become more variable. From Exhibit 4, the variance of a multinational firm with a correlation between the return on domestic and foreign assets equal to .50 will be 9%. If the foreign exchange rate becomes more variable, the return on multinational assets, in dollar terms, becomes more variable and the variance of returns for the multinational firm rises, also.

$$\sigma^2_{MNE} = (.5)^2(12) + (.15)^2(13) + (.5)(.5)(\sqrt{12})(\sqrt{13})$$
$$= 3 + 3.25 + 3.12 = 9.37$$

Although the variance of returns for the multinational is still less than the variance of returns for a domestic firm, 12%, the increase in variability of foreign exchange rates raises the variance of the multinational firm above the level of variability with fixed exchange rates. Recent evidence indicates that floating foreign exchange rates, even if partially managed, are more variable than fixed rates.[7] Thus, the riskiness of multinational enterprises should be higher with floating foreign exchange rates.

Summary

The model tested in this study is developed from the work of Markowitz. Markowitz demonstrated that the return on an investment

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[6] Ian H. Giddy and Gunter Dufey, "The Random Behavior of Flexible Exchange Rates: Implications for Forecasting," Journal of International Business Studies, 6 (Spring 1975):1-31.

[7] Geoffrey Bell, "The New World of Floating Exchange Rates," The Journal of Portfolio Management, 4 (Spring 1977):25-28; Thomas Willett, Floating Exchange Rates and International Monetary Reform (Washington: American Enterprise Institute), ch. 2.

is a weighted average of the returns on each asset in a portfolio. The variance of the returns on the portfolio will be reduced to the degree that the assets in the portfolio are less than perfectly positively correlated. Grubel reformulated this model to apply to multinational enterprises which are viewed as portfolios of assets in more than one country. To the extent that the correlation between economies of countries is less than one, multinational diversification reduces the total variance of returns for the multinational enterprise.

The return for a multinational enterprise is determined by the return in both the domestic and foreign investments and the proportion of assets invested in each. The returns on the foreign investment are influenced by an additional foreign exchange factor which is determined by the probability of a foreign exchange rate change. As the probability of a foreign exchange rate change increases, the rate of return on foreign investment becomes more variable. Since floating foreign exchange rates are more volatile than fixed exchange rates, the effect should be to increase the required rate of return for a multinational enterprise.

CHAPTER IV

RESEARCH DESIGN

This chapter describes the research design used to determine if the change in the international monetary system has had an impact on the risk-return relationship for multinational firms, and, if so, how that relationship has been changed. A definition of a multinational firm is developed based on the degree to which foreign operations affect the firms earnings. A multinational firm is defined as one that has manufacturing operations in six or more foreign countries. The Fortune 500 Directory of Firms for 1976 is used as the test group. Firms in the Directory that had data available on the CRSP tapes for the test period, 1967-1976, were divided into three groups: (1) Firms with no overseas manufacturing, (2) Firms with manufacturing facilities in six or more foreign countries, and (3) Firms with one to five foreign operations. In order to get two distinct test groups, the third group was eliminated in order to make the remaining groups as distinct as possible. Analysis of covariance was used to determine if and how beta coefficients for the two groups changed.

Multinational Enterprise Defined

A multinational enterprise can be viewed as a firm whose assets or sales are in more than one country.[1] This is a rather general definition and not of much operational value. It would include firms such as Exxon with sales and assets in over 100 countries with small firms where being multinational is limited to occasional exporting. Thus, the first aspect of being multinational involves the significance of nondomestic operations. They must be of material impact on the firm either by involving a relatively large investment in assets or a large proportion of sales.

The second aspect of being multinational involves the number of countries in which a firm operates. Again, Exxon, with manufacturing facilities in almost every Western country, is more multinational than a Texas bottling company selling a portion of its output to a single Mexican distributor. Therefore, a multinational enterprise should have operations in several countries.[2] A firm, by establishing manufacturing facilities in nondomestic countries, is committing itself to being multinational.

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[1]John Fayerweather, ed., International Business - Government Affairs. Cambridge, Mass.: Ballinger Publishing Company, 1973, p. 1; Warren J. Keegan, Multinational Marketing Management, Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1969, p. 8; James W. Vaupel and John P. Curhan, The World's Multinational Enterprises, Boston: Harvard University, 1973, p. 10; Zenoff and Zwick, International Financial Management, Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1969, p. 2.

[2]Larry Ross Lang, "The Effects of a Corporation's Multinational Diversification on its Common Stock Holders' Return and on their Risk Exposure," Unpublished Doctoral Dissertation, Michigan State University, 1973; Sidney M. Robbins and Robert G. Stobaugh, Money in the International Enterprise, New York: Basic Books, 1973, p. 10.

For a firm to be a multinational, nondomestic resources and commitments of the firm must be significant. A definition must involve the proportion of total sales that derive from nondomestic sources and the number of countries in which the firm has a manufacturing commitment. In keeping with previous studies, the definition used in this study involves two factors. Specifically, a multinational enterprise is any firm that derived at least 20% of its sales from nondomestic sources or has at least 20% of its investment overseas and operates manufacturing subsidiaries in six or more countries.

Population

The population for this study was limited to New York Stock Exchange firms in the Fortune 500 Directory of Firms. Firms had to meet the previous definition of multinational for the entire period of the study (1967-1976). This group of firms includes well over 75% of all United States direct investment.[3] Because of heavy regulation or limited overseas exposure, the study did not deal with firms in the following industries: banking, insurance, retailing, transportation, and utilities.

The group of firms meeting this definition of a multinational enterprise were subdivided into appropriate industries using the two digit Standard Industrial Code. Each of these groups were used to determine if the effects are different across industries. This was

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[3]Ibid., Robbins and Stobaugh, p. 1Ø.

done to test any bias induced by industry effects.[4]

The remaining firms in the sample were divided into two categories: firms with zero multinational content and firms with more than zero, but less than required, foreign content. The former firms were used for control purposes to compare to the group of multinational firms.

Data Sources

Data for partitioning firms into the appropriate groups were derived from annual reports and 10K reports filed with the Securities and Exchange Commission for the years 1967 and 1976. Firms which meet the definition of multinational for both of these years were classified as multinational. Monthly rate of return data were taken from the CRSP tapes. These data were used to calculate each firm's beta coefficients.

Time Period

The time period for this study will be from 1967 to 1976. This time period will cover three important subperiods. From 1967 to 1971, the foreign exchange system was a fixed system. From 1971 to 1973, the foreign exchange system was both fixed and floating. During this time, some currencies floated and some were fixed for varying periods of time. The final period, 1973 to 1976, was a period of floating rates. This study will examine the two forty-eight month periods from 1967 to 1971 and from 1973 to 1976. Betas for industry groups

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[4]Benjamin King, "Market and Industry Factors in Stock Price Behavior," Journal of Business, 42 (January 1966):139-170; John D. Martin and Robert C. Klemkosky, "The Effect of Market Risk on Portfolio Diversification," Journal of Finance, 30 (March 1975):147-154.

and diversified portfolios were calculated for each period. This was the primary analysis to test if the systematic risk for multinational firms has changed because of the change in the foreign exchange system.

Analysis of Covariance[5]

When comparing two groups of observations or a single group before and after an event, a simple t-test may be sufficient. However, as the number of groups rises, the probability of rejecting a true null hypothesis of no differences between groups rises. Consequently, an alternative procedure is required if several groups are to be compared. An appropriate procedure is the analysis of variance.

A group of sample observations, Y_{ij}, divided into p classes with m observations in each class is obtained.

$$Y_{ij} \qquad i = 1,\ldots,p \qquad j = 1,\ldots, m$$

The mean of each group is obtained by summing the observations in each group and dividing by the group sample size.

$$\sum_{ij} (Y_{ij}-\bar{\bar{Y}})^2 = \sum_{i} m(\bar{Y}_i-\bar{\bar{Y}})^2 + \sum_{j}(\bar{Y}_{ij}-\bar{\bar{Y}})^2$$

The research question now is, are the groups similar or are the groups different?

This question is answered by first separating the total variation of the observations into two parts -- the variation between the separate groups and the variation of observations within each group. This latter

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[5]J. Johnston, Econometric Methods, 2nd, New York: McGraw-Hill, 1972, Chapter 6.

variation is the error term or individual, random variability.

$$\bar{Y}_i = \frac{1}{m} \sum_{j=1}^{m} Y_{ij} \qquad i = 1, \ldots, p$$

where,

$\sum_{ij} (Y_{ij}-\bar{Y})^2$ = the total variation of the observations.

$\sum_{i}^{m} (\bar{Y}_i-\bar{Y})^2$ = the variation between groups.

$\sum_{j} (Y_{ij}-\bar{Y})^2$ = the variation within groups - error.

$\bar{Y} = \frac{1}{mp} (\Sigma_{ij} Y_{ij})$ = the grand mean.

The test statistic for this test is the F-ratio. This ratio is the ratio of the mean squared differences between groups divided by the mean squared differences within groups. As the groups become increasingly dissimilar, the mean squared differences between groups becomes relatively larger and the error term becomes relatively smaller causing the test statistic, F, to rise. If the F that is calculated is larger than the critical value for F, the groups are considered to be dissimilar, i.e., at least one of the groups is unlike the others.

A shortcoming of ANOVA is that it assumes that the test observations, Y_{ij}, are affected only by the variables included in the test. If this is not true for a particular study, the error term may be overestimated, which will result in a reduced F value. Exhibit 7[6] demonstrates this phenomenon. An analysis of variance would predict a mean group difference of magnitude A. In fact, because the two groups began at different mean levels, 1 versus 2, the mean group difference is

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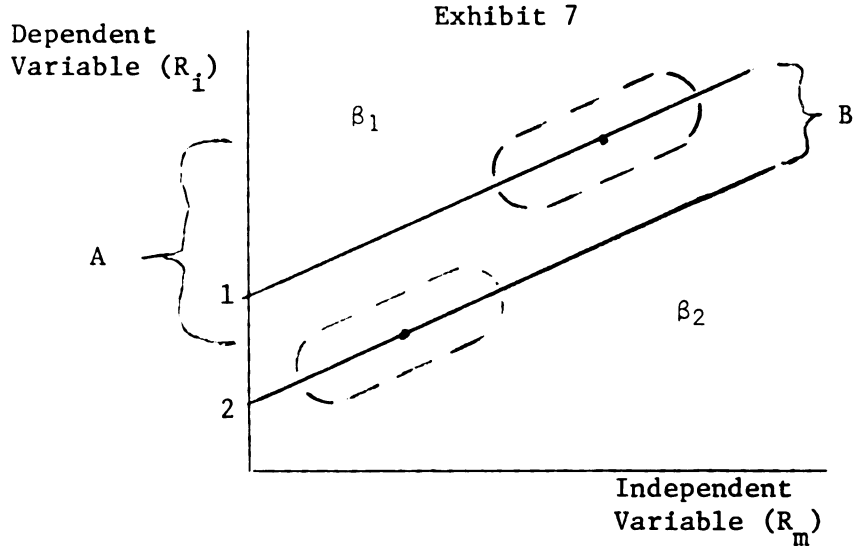
[6]Ibid., p. 193.

only B. Consequently, the F ratio calculated would be small and possibly not reject the hypothesis that the group means are the same. Analysis of covariance, ANCOVA, is a statistical method to correct the effects of uncontrolled variables.

Exhibit 7



The ANCOVA model begins with sample observations: Xrij and Yij. There are "p" groups with "n" observations in each group. There are "r" independent variables, Xrij, and one dependent variable, Yij. The simplest model that can be used to explain this relationship is

$$Y = X\beta + \mu \qquad (1)$$

Where,

Y = an (nxl) vector with p subvectors.
= a vector of sample observations.

X = an (nxh) matrix of dependent variables.

β = an (hxl) vector of coefficients for the dependent variables.

h = the total number of variables, dependent and independent.

n = the total number of observations.

This model implies that "the grouping of the data into p classes has no relevance or significance, the variation in Y is effectively explained by the variation in the X variables."[7] However, this model is incorrect if there are group differences initially.

To test for group differences, the model must be expanded. The expanded model has an additional element for the intercept vector.

$$Y = D\alpha + X\beta + \mu \qquad (2)$$

Where,

D = an (mp x [p-1]) matrix of dummy variables.

α = a ([p-1] x 1) column vector of intercepts for the independent variable groups.

If all group intercepts are equal, then, the ordinary least squares residuals for this model are equal to the ordinary least squares residuals for the simple model. If there are no group effects, the alphas will all be zero. The F ratio is the ratio of the incremental mean squared error explained by the expanded model divided by the mean squared error term. If the F is larger than the expected F value, then, the hypothesis that all of the $\alpha = 0$ is rejected.

In order to test for varying slopes and intercepts, the model is expanded again. This time the X matrix for independent variables includes a column of ones which represent the intercept terms. The vector includes a term that represents the intercept value.

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[7] Ibid., p. 194.

$$Y_i = X_i\beta_i + r_i \qquad i = 1,\ldots, p \qquad (3)$$

Where,

Yi = a vector of independent variables.

Xi = a matrix of intercept and slope terms.

βi = a vector of the coefficients for the intercept slope terms.

ri = a vector of the residual values.

If a matrix, Z, is formed where the diagonal elements are Xi matrices and all other values are zero, the model for testing differential intercepts and slopes follows.

$$Y = Z\beta + r$$

Where,

Z = the block-diagonal matrix of Xi.

β = the (ph x 1) column vector of the i.

R = the column vector of Ri.

Equation 1 assumes that the intercepts and slopes for each group are equal. Equation 2 allows the intercepts to vary but holds the slopes constant. The difference between the residual errors for Equation 1 and the residual error for Equation 2 is the incremental reduction in error achieved by allowing the intercepts to vary. The difference between the residual error for equation 2 and equation 3 is the incremental benefit of allowing the slopes to vary. This is the relevant test for this study. The test for the significance of this relationship is the ratio of the incremental residual reduction, S3, divided by its degrees of freedom, (pk-p-k+1) to the residual error of

Equation 3, S4, divided by the appropriate degrees of freedom, p(m-k).

$$F = \frac{S_3/(pk - p - k + 1)}{S_4/p(m-k)}$$

If this value is greater than the table value of F with (pk-p-k+1), p(m-k)) degrees of freedom, the null hypothesis of homogeneity of slope would be rejected.

The sample points in this study are in the [Ri,Rm] space calculated for multinational firms before and after the foreign exchange system changed. This results in a time series of sample points from January, 1967 to December, 1976. This time period is divided into three sub-periods: January, 1967 to December, 1970; January, 1971 to December, 1972; and January, 1973 to December, 1976. These time periods correspond to three eras. The first forty-eight month time period represents the fixed rate foreign exchange system of Bretton Woods. The middle twenty-four month time period is transitional. The third forty-eight month period represents the era after Bretton Woods collapsed.

ANCOVA was used to test the betas calculated for each of these periods for portfolios of firms to determine if the beta relationships changed as a result of the change in the foreign exchange system. The primary hypothesis involves the slope coefficients of the portfolio regressions. It was hypothesized that the slope coefficients have not changed. If this hypothesis is rejected, the beta coefficients can be further examined to see if they have become larger or smaller. If the former case is true, investors are requiring a greater return from multinationals and increasing their evaluation of the firms' riskiness. In the latter case, the new foreign exchange system is viewed as making

a multinational firm less risky. In addition, a control group of non-multinational firms was examined to determine if additional factors have changed which could explain a change in the multinationals.

Summary

The objective of this study is to determine the affect that floating foreign exchange rates have had on the riskiness of multinational enterprises. Multinational enterprises are defined as those companies that have investment in six or more foreign countries and either 20% of sales derived from foreign sources or 20% of investment overseas. Domestic firms are firms that have no overseas investment or sales. The sample for taken from firms listed in the Fortune 500 Directory of Firms. Further data for segregating the firms into groups were derived from annual reports and form 10K's for all firms that were listed on the New York Stock Exchange for the study period and had a full set of data available on the CRSP tapes. The firms with all data were divided into three groups: (1) those which are multinational, (2) those which are domestic, and (3) those which are in neither category.

The monthly returns for each firm were regressed against the returns on the Standard and Poor 500 Index, including distributions, to calculate portfolio betas for both the domestic and multinational groups for the fixed foreign exchange period, 1967-1970, and the floating foreign exchange period, 1973-1976. Analysis of covariance, using the market return as the covariate, was used to determine if the slope coerficients for each group changed, from one period to the next. In the case of the multinational firms, the betas decreased which

indicates a decrease in riskiness. The domestic firms' betas increased indicating that they have become more risky.

CHAPTER V

Results

Introduction

The population for this study was the Fortune 500 Directory of Manufacturing Firms. Of the 500 firms listed, 193 firms were found that were multinational and had data available on the CRSP tapes for the test period 1967-1976. Another 49 firms were found that had no overseas investment for the period of the study. These domestic firms were used as a control group to assure that any changes occurring in the multinational group were not also occurring in the domestic group. The data used to classify firms in these two groups were derived from annual reports and Form 10K reports for the individual firms to determine the number of countries in which each firm had investments and the proportion of multinational sales.

Calculation of Statistics

To test for homogeneous slope coefficients and to calculate the regression coefficients for the various sample groups, two separate regressions were run to obtain the F-ratio for homogeneity of the slope coefficients over the period of the study. The first regression assumes an additive model in which the slope coefficients are equal for both time periods.

$$R_i = a + bD + cR_m$$

where,

R_i = the monthly return for security i

a = the intercept term for the regression

b = the regression coefficient for the dummy variable D

D = the dummy variable to classify a return in either the floating rate period (0) or the fixed rate period (1)

c = the regression coefficient for the market return variable R_m

R_m = the monthly rate of return on the market index including dividends.

The results of this regression are compared to the results of a second regression which includes an additive term to allow the slope coefficients for the two periods to vary.

$$R_i = a + bD + cR_m + d(D \cdot R_m)$$

where,

d = the slope coefficient for variable $D \cdot R_m$

$D \cdot R_m$ = the variable obtained by multiplying D by R_m - the interaction term.

The F-ratio is calculated by taking the mean difference in explained variation of the two models and dividing by the mean residual error term.

$$F = \frac{(R_1^2 - R_2^2)/df_1}{(1 - R_2^2)/df_2}$$

where,

R_1^2 = the explained variance in the full or interactive model

R_2^2 = the explained variance in the additive model

$(1-R_1^2)$ = the residual or unexplained variance

df_2 = the degrees of freedom for the denominator

df_1 = the degrees of freedom for the numerator

For this study, the degrees of freedom for the numerator is one and the degrees of freedom for the denominator is assumed to be ∞ for all cases because the sample sizes are large, i.e., greater than 120.

Aggregate Test Results

The first test was to determine if there has been a change in beta for both test groups from the fixed rate period, 1967-1970, to the floating rate period, 1973-1976. The F-ratio for the multinational group is 79 and for the domestic group is 4.73 (Table I). Both of these ratios are significant at the .05 level. Consequently, the hypothesis that the slope coefficients for each period - fixed rate vs. floating rate - are equal is not supported by these data. Table I shows the slope coefficients for both groups of firms. Multinational firms have become less risky, as measured by beta, and domestic firms have become more risky, as measured by beta.

TABLE I

AGGREGATE TEST RESULTS

Group	Number	F-Ratio	Beta 1967-70	Beta 1973-76
MN	193	79 *	1.16	.95
DOM	49	4.73**	.88	1.26

*Significant at the .001 level.
**Significant at the .05 level.

Firm Size Effects

A major criticism of studies comparing multinational firms with non-multinational firms is that multinationals are systematically larger than non-multinationals. As can be seen in Table II, multinational firms have larger sales, on average, than non-multinationals. This could provide an alternative explanation for differences between the two groups.

TABLE II

SIZE OF FIRMS
($ Millions Sales)

	Number	Mean	Range
Multinational Firms - Quartiles			
Highest	49	9302.2	3032.8 - 48630.8
Upper Middle	48	1987.4	1421.4 - 2967.6
Lower Middle	48	1054.7	747.0 - 1385.4
Lowest	48	510.0	327.7 - 745.9
Total	193	3245.1	327.7 - 48630.8
Domestic Firms - Halves			
Higher	25	1504.5	689.9 - 3727.3
Lower	24	486.0	339.3 - 652.0
Total	49	1005.6	339.3 - 3727.3

To determine if size is a factor in comparing these two groups of firms, the multinational firms were divided into quartiles. Each of these sub-groups were tested to see if the slope coefficients changed

consistently within each quartile. The domestic firms, because of the smaller sample size, were divided in half, and each of these groups was tested for homogeneous slopes. The R-ratios listed in Table III show that all six groups had slope coefficient changes.

TABLE III

SIZE EFFECTS

	Multinational Quartiles		Beta	
	F-Ratio*	Number	1967-70	1973-76
Highest	22	49	1.21	.98
Upper Middle	11	48	1.12	.97
Lower Middle	24	48	1.03	.84
Lowest	26	48	1.29	1.01
	Domestic Halves			
Higher	24	25	.94	1.24
Lower	16	24	.97	1.28

*All are significant at the .001 level.

Table III shows the slope coefficients for each of the six groups before and after the foreign exchange system changed. In all cases, the multinational firm slope coefficients decreased, and the domestic slope coefficients increased.

Foreign Sales Level Effects

It has been demonstrated that the proportion of foreign sales to total sales impacts on the riskiness of the multinational

firm.[1] To determine if the proportion of multinational sales affects the results of this study, the multinational firms were divided into four groups. One group of forty-eight firms was composed of firms that did not report multinational sales. The remaining firms (145) were divided into three groups from the highest proportion of multinational sales to the lowest proportion of multinational sales. Each of these groups was tested to determine if the slope coefficients were homogeneous with respect to proportion of multinational sales from 1967-70 to 1973-76. Table IV indicates the R-ratios for each group. All four F-ratios are significant at the .10 significance level, indicating that for each group the slope coefficient shifted.

TABLE IV

FOREIGN SALES LEVEL

Group	Number	F-Ratio	Beta 1967-70	Beta 1973-76
Highest Proportion	48	5.93**	1.13	1.03
Middle Proportion	48	19 *	1.21	1.01
Lowest Proportion	48	22 *	1.17	.90
Non-Reporting	49	31 *	1.13	.86

*Significant at the .001 level.
**Significant at the .020 level.

[1]Rugman, Alan M., "Risk Reduction by International Diversification," Journal of International Business Studies 7 (Fall/Winter 1976): 75-80; _____. "International Diversification by Financial and Direct Investment," Journal of Economics and Business, 29 (Fall 1977): 31-37.

Table IV indicates the slope coefficients for each group for the 1967-70 and 1973-76 periods. In all four cases, the slope coefficients for each group declined.

Number of Countries Effects

Many studies classify multinational firms on the basis of the number of countries in which the firm has investments.[2] To test if beta changes were consistent with respect to the number of countries in which a multinational firm has investments, the multinational firm group was divided into three groups. The test results indicate that in all three groups, betas dropped significantly. Therefore, the number of countries in which a firm has investments did not impact on the results of this study.

TABLE V

NUMBER OF COUNTRIES

Group		Number	F-Ratio	Beta 1967-70	Beta 1973-76
(1)	6- 8	68	49*	1.27	.97
(2)	9-15	69	26*	1.15	.96
(3)	16-99	56	13*	1.04	.90

*Significant at the .001 level.

[2]Fayerweather, John, ed., International Business - Government Affairs, Cambridge, Mass.: Ballinger Publishing Company, 1973, p. 1; Warren J. Keegan, Multinational Marketing Management, Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1969, p. 8; James W. Vaupel and John P. Curhan, The World's Multinational Enterprises, Boston: Harvard University, 1973, p. 10; Zenoff and Zwick, International Financial Management, Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1969, p. 2.

Industry Effects

A final question deals with industry effects.[3] Multinational firms were divided into industry groups and each group was tested for beta shifts. Table VI describes each industry group - SIC, number of firms in the group, the F-ratio, and the industry name.

TABLE VI

SIC	Number	F-Ratio	Industry Name
10	5	4.05	Mining, crude oil production
20	19	0.00	Food
21	2	0.17	Tobacco
22	3	2.45	Textiles, vinyl flooring
25	1	3.01	Furniture
26	5	0.96	Paper, fiber, and wood products
28	27	22.00	Chemicals
29	14	13.00	Petroleum refining
30	5	2.19	Rubber, plastic products
32	5	4.26	Glass, concrete, abrasives, gypsum
33	9	8.97	Metal manufacturing
34	9	6.93	Metal products
36	15	5.52	Electronics, appliances
37	2	0.00	Shipbuilding, railroad and transportation equipment
38	9	0.43	Measuring, scientific, photographic equipment
40	10	17.00	Motor vehicles
41	5	18.00	Aerospace
42	14	0.12	Pharmaceuticals
43	6	0.07	Soaps, cosmetics
44	7	4.22	Office equipment (includes computers)
45	16	4.68	Industrial and farm equipment
47	2	2.28	Musical instruments, toys, sporting goods
48	1	2.52	Broadcasting, motion-picture production and distribution
49	2	6.18	Beverages

[3]Footnote 3 on following page.

Although not all industry groups had significant shifts in beta, of the thirteen groups that did, twelve were decreases in beta and one was an increase in beta. The eleven other industries groups appear to have changed also, but to a lesser extent, on average. This coupled with smaller average group sizes, probably accounts for the group differences not being statistically significant.[4]

TABLE VII

INDUSTRIES

Industry	Number	F-Ratio	Beta 1967-70	Beta 1973-76
10	5	4.05+	1.13	.75
25	1	3.01++	.99	.32
28	27	22 *	1.19	.91
29	14	13 *	.95	.69
32	5	4.26+	1.19	.91
33	9	8.97**	1.09	.77
34	9	6.93**	1.40	1.05
36	15	5.52+	1.38	1.15
40	10	17 *	1.33	.91
41	5	18 *	1.45	.82
44	7	4.22+	1.54	1.21
45	16	4.68+		.99
49	2	6.18+		1.11

*Significant at the .001 level.
**Significant at the .01 level.

+Significant at the .05 level.
++Significant at the .10 level.

[3]King, Benjamin, "Market and Industry Factors in Stock Price Behavior," Journal of Business, 42 (January 1966):139-170; John D. Martin and Robert C. Klemkosky, "The Effect of Market Risk on Portfolio Diversification," Journal of Finance, 30 (March 1975):147-154.

[4]To test for sample size bias, power coefficients were calculated and compared for the average groups that had or did not have significant beta changes. To detect a beta shift in the smaller sample group, the shift would need to be 24% greater than the shift in the significant groups. In fact, the shifts were smaller, and therefore not detected.

Conclusions

Over the period when the international monetary system changed from a fixed rate system to a floating rate system, multinational firms have become less risky as measured by beta. In addition, multinational firms have become relatively less risky than the domestic firms, which have become more risky, as measured by beta. Betas for multinational firms were shown to be lower after the change in the international monetary firms regardless of several factors which might have affected these results - the size of the firm as measured by sales, the proportion of foreign sales to total sales, the number of countries invested in, and the industry. In all sub-categories, except industry group 49 - beverages, betas for multinational firms decreased, and betas for domestic firms increased, which supports the hypothesis that multinational firms are now less risky in spite of the change in the international monetary system.

Now that the international monetary system has changed and foreign exchange rates are more volatile, the riskiness of multinational firms might logically be expected to be higher, causing the firms' betas to rise. This research does not support their conclusion. It may be that multinational firms are less risky because other factors are more important than floating foreign exchange rates on the riskiness of these firms. If the domestic environment has become more risky because of higher and less stable inflation rates, increased hostility toward business, or increased government intervention, multinational firms would be less influenced because their assets are diversified and not all subject to these adverse effects. Domestic firms, which do not mitigate against the increased domestic risk with foreign investments,

must absorb the total increase in risk. Therefore, multinational firms have not only become less risky, but have become less risky when domestic firms have become more risky.

A second possible explanation for these results deals with the impact of the change in the international monetary system upon the way foreign exchange rates are determined. Under the fixed foreign exchange rate system, the ultimate decision to change a foreign exchange rate was made in the political arena. Thus, although all economic factors might indicate that a foreign exchange change was needed, no change would be made, for political reasons, until the situation became so serious that only traumatic changes would do, e.g., the devaluation of the Mexican peso by 50% in 1978. Any probability distribution of expected foreign exchange rates for the future would have riskiness with respect to economic predictions and uncertainty with respect to political changes. Under the floating rate system, the political impact and uncertainty on foreign exchange rates is reduced. Therefore, although foreign exchange rates are now more volatile, they are less uncertain.

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