The Diversification Service by a Multinational Corporation to Its Shareholders.

Ho Chull Yang

Louisiana State University and Agricultural & Mechanical College
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THE DIVERSIFICATION SERVICE BY A MULTINATIONAL CORPORATION TO ITS SHAREHOLDERS

The Louisiana State University and Agricultural and Mechanical Col. Ph.D. 1983

University Microfilms International 300 N. Zeeb Road, Ann Arbor, MI 48106
THE DIVERSIFICATION SERVICE BY A MULTINATIONAL CORPORATION TO ITS SHAREHOLDERS

A Dissertation
Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy in
Interdepartmental Program in Business Administration

by
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May 1983
ACKNOWLEDGEMENTS

I would like to thank Dr. James W. Wansley, Assistant Professor of Finance, who has served as my committee chairman. His advice, guidance and patience have been outstanding. The suggestions of the other members of my committee greatly improved the quality of this dissertation. My gratitude also goes to them: Dr. William R. Lane, Assistant Professor of Finance; Dr. Herb E. Johnson, Assistant Professor of Finance; Dr. Thomas R. Beard, Professor of Economics; Dr. Lamar B. Jones, Professor of Economics; Dr. Michael H. Peters, Professor of Quantitative Business Analysis; and Dr. Robert E. Martin, Assistant Professor of Economics. I also wish to thank the chairman of the finance department, Dr. David T. Crary and the finance faculty for offering me a graduate assistantship which was held during the past three years. I also would like to thank Dr. Kyung M. Huh, Senior Economist at the IMF for providing me with data and Mrs. Brenda Gatlin for her professional typing service.

Finally, I would like to recognize the contribution of my parents and my wife, who have encouraged me throughout the duration of the entire Ph.D. program. Their love, encouragement and support have enabled me to overcome the difficult years of the doctoral study.
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ABSTRACT

In perfect capital markets, optimal investment decisions of a firm involve no incentive for a firm to diversify operations. However, in an imperfect capital market where homemade portfolio diversification incurs higher cost or faces restrictions, operational diversification of a firm may be beneficial to its shareholders.

A substantial amount of empirical evidence has supported the hypothesis that U.S. investors would have higher risk adjusted performance through international portfolio investment. In reality, however, some major barriers to international diversification have prevented U.S. investors from diversifying internationally. Consequently, it can be expected that multinationality of a firm would be beneficial to investors. This hypothesis is the central issue of this study.

The primary purpose of the dissertation is to examine whether foreign direct investments by U.S. multinational firms provide diversification service to shareholders who have some difficulties in diversifying their own portfolios internationally. The importance of examining the existence of diversification service is justified on the ground that it can be one of the most fundamental economic motives behind foreign direct investments. If investors recognize and reward it, multinational firms can reduce their cost of equity.
The dissertation is arranged as follows. First, benefits from international portfolio investments are discussed in terms of ex ante and ex post approaches. A survey of barriers to international portfolio investments follows. Consequently, several testable hypotheses with respect to multinationality of a firm are derived and discussed. The major hypothesis of market recognition of diversification service is tested. Various tests are employed with a sample including 135 U.S. based multinational firms and 135 domestic firms. In the residual analysis, the effects of the Interest Equalization Tax in July, 1963 and the Foreign Direct Investment Program in January, 1968 on the values of multinational firms and domestic firms are examined.

The overall test results strongly show some evidence in favor of market recognition of multinationality of a firm. However, the results appear to reject the hypothesis of the existence of a diversification service. It can be presumed that there is no diversification service at all or market considers it of little value.
CHAPTER 1

INTRODUCTION

Fama and Miller\(^1\) have shown that, in a perfect capital market, optimal investment decisions of a firm involve no incentive for the firm to diversify. Since individual investors can combine shares of different firms and establish efficient portfolios without costs, the diversification of operational activities on the part of a firm has no economic value to its shareholders.

The Value Additivity Principle, which states that the total value of a firm cannot be increased by dividing or combining cash flows, may be another theoretical factor which nullifies the operational diversification on a firm level. Without some synergy altering future cash flows, the value of the security of a diversified firm should be the sum of the securities of the firm's component parts. Furthermore, even more stable future cash flows of a diversified firm cannot be attractive to individual investors as long as they can diversify their own portfolios without additional costs.

Many firms, however, have diversified operations across industries or across countries. Generally, diversified firms of the former type are called "Conglomerate firms" and those of the latter

are called "Multinational firms" (hereafter MNCs). Only a few studies have analyzed the effects of international diversification on the value of a firm. Under the more realistic assumption of imperfect capital markets, many studies have tried to find an economic rationale behind conglomerate mergers. Most empirical tests concerning the performance of conglomerate firms show that risk-adjusted performance is not significantly different from that of single firms or portfolios. As indicated by Levy and Sarnat, the availability of homemade portfolio diversification in a domestic capital market prevents conglomerate mergers from providing substantial benefits to shareholders. However, if there exist some difficulties in homemade portfolio investments, the operational diversification can be valuable to shareholders. Once investment opportunities are expanded internationally, some restrictions on international portfolio investments may motivate firms to diversify their operations internationally.


The main purpose of this study is to examine the effects of multinationality of a firm on its value and on shareholder's wealth. More specifically, the following issues are discussed.

(1) The operational diversification of MNCs has provided shareholders with unique benefits (diversification service) that are not available from domestic firms.
(2) The shareholder's risk reduction benefits by diversification service can be a motive for firms to diversify internationally.

In Chapter 2, the notion of risk reduction benefits from international portfolio investment is presented using mean variance portfolio theory. Ex ante theory shows that to the extent that economic activities in different national units are less than perfectly correlated, international diversification will improve investors' risk-return opportunities. Ex post, an efficient frontier shifts upwardly and to the left after barriers to international portfolio investment have been lifted. Some empirical tests on the risk reduction benefits from international portfolio investments are surveyed. Major barriers and impediments of international portfolio investments are described and discussed. These negative aspects suggest that investment in the shares of MNCs might be an alternative way of realizing risk reduction benefits which otherwise cannot be obtained due to restrictions and additional costs in international portfolio investment.

Chapter 3 discusses the complementary relationship between international portfolio investment and foreign direct investment. An
overview of the literature regarding this issue is presented. Some testable statements are derived and modified. More specifically, the traditional debate over the possibility of higher risk-adjusted returns from purchasing shares of MNCs than from those of domestic firms is discussed. This proposition is related to the required cost of equity of MNCs and the motive for foreign direct investments. Finally a basic testable proposition of market recognition of and reward for the diversification service by MNCs is derived.

In Chapter 4, several hypotheses are stated and major testing methodologies are explained. Also covered in this chapter is a discussion of some problems involved in previous empirical tests. Chapter 5 introduces more detailed test methodologies for five tests and reports the empirical evidence and implications. In Chapter 6 the results of the research are summarized, and conclusions and implications are presented.
CHAPTER 2

SURVEY OF THE LITERATURE

The effects of diversification on portfolio efficiency have been examined extensively over the past three decades since the seminal work of Markowitz. In this chapter, the effects of an international expansion of investment opportunities on the risk-return relationship are examined. Benefits from international portfolio investments are emphasized since they form the basic economic rationale supporting the diversification service hypothesis. First, some theoretical implications of international portfolio investments are examined in ex ante and ex post terms. A survey of the literature regarding performance of international portfolio investments follows.

Benefits from International Portfolio Investment: An Ex Ante Approach

According to the Markowitz portfolio theory, to the extent that economic activities in different national units are less than perfectly correlated, diversification across international boundaries will improve investors' risk-return opportunities. Foreign assets increase the opportunity to reduce risk because the correlation of

returns among domestic and foreign assets tends to be smaller than that among domestic assets alone. This lower correlation exists because business cycles are not synchronized perfectly and governments have different abilities to deal with economic instability. Thus, for a given level of expected return, an investor who diversifies across countries will face less risk than an investor with only domestic investments.

Although there has not been a conclusive study on international capital market structure, most earlier studies are based on the segmented international capital market structure approach. This approach treats different national capital markets as separated units that are not closely related to one another. In such a market, most investors usually limit investments to a domestic subset of the whole space of international asset claims. In contrast, when the whole opportunity set of investments is available to every investor, the international capital market is integrated internationally. To see the effects of international diversification, assume that some barriers to international diversification that have existed among nationally segmented markets are eliminated. In this case, Cohn and Pringle refer to the systematic risk of each security in domestic return-risk space will decline as the market portfolio is augmented with less correlated foreign

\[
\]
securities. Second, for two classes of utility functions, logarithmic and exponential, the slope of the Capital Market Line (CML) also declines. To those investors with such utility functions, the above two effects tend to reduce the required return and increase the price of individual securities. The initial reduction in the systematic risk term results from the fact that in the new perfectly integrated market, the correlation of returns on each single risky asset with the newly augmented market portfolio returns is likely to be lower than that with the old market portfolio due to the addition to the old market portfolio of less-correlated foreign securities. This downward adjustment in ex ante risk-premia would cause a corresponding upward adjustment in prices of risky assets and thus result in windfall gains to current holders of risky assets.

In order to examine the second effect, all investors are assumed to have logarithmic or exponential utility function. For those investors, the expected rate of return can be expressed as:

$$E(R_i) = R_f + \frac{\sigma_w}{w} \rho_{iw} \cdot \sigma_{R_i}$$

(2.1)

where $E(R_i)$ is the expected rate of return on the ith security

$R_f$ is the risk-free rate of return

$\sigma_w$ is the standard deviation of $w$, end-of-period wealth

$w$ for all investors

---

3 The logarithmic utility function displays the desirable properties of decreasing absolute risk aversion and constant relative risk aversion, while the exponential utility function displays constant absolute risk aversion and constant relative risk aversion.
\( \bar{w} \) is the aggregated expected end-of-period wealth for all investors.

\( \sigma_{R_i} \) is the standard deviation of the rate of return on ith security.

\( \rho_{iw} \) is the coefficient of correlation between the total end-of-period dollar return on the ith security and \( \bar{w} \).

In this context, \( \sigma_{w}/\bar{w} \) is equivalent to \( [E(R_m) - R_f]/\sigma_m \) in the Capital Asset Pricing Model (CAPM), where \( R_m \) and \( \sigma_m \) are the rate of return on the market portfolio and the standard deviation of \( R_m \) respectively. Since \( [E(R_m) - R_f]/\sigma_m \) represents the slope of the CML, \( \sigma_{w}/\bar{w} \) can also be regarded as the slope of the CML. After restrictions have been lifted, \( \bar{w} \), the denominator of \( \sigma_{w}/\bar{w} \) will increase additively as the opportunity set is expanded to include new foreign economic units. But the numerator, \( \sigma_{w} \), will grow less than additively due to the less than perfect correlations among various national economic units. Hence the new internationally determined \( \sigma_{w}/\bar{w} \) will be lower than the old domestically established ratio. Consequently, for any country, the slope of the CML will decline. For investors with the exponential utility function, a similar result can be derived.4

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4 For an investor with the exponential utility function, the slope of the CML is given by \( \sigma_{w}/(1/A_r) \) where \( A_r \) is investor k's Pratt-Arrow risk aversion coefficient. Like the logarithmic case, the denominator, \( \sum_k A_r \), will increase additively as foreign investors join while the numerator, \( \sigma_{w} \), will grow less than additively. Note that the coefficients of absolute risk aversion are assumed to be the same across countries. For the derivation of equation (2-1) and the slope of the CML with the exponential utility function, see Cohn and Pringle, ibid, and R. H. Litzenberger and A. P. Budd, "A Note on Geometric Mean Portfolio Selection and the Market Prices of Equities," Journal of Financial and Quantitative Analysis, pp. 1277-1282, December, 1971.
From an ex ante viewpoint, the above two effects can be explained graphically in mean-standard deviation space. The curved line in Figure 1 represents the efficient set of portfolios. When lending and borrowing are allowed at the risk-free rate and short sales are permitted, the tangent line to the curved line will dominate all other opportunities. This line is called the "Capital Market Line" and is a linear relationship between the rate of return and the total risk of a portfolio. For a typical country, the total risk of the newly created international market portfolio, $\sigma_I$, is less than that of the old domestic portfolio, $\sigma_D$. Thus, under the assumption of an unchanged risk-free rate, $R_f$, the slope of the domestic CML declines to the dotted line in Figure 1. For most countries, the new market portfolio, I, will lie below the old domestic market portfolio, D.

A Change in the Risk-Free Rate

In the perfectly integrated capital market, a common risk-free rate is determined after arbitrage processes. We will examine the effects of lifting restrictions on some exogeneous variables that determine the risk-free rate.

In time-state preference theory, the concept of a risk-free rate is associated with the value of a unit riskless claim on future income. A risk-free asset claim is defined as a particular security composed of elementary time-state claims. The price of this security, $\phi_f$, which has $C_f = (1, 1, 1, \ldots)$ must be $\phi_f = \phi_{la} + \phi_{lb} + \phi_{lc} + \ldots$ since it guarantees certain future consumption units.
FIGURE 1
THE CML WITH BARRIERS VERSUS THE CML WITHOUT BARRIERS

(A similar figure is shown by Cohn and Pringle, "Imperfection in International," p. 64.)
Here $\phi_{1a}$, $\phi_{1b}$, $\phi_{1c}$ ... are the prices of elementary time-state claims that pay $1$ only when state, a, b, c, ... occurs. So, a risk-free rate can be written as:

$$\phi_f = \frac{1}{1 + R_f} = \frac{1}{1 + R_{1a}} + \frac{1}{1 + R_{1b}} + \frac{1}{1 + R_{1c}} + \ldots$$

$$= \phi_{1a} + \phi_{1b} + \phi_{1c} + \ldots$$

where, $R_{1a}$, $R_{1b}$, $R_{1c}$ ... are time-state discount rates that reduce time-state claims to present certain consumption. Under the assumption of state and time independent utility functions, the prices of elementary time-state claims are given by Hirshleifer.\(^5\)

$$\phi_{i1} = \frac{\pi_i v_{1i}}{\nu_0 (1 + \xi)}$$

for $i = a, b, c \ldots$ (2.2)

where $\pi_i$ is the probability of occurrence of state $i$, $v_{1i}$ is the derivative of the cardinal utility function of consumption endowments when state $i$ occurs, $\nu_0$ is that of present consumption endowments and $\xi$ is a constant discount rate for future utility. So, the risk-free rate depends on changes in present and future consumption endowments that distribute among individuals over times and states. Furthermore, the risk-free rate relies on changes in the elementary utility functions $v_{1i}$, $\nu_{0i}$ and the probability beliefs, $\pi_i$. In this context, the effects of lifting restrictions on

these variables are examined. As mentioned earlier, since the expected rate of return on any security will decline, investors are expected to be wealthier than before. If investors sell and put the proceeds into the risk-free asset, their future consumption endowments will increase for any state. Since investors are assumed to have constant relative risk aversion utility functions, there will be no change in the marginal elementary utility functions. Thus, investors will have the same preferences toward poorly-endowed states and well-endowed states as they did before restrictions were lifted. At the same time, the lifting of restrictions is not expected to have a significant impact on the subjective probability of the occurrence of any state. In conclusion, the overall effects on the risk-free rate come through increased future consumption endowments. Hirshleifer notes that a proportionate combined increase in future consumption endowment would reduce the price of future elementary time-state claims and lead to an increase in the risk-free rate. The increase in the risk-free rate further decreases the slope of the CML and thus aggravates the effects of reducing expected rates of return.

This argument, however, is based on the assumption that the coefficient of correlation between a foreign market portfolio and the domestic market portfolio, $\rho_{FD}$, is less than one. Subrahmanyan\textsuperscript{6} points out that without such an assumption there

are two effects of international diversification. One is changes in wealth due to changes in macro-parameters of the risk-return pricing relationship. The other is the enlargement of the investment opportunity set. These two effects will determine changes in the welfare of individual investors. According to Subrahmanyan's model, it may be possible that the individual's wealth declines together with a reduction in the slope of the CML. Therefore, without knowing the utility functions of individual investors of different countries and the variance-covariance structure of returns in the integrated capital market, changes in the welfare of individual investors are indeterminate. However, for quadratic, exponential and logarithmic utility functions and for the case of a two market merger, Subrahmanyan shows that the integrated capital market is pareto optimal--the welfare of investors in each country will improve while none will suffer losses. In the worst case of perfectly positive correlation, investors will be no better off since the effects of losses in wealth nullify the effects of an enlarged opportunity set. In conclusion, regardless of $\rho_{FD}$, the welfare of all participating individuals will be improved, or will be the same as the current level of welfare with only a domestic market portfolio.

Benefits from International Portfolio Investment: An Ex Post Approach

From an ex post viewpoint, the short-term impact of lifting restrictions is the movement of the ex post efficient frontier upwardly and to the left. Investors holding the international market portfolio together with the risk-free asset can achieve the
same level average realized return with less standard deviation of
return. At the same time, investors investing internationally can
achieve higher average realized return, with the same standard
deviation of return, than those investing domestically. In
Figure 2, it is shown that the new ex post CML\textsubscript{1} dominates the
domestic CMLs of countries A, B, and C.

There is a limitation in the reduction of total risk of a
domestic portfolio. A portion of total risk still remains as a form of
systematic risk. However, when diversification is extended across
national boundaries, a substantial portion of the risk that is
systematic within each country will be averaged out. The reason
for this additional diversification is that returns on market portfo-
lios of various countries display considerable independence. Joy,
Panton, Reilly and Martin report\textsuperscript{7} the correlation between the
common stock markets of 12 developed countries for the period
1963-1972. These correlation coefficients are computed using weekly
returns on market index. While the average correlation coefficient
between a pair of U.S. securities is about 0.40 and that between an
index of New York Stock Exchange and the American Stock
Exchange is well above 0.90, the correlations between the U.S.
market index and other country indices or among themselves are
extremely low except for the case of U.S. and Canada (0.634).

\textsuperscript{7}M. Joy, D. Panton, F. Reilly and S. Martin, "Co-Move-
FIGURE 2
THE EX POST INTERNATIONAL CML VERSUS THE DOMESTIC CMLs
More recently, Ibbotson, Carr and Robinson\textsuperscript{8} examine the cross-correlations of common stock market returns across 18 countries from 1960 through 1980. Although many of the countries exhibit strong positive co-movement in common stock returns, U.S. stocks are negatively correlated with those of two countries and have low positive correlations (below 0.4) with those of nine countries.

Finally, the magnitude of international diversification gains depends on the degree of segmentation of international capital markets. In the context of a perfectly integrated market, the expected rate of return on a risky asset is determined by a world market portfolio. Specifically, the expected return on a security is related to its risk, where risk is determined by its sensitivity to a world market portfolio. In this case, investors holding only domestic securities would be subjecting themselves to high risk without corresponding return simply because they are bearing diversifiable risk. Thus, international diversification provides a pure diversification service to domestic-oriented investors. On the other hand, assume that the expected rate of return on a risky asset is determined in its own domestic market. This would occur if investors could not or had not diversified internationally in segmented capital markets. In this case, by diversifying internationally, investors can eliminate part of the risk inherent in the

domestic market without sacrificing expected return, assuming expected returns on foreign securities are the same as those of the U.S. market. In addition to the pure diversification benefits, international diversification would eliminate a portion of domestic systematic risk.

In conclusion, there appear to be benefits from international diversification whether markets are fully integrated or perfectly segmented, and the gains would be greater if markets were fully segmented.

Empirical Studies on Benefits from International Portfolio Investments

Earlier Studies in the Context of a New Efficient Frontier

From the viewpoint of the segmented market pricing approach, Grubel,9 Levy and Sarnat10 and Grubel and Fadner11 employ historical values of national stock market indices to derive a new efficient frontier in an attempt to show the ex post benefits from international diversification. While these studies stress the reduction in overall portfolio risk through pooling of risks,

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Bergstrom\textsuperscript{12} finds even higher realized returns than domestic investment would provide.

Grubel\textsuperscript{13} assumes a special case of a two-country, two-asset investment model. In this world, he shows that, with less than perfectly correlated returns on two assets, a portfolio with two assets can reduce total risk. Therefore, his major objective is to find the correlation between domestic and foreign assets. His analysis is based on the market indices of 11 countries as proxies for market portfolios. Grubel finds less than unit correlations between the returns on the U.S. market index and returns on 10 foreign market indices, respectively. Except for Canada, the other 9 countries show very low levels of correlation. Using these correlation coefficients, Grubel further calculates the ex post rates of return and risk of internationally diversified portfolios of various combinations. His findings show that diversification over assets of these 11 countries in general would have improved performance—a higher rate of return at a given risk or lower risk for a given return.

However, Grubel's positive findings are subject to criticism. First, Agmon\textsuperscript{14} insists that an appropriate measure for the

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\textsuperscript{13}Grubel, Internationally Diversified Portfolios," pp. 1299-1314.

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benefits from international diversification should consider the marginal contributions of any foreign assets to the reduction in the total risk of an investor's domestic portfolio. Furthermore, Agmon argues that since market indices cannot capture all possibilities of diversification within a domestic market, such advantages could be obtained through further diversification with domestic assets. On the other hand, Guy\textsuperscript{15} indicates that the omission of dividend payments cause the advantages to be underestimated. In addition to the problem of whether the time period analyzed is representative or not,\textsuperscript{16} Grubel does not include the risks and costs of international portfolio investments. The exclusion of additional risks and costs evidently cause the advantages to be overstated. Thus, only ignoring the additional costs, are gains realized from international diversification.

Levy and Sarnat\textsuperscript{17} employ 28 common stock indices of various countries and find a systematic reduction of risk through international diversification as the investment opportunity set is broadened. Their test is implicitly based on the fact that there is a limit in total risk reduction through domestic diversification. Even though this fact has been challenged by Elton and


\textsuperscript{16}The time that Grubel analyzed is 1957-1966.

\textsuperscript{17}Levy and Sarnat, "International Diversification," pp. 668-675.
Gruber and Lloyd and Haney international diversification should be at least one of the means of reducing total portfolio risk. One interesting finding of Levy and Sarnat is that even though the portfolio formed with market indices of nine developing countries is inferior to other portfolios in risk-return space, the world portfolio including it dominates any sub-portfolios. This implies that as long as investments in developing countries can make contributions in reducing the overall risk, they are beneficial even if they have low expected returns.

Grubel and Fadner hypothesize that correlation between returns is an increasing function of the length of time over which stocks are held. They compare average correlation coefficients among domestic securities with those of the combinations of domestic and foreign securities at different holding periods. Their findings show that the absolute level of correlations between pairs of domestic and foreign securities is smaller than the level of those among domestic securities for any holding periods. Another

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18 Elton and Gruber argue that more risk reduction could be achieved by forming a portfolio with even more than 15 securities. For more details, see E. Elton and M. Gruber, "Risk Reduction and Portfolio Size: An Analytical Solution," Journal of Business, pp. 415-537, October, 1977.

19 Lloyd and Haney insist that additional risk reduction would be realized from additional holding periods with a given number of constituent securities. For more discussion, see W. D. Lloyd and R. L. Haney, Jr., "Time Diversification: Surest Route to Lower Risk," pp. 5-9, Journal of Portfolio Management, Spring, 1980.

interesting finding is that, for both types of correlation, correlation is an increasing function of the holding period. Furthermore, the percentage increase in correlation affected by increasing holding periods is much greater for the international group of stocks.

A Study Based on Risk Reduction in Portfolios

A direct way to analyze the benefits from international diversification is to compare the risk of portfolios of different size selected from an international group of stocks with the risk of domestic groups of stocks. Solnik examines the risk reduction in international portfolios with a consideration of the number of securities in a portfolio. He finds that for any size portfolio, diversification across countries produces a less risky portfolio than domestic diversification. Specifically, the risk of an internationally diversified portfolio (with 20 stocks) is 11.7% of the risk on a typical stock while the risk of a domestically diversified portfolio (with 20 stocks) is 27% of the risk of a typical stock.

Multivariate Analysis for Correlation

Instead of employing stock market indices, Lessard performs factor analysis to find principal components of four South American countries' stocks. Correlations among those countries are

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calculated based on principal components that serve as proxies for returns on the market portfolio. Even though several significantly positive correlations are found in three different time periods, no systematic pattern of positive correlations is found over different time periods.

Furthermore, by applying the varimax rotation technique to the covariance matrix of all securities of the four countries, Lessard obtains eight factors which are independent of one another. Then he tries to find the proportions of total variance of each country's stocks explained by the eight factors, and selects the factor with the largest explanatory power for each country. This factor serves as another proxy for returns on the market portfolio. There is no significant difference in the explanatory power between principal components that may be correlated with one another and selected factors which are designed to be independent of one another. These findings indicate that the market factors of four countries are significantly independent of one another.

Ripley\textsuperscript{23} also employs factor analysis in order to measure the extent of covariation among national stock markets and to identify the pattern of linkages among these markets. He finds that more than half of the variance of 14 developed countries' stock market indices are not explained by four common factors that are obtained from the pooled covariance matrix of all national market indices.

indices. This finding also implies that a substantial portion of the movement of the market index is unique to each country. Robichek, Cohn and Pringle\textsuperscript{24} extend the study of Ripley by including bond market indices and reach the same conclusion that there has been a substantial degree of independence among various national equity and bond markets. Finally, Lessard\textsuperscript{25} employs factor analysis to calculate the principal component of the covariance matrix of 16 developed countries' market indices. The principal component serves as a proxy for a world market index. He hypothesizes that the advantages of international diversification depend on the relative contribution of the world factor and the domestic factor to the variance of security returns in a specific country. Since Lessard finds a strong country factor but insignificant explanatory power of the world common factor on the variance of returns of national portfolios, he can argue that there are potential benefits from international diversification.

Lessard\textsuperscript{26} also presents some empirical evidence supporting benefits from international diversification. He examines the proportion of the variance of the return on stocks in each of 14


countries explained by a world index. Lessard finds that a large portion of the variance of an individual security is related to a country index. This evidence suggests that while a world index is important in accounting for risk, country factors are also important. Thus, investors who hold only domestic securities bear additional risk that could be diversified away internationally.

The Performance of an Ex Ante International Portfolio

To determine gains from international diversification, tests discussed previously (Grubel, Levy and Sarnat and Grubel and Fadner) use ex post international portfolios which represent the efficient combinations of risk and return given knowledge of the performance of individual stocks. In a strict sense, those studies are not tests of gains from international diversification. Lessard\textsuperscript{27} points out that the performance of international portfolios selected on an ex post basis would at least equal those of domestic portfolios and these outcomes can not be repeated by investors without perfect foresight. McDonald\textsuperscript{28} also warns that the ex post dominance of an international portfolio must be interpreted with caution. It is expected that the ex post performance of international portfolios would be the maximum performance.

\textsuperscript{27}Lessard, "International Portfolio Diversification," pp. 619-633.

An ex ante test is obtained by Lessard\textsuperscript{29} by comparing the performances of equal weighted portfolios of 30 stocks from each of four South American countries with those of mean-variance efficient combinations of these native portfolios. In this study, the expectations for the ex ante selection are derived from the outcomes from 1958 to 1963 and the performance of the portfolio is measured over the time period of 1963 to 1968. His findings show that the performance of the ex ante efficient international portfolio dominates all the native country portfolios except for Brazil in terms of mean and standard deviation of returns. This study appears to show that in a stricter sense, international diversification would have resulted in considerable gains. It should be noted, however, that the results of his study cannot provide a conclusive answer to whether gains from international diversification outweigh additional costs in diversifying a portfolio internationally.

The Performance of International Mutual Funds

Since it is difficult to measure additional costs and to quantify restrictions on international portfolio investments, an evaluation of the performance of international mutual funds may show the desirability of international diversification after taking additional costs into account.

\textsuperscript{29}Lessard, "International Portfolio Diversification," pp. 619-633.
McDonald\textsuperscript{30} examines eight French mutual funds from April, 1964 to November, 1969. In terms of Sharp's return-to-variability ratio,\textsuperscript{31} he finds that international mutual funds appear to yield superior risk-adjusted returns. The rankings of the funds by performance roughly parallel the degree of international diversification. Unfortunately, however, his study may be subject to error: the suboptimality in selection of domestic stocks may underestimate the gains while a part of the superiority may result from the ability of those funds to select undervalued domestic stocks. In this case, the superiority of international mutual funds is overestimated. It is expected that international mutual funds which are usually equipped with better management can also accomplish higher performance in the domestic market than domestic mutual funds would do. For these problems, McDonald devises a new performance measure for international mutual funds which, under some assumptions, enables him to decompose the international portfolio into its national components. Based on evidence\textsuperscript{32} of U.S. mutual funds' performance in the U.S. market, McDonald assumes that French funds are unable to select undervalued U.S. stocks (foreign stocks) while they can select undervalued French stocks since the French market

\textsuperscript{30}McDonald, "French Mutual Fund Performance," pp. 1161-1180.

\textsuperscript{31}For the definition of Sharp's ratio, see footnote 34.

is inefficient with respect to the unbiasedness and the speed of information germane to investment decisions. McDonald shows further that the top ranking international-oriented mutual fund also makes the top ranking in selecting undervalued French stocks. Thus, it is still uncertain whether the best mutual fund benefited from international diversification or from its selection of under­valued French stocks.

Guy examines the effect of foreign investment on the performance of a sample of 50 British investment trusts from 1960 to 1970. Whether measured by the indices of Sharp, Treynor or Jensen, the level of international diversification has insignificantly positive impacts on trust performance: "there was no evidence to conclude that the international trusts significantly

\[ \text{Sharp's reward to variability ratio} = \frac{R_{jt} - R_{ft}}{\sigma_j} \]

\[ \text{Treynor's performance index} = \frac{R_{jt} - R_{ft}}{\beta_j} \]

\[ \text{Jensen's abnormal performance index} = \alpha_{jt} = (R_{jt} - R_{ft}) - [\beta_j (R_{mt} - R_{ft})] \]

where \( R_{jt} \) = the return on the jth mutual fund in the period t

\( R_{ft} \) = the risk free rate

\( \sigma_j \) = the standard deviation of returns on the jth mutual fund

\( \beta_j \) = the estimated systematic risk of the jth mutual fund.
outperformed the domestic ones" (p. 20). This finding implies that benefits from international diversification are offset substantially by additional costs. However, Guy does not conclude that international diversification cannot be beneficial. Instead, he attributes the insignificant effect to possible suboptimality of British investment trusts from 1960 to 1970.35 "It remains to be seen whether an optimally diversified trust would have shown superior performance" (p. 20).

Based on the above empirical evidence, international diversification appears to have potential benefits of risk reduction before accounting for additional costs. However, it remains inconclusive whether the potential gains are still realized after allowing for additional costs and restrictions. In fact, due to some official restrictions and the underdeveloped states of foreign capital markets, U.S. investors do not have ready access to foreign capital markets. The following section will survey major restrictions and additional costs. However, the fact that international diversification has potential benefits ignoring additional costs and restrictions will be enough to be a basis upon which subsequent belief in diversification role of MNCs is derived.

Barriers to International Portfolio Investment

Since the second world war, there has been a rapid expansion of international capital movement in the form of foreign direct

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35 For most funds in his sample, the percentage of the portfolio invested in the U.K. market is more than 50% during 1968-1970.
investment. However, many barriers to international portfolio investment as well as additional risks tend to prevent investors from diversifying across countries.

In this section, several ways of purchasing foreign securities are surveyed and major barriers to international portfolio investment are discussed.

The Means of Foreign Security Investment

Although the principal market for individual foreign securities is generally in their home countries, a small number of foreign firms has listed their securities on the New York Stock Exchange (NYSE) or the American Stock Exchange (AMEX). A number of foreign securities that are not listed is traded over-the-counter. An investor purchasing these shares will normally purchase an American Depository Receipt (ADR). This is a certificate of ownership issued by a U.S. bank on its own initiative, which represents the underlying foreign shares the bank holds in custody. U.S. investors can buy American shares that are security certificates issued in the U.S. by a distribute agent operating on behalf of a foreign issuer. Also, several open-end and closed-end

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36 For example, British Petroleum and Sony Corporation trade on the NYSE.
37 For example, Toyota Motors trades over the counter.
Investment funds are available that invest primarily in foreign securities.\(^{38}\)

Investments in ADRs require some expertise and additional considerations. For example, accounting procedures vary from country to country and the role of the foreign government in its economy may be different from that in the U.S. economy. Furthermore, many financial ratios may have different implications when applied to a foreign firm and the capital structure of a foreign firm may have a different industry standard.\(^{39}\) A further problem associated with investment through investment firms is that their portfolios may not be well diversified.\(^{40}\) From the investor's point of view, one of these funds cannot provide sufficient diversification and still must be viewed as essentially a one-security input to his portfolio.

Finally, a U.S. investor can purchase securities listed on a foreign stock exchange directly. However, a number of potential problems is involved in the direct acquisition of foreign securities.

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\(^{38}\)For example, for mutual funds, there are Canadian Fund, International Investors, Scudder International Investments and Templeton Growth. There are also several closed-end investment funds such as ASA Limited, Japan Fund and U.S. & Foreign Securities. Source: Investment Companies (New York: Wiesenberger Services, Inc., 1982).


\(^{40}\)For example, ASA Limited invests exclusively in South African gold mining securities, while Japan Fund invests in Japanese securities.
Major Problems in Direct Purchase

A. Restrictions on Domestic Security Transactions by Foreign Investors

These restrictions may not allow foreign investors to have access to the domestic capital market. In order to protect the ownership of domestic firms and monetary policy, many countries do not open their capital markets to foreign investors without some restrictions. These restrictions may involve long-term or short-term securities, listed or unlisted.\(^\text{41}\) For example, in Ecuador, the acquiring of shares in a national firm by foreign investors is not allowed. The Swedish securities markets are virtually closed to foreign investors. The right of foreigners to own shares of Finnish companies is restricted to 20% of the capital, unless permission to own a higher percentage is given by the Ministry of Trade and Industry. In Mexico, shares of some companies (Mexican Airline, Mexicana and the industrial holding companies such as ALFA, DESC and VISA) are not available to foreign investors. Furthermore, purchasing shares in companies whose foreign shareholding is at or near the legal limit (49%) may be difficult for foreigners. In Japan, until February 1979, there had been limits (25%) on the total amount of securities that may be purchased by foreign investors. Such limits are still applied to shares of specially designated companies of strategic industries. The consent of the Bank of Norway is

required for capital transfer to Norway by a foreigner for portfolio investment purposes. In New Zealand and Venezuela, no foreign investor may acquire shares in existing companies without the approval of the Reserve bank and the Office of Foreign Investment, respectively. In Germany, money market instrument and fixed-interest securities with a remaining maturity of less than two years are not normally permitted to be sold to foreigners while common stocks are not available to foreigners in Kuwait. Strong controls by foreign governments are common when these governments consider their own markets to be under pressure. For example, in 1973, Germany imposed a ban on the purchase of domestic securities by foreign investors, which has now been entirely lifted. A similar ban was imposed by the National Bank of Switzerland between February 1978 and January 1979.

B. Restrictions on the Listing and the Purchase of Foreign Securities

Many countries do not allow their resident investors to purchase unlisted foreign securities and restrict their institutional investors to hold only a certain proportion of their portfolio in foreign assets. For example, Taiwanese individuals are not allowed to invest outside the country. In Chile, Korea, Malaysia, Ireland and Australia, foreign portfolio investment by residents faces some restrictions or requires the approval of authorities. In previous periods restrictions existed on outward portfolio transactions by other countries. Until 1963, residents of Italy were not permitted to buy any foreign securities. In Japan, outward portfolio
transactions were not liberalized until the end of the 1960s. There are also restrictions on domestic markets. For example, in order to be eligible for registration on the Indonesian Stock Exchange, a company must be located in Indonesia.

C. Regulations on the Remittance of the Proceeds from Foreign Investment and on the Exchange of Currencies

Some countries require reinvestment of all proceeds from the sale of domestic securities by foreign investors in the domestic market, while other countries require all proceeds from the sale of foreign securities by domestic investors to be repatriated. There are limits on the amount of an exchange of currency for international portfolio investment or provisions that require disadvantageous exchange rate for the purpose of foreign portfolio investment. For example, United Kingdom residents were not usually allowed to purchase currency at official exchange rates for investing in foreign securities. Instead, they were required to use "investment sterling" which originated mainly from the sale of foreign currency-securities owned by U.K. residents. Investment sterling was available only at a considerable premium over normal "resident sterling." However, in October 1979, such exchange controls were completely abolished. In Belgium and Luxembourg, there still exist two-tier foreign exchange systems in which financial transactions such as the purchase or sale of securities must take place via the Financial Francs market.
D. Tax Disadvantages

There is extra taxation on foreign portfolio investment, such as the Interest Equalization Tax of the U.S. which charged up to 18.75% of additional tax on the purchase of foreign securities. Other important tax disadvantages are the withholding tax on dividends and interest income. For example, in Switzerland, the withholding tax is levied at 35% on all distributions by Swiss resident firms including dividends. This tax is charged to all recipients, individuals as well as corporations.42

E. Foreign Exchange Risks

The final proceeds from foreign portfolio investment are affected by the foreign exchange rates prevailing when the proceeds are converted back to domestic currency. Therefore, in addition to the risk of foreign securities, investors should face foreign exchange risks. However, exchange rate fluctuations are not necessarily bad for an investor. If exchange rate fluctuations are independent of one another, they can be diversified away and have negligible impact on the risk of the portfolio. Furthermore, many hedging strategies against foreign exchange risks are available in future and forward exchange markets and money markets. However, as noted by Elton and Gruber,43 variabilities in

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42 For more information regarding withholding taxes of different countries, see Business Study, 2nd ed. (Touche Ross & Co., 1978) and R. Shohet, "Investing in Foreign Securities," p. 71.

exchange rates introduce an unfavorable element into international diversification as long as one currency tends to fluctuate uniformly compared to all other currencies. To U.S. investors, when the dollar deteriorates relative to all foreign currencies, this unfavorable fluctuation in exchange rates creates additional risks.

Several studies find some evidence that, ex post, foreign exchange risks, although they tend to reduce the benefits, cannot change the positive conclusion of risk reduction benefits from international diversification. Solnik\(^4^4\) finds that the risk of an international portfolio unprotected against foreign exchange risks is larger than that of a hedged one. However, the total standard deviation of the unprotected international portfolio is still much smaller than that of a comparable domestic portfolio. Grubel and Fadner\(^4^5\) find that the observed changes in exchange rates are small compared with changes in equity values. Consequently, the standard deviation of returns from international portfolios with and without foreign exchange adjustment are statistically not different. In the above studies, exchange risk does not have a major impact on results. However, recent increases in the instability of exchange rates could modify these results.

In addition to the above mentioned disadvantages, unfamiliarity with foreign capital markets and different accounting


\(^{4^5}\) Grubel and Fadner, "The Interdependence of International," pp. 89-94.
procedures may cause additional information costs. Furthermore, foreign investments usually are exposed to a variety of political risks. In the extreme, the holding of foreign securities may be expropriated.

Concluding Remarks

In this chapter, it has been shown that without considering restrictions or additional costs, international diversification could provide risk reduction benefits. However, a survey of major barriers and a past historical record of U.S. capital flows\(^4\) tend to suggest that in reality, it is still difficult for U.S. investors to diversify portfolios internationally. Consequently, several people\(^7\) have suggested purchasing securities issued by U.S. based MNCs as an indirect method of international diversification. Under this

\(^4\)During the last two decades, U.S. investment in foreign securities has been outnumbered by foreign investment in U.S. securities while U.S. foreign direct investment has far exceeded foreign direct investment in the U.S. However, 1978 U.S. foreign portfolio investment (53.4 billion dollars) came close to the amount of foreign investment in U.S. securities (55.4 billion dollars). In 1981 the holding of U.S. securities (93.8 billion dollars) by foreigners exceeded the holdings of foreign securities by U.S. residents (62.9 billion dollars). Source: Department of Commerce, U.S. Survey of Current Business, Vol. 59, No. 8 (August 1979), p. 56 and other volumes.

indirect approach the same magnitude of risk reduction benefits could be achieved as through international portfolio investment. Since this argument is the central issue of this study, this topic will be discussed in more detail in the following chapter.
CHAPTER 3

THE RELATIONSHIP BETWEEN FOREIGN DIRECT INVESTMENT AND FOREIGN PORTFOLIO INVESTMENT

In Chapter 2, it was shown that by diversifying a portfolio internationally, investors would gain risk reduction benefits, assuming no restrictions or additional costs. Considering restrictions and the additional risks involved in international diversification, it is unclear whether an international portfolio still provides benefits. Consequently, an alternative way of achieving risk reduction benefits by purchasing shares of MNCs has been suggested. In this chapter, the complementary relationship between foreign direct investment and foreign portfolio investment will be examined from the U.S. investor's point of view.

The Complementary Relationship

Foreign direct investment is an investment by residents of a country in a foreign firm over which they have effective control. On the other hand, in a foreign portfolio investment, investors have no substantial control over foreign firms. The former is made mostly by firms while the latter is executed by individual investors and financial institutions. The literature on each type of foreign investment has been developed separately. Most literature regarding foreign direct investment stresses the theory of industrial
organization\(^1\) rather than the theory of international capital movement. Rugman\(^2\) introduces a more fundamental motive behind foreign direct investment. He argues that the foreign operations of MNCs allow the firm to maximize its overall level of profits. The MNCs enjoy the additional advantage of less risk in profits than a domestic firm would face. Due to the possibility of diversification in various national real goods markets that are not perfectly correlated, the MNCs can realize the benefits of risk reduction in the form of more stable earnings. Lloyd, Goldstein and Rogow\(^3\) show less than perfectly positive correlations among various national real asset markets. Thus, if investors cannot diversify their own portfolios internationally, the international diversification of operations would reduce the risk of a firm and lead to a decrease in the risk premium component of the cost of capital. As a result, a firm can improve the efficiency of real capital allocation and presumably,


increase its market value. The incentive to stabilize the earnings stream may, however, be contradictory to the goal of shareholder wealth maximization. Employing the option pricing theory, Galai and Masulis\(^4\) demonstrate that a reduction in the variability of the firm's earnings and value may increase systematic risk and result in the transfer of wealth from stockholders to bondholders. Based on such arguments, Amihud and Lev\(^5\) advance a managerial motive for conglomerate mergers, to reduce the nondiversifiable employment risk of management. Since this risk is related to the operational risk of a firm, management may execute foreign direct investment to reduce earnings variability, even though the foreign direct investment may not benefit shareholders. Furthermore, if a more stable earnings stream is a primary objective of operational diversification, conglomerate merger within a country can be an alternative way. Assuming a perfect capital market where no transaction costs are incurred, operational diversification does not provide any economic value to shareholders once they can establish well-diversified portfolios. Thus, foreign direct investment seems to be contradictory to the principal goal of shareholder wealth maximization.


However, in an imperfect capital market where homemade portfolio diversification incurs a high cost or faces restrictions, operational diversification of a firm may be beneficial to its shareholders. The objective of providing a diversification service is consistent with the shareholder wealth maximization. Furthermore, assuming efficient capital markets, such benefits, if they exist, should be recognized and rewarded by investors. As a result, a firm can reduce its cost of equity. The magnitude of such benefits would depend on the degree of imperfection in the capital market. For example, diversification through conglomerate merger is not expected to provide substantial benefits to shareholders since within a domestic capital market, individual investors can diversify their portfolios without substantial extra costs. However, as illustrated in the previous chapter, in imperfectly integrated international capital markets, individual investors face some restrictions or higher risk and costs. These barriers tend to prevent U.S. investors from diversifying internationally despite the potential of risk reduction benefits. Under such circumstances, MNCs may diversify operations on behalf of shareholders at considerably lower costs and risks. Thus, in the extreme case of a perfectly segmented international capital market, a share of MNC is considered to be equivalent to an international portfolio in terms of risk. By purchasing shares of MNCs, individual investors gain indirect risk reduction benefits that might be offset by additional costs or impossible through international portfolio investment. It
should be emphasized that, however, like the case of benefits from international portfolio investment, the magnitude of benefits depends on the degree of international capital market segmentation. Hughes, Logue and Sweeney\(^6\) point out that in a perfectly integrated international capital market, there are no diversification benefits uniquely inherent to MNCs. The value of MNCs will be determined by the same factors that would be applied to the value of domestic firms. In such an environment, there is only one economic justification for foreign direct investment: a firm with operational superiorities would be able to operate its subsidiaries to earn a higher rate of return than competing local firms.

Assuming imperfectly integrated international capital markets, the objective of providing a diversification service may be one of the most fundamental economic motives behind foreign direct investment, a motive that is consistent with shareholder wealth maximization.

Studies on the Complementary Relationship

When there are barriers to international portfolio investment, it is expected that risk averse investors would invest less in international assets than when there are no barriers and no

additional costs. Black\(^7\) develops a model of capital market equilibrium considering barriers to international portfolio investment. His model predicts that there would not be two-fund separation between the international market portfolio and a risk free asset. Instead, an optimal individual portfolio would include the domestic portfolio in addition to the international market portfolio and the international minimum variance zero-beta portfolio. Under the same circumstances, Adler and Dumas\(^8\) find that an optimal foreign acquisition decision by a firm should reflect the inadequacy of homemade diversification. In other words, a firm diversifies internationally on behalf of individual investors and more importantly, diversification by foreign direct investments substitutes for diversification by international portfolio investment. Specifically, under the assumptions of segmented capital markets, deterministic foreign exchange rates and negative exponential utility for investors, their model indicates that the differences in risk free rates across countries do not have any deterministic effects on the decision of a value-maximizing firm with respect to optimal equilibrium acquisitions. Instead, the model implies that the optimal


acquisition is a negative function of the domestic market price of risk, but a positive function of the domestic risk-free rate. Furthermore, differences in the risk aversion of investors among various countries affect the optimal equilibrium acquisitions.

However, the model of Adler and Dumas is based on the implicit assumption that a domestic market portfolio is the same with or without foreign acquisitions. Furthermore, the optimal equilibrium acquisition is for a marginal MNC, not for the average MNC. Thus, recently, Lee and Sachdeva⁹ reexamine the optimal acquisition at the aggregate level. They argue that in aggregate, a foreign investment decision of the ith MNC in country 1 depends on the perception of the MNC about impacts that its foreign investment decision would have on other MNCs' foreign investment decisions. In a perfectly competitive foreign direct investment market, a specific MNC cannot affect the aggregate foreign investment level and thus the aggregate foreign investment level is taken to be fixed. In this case, Lee and Sachdeva show that a market value-maximizing MNC in country 1 would choose the same aggregate foreign acquisition vector that utility-maximizing investors in country 1 would choose themselves through international portfolio investment when only domestic borrowings are allowed for investors. They note that the level of welfare, achieved by investors

in country 1 when exercising direct control over foreign investment decisions, is also attained through indirect foreign investment by value-maximizing MNCs under conditions of perfect competition. More specifically, their model shows that, regardless of interest rate differentials among countries, under a perfectly competitive market for foreign direct investments, the aggregate optimal acquisition of a value-maximizing MNC is identical with that of expected utility-maximizing individual investors. This fact implies that if the welfare of individual investors would be increased through international portfolio investment, the same increases in welfare can be attained indirectly by the foreign direct investments of MNCs. Thus, Lee and Sachdeva conclude that "the MNC performs the useful function of making welfare-optimal investment decisions on behalf of investors, and in this role provides a purely financial rationale for the MNC" (p. 490). Furthermore, even when the assumption of deterministic exchange rates is dropped, the above result still holds. The complementary relationship between international portfolio investments and foreign direct investments remains intact as long as we can assume that the coefficients of risk aversion of MNCs and individual investors are the same. Otherwise, the absolute change in the aggregate optimal acquisition due to foreign exchange risk is indeterminate without additional assumptions.

Since there is evidence that most MNCs display oligopolistic behavior in domestic markets, it is presumed that they may also
display oligopolistic behavior in the foreign direct investment market. Thus, it is of interest to examine whether the complementary relationship under the perfect competition condition will be sustained under an imperfectly competitive market. Lee and Sachdeva examine this issue. They classify oligopolistic behavior into three different types, such as Cournot, Stackelberg and collusion.\textsuperscript{10} Generally, under such imperfectly competitive conditions, value-maximizing MNCs tend to have fewer foreign direct investments than those under perfectly competitive conditions and the effect of a restriction on the number of MNCs is to make MNCs behave in a less risk-averse way than they otherwise would. Consequently, it is also evident that MNCs are likely to hold fewer foreign direct investments than the optimal foreign acquisition by international portfolio investors. Thus, under such circumstances, foreign direct investment decisions by MNCs result in suboptimal welfare for individual investors.

However, when MNCs also face some restrictions on optimizing their percentage ownership in their foreign subsidiaries, the role of MNCs as an indirect factor for achieving an integrated international market may be substantially reduced. Adler\textsuperscript{11} notes that decentralization could be optimal only when the parent firm is

\textsuperscript{10}For a detailed discussion on such types of oligopolistic behavior, see J. M. Henderson and R. E. Quandt, Microeconomic Theory (New York: McGraw-Hill, 1971), ch. 6.

completely free to optimize its percentage ownership in its subsidiaries. In other words, in perfectly segmented markets where MNCs also face serious barriers to foreign direct investments, MNCs have no role to play on behalf of investors. In reality, this situation is too extreme. Provided that MNCs are not subject to the same capital flow restrictions as individual investors (a more realistic assumption), Goldberg and Lee\textsuperscript{12} argue that maximizing behavior on the part of MNCs would play a role that international portfolio investment would otherwise play. More recently, Errunza and Senbet\textsuperscript{13} present a model in which there exist differential barriers to foreign direct investment, so the cost of the foreign direct investment is not the same for all firms. In their model, an equilibrium is established in which companies with relatively low costs will undertake foreign direct investments. These firms can gain the benefits from foreign direct investment. Errunza and Senbet further identify three kinds of benefits expected from foreign direct investment. The first one is based on the existence of imperfections in real asset and factor markets. The second benefit is due to differential taxation by foreign government. The third benefit is based on the existence of imperfect capital markets, which is the main issue of this study.


Under some assumptions governing international real goods and capital markets, we have noted that there may exist a complementary relationship between foreign direct investments and foreign portfolio investments. Thus, for individual investors who face some barriers to international diversification, purchase of shares of MNCs may be an indirect way to achieve international diversification. Assuming an efficient domestic capital market, these unique benefits, available only from MNCs, should be recognized and rewarded by investors. However, the above argument can be justified only when MNCs have no difficulties in operational diversification while individual investors are restricted in their foreign portfolio investments. Furthermore, only when the market for foreign direct investments is perfectly competitive, can the optimal equilibrium acquisition of MNCs satisfy the diversification desires of investors. Due to imperfect markets for foreign direct investments and other factors that MNCs must consider in foreign direct investments, operational diversification by MNCs may not be optimal for individual investors. The magnitude of diversification depends on the degree of segmentation in international capital markets. Stehle\(^{14}\) gives some evidence supporting the hypothesis of integrated capital markets. His empirical tests of domestic and international pricing hypotheses in U.S. shares indicate that neither can be rejected in favor of the other. In this

case, the diversification benefits attached only to MNCs, may be substantially reduced or discounted by investors. Finally, if the domestic market is inefficient, such benefits may not be reflected in the values of MNCs. In addition to the above-mentioned negative aspects, an increase in availability of foreign securities in the U.S. capital market (listing of foreign shares on U.S. securities markets) is likely to reduce the value of diversification services by MNCs. Furthermore, an introduction of new domestic financial instruments (options, GNMA securities, future markets and other money market securities) that U.S. investors use for domestic diversification may reduce the motive for international diversification.

Considering all the possible negative factors, it is impossible to say whether the diversification service in the form of additional risk reduction is strong enough to benefit U.S. investors and thus to be recognized and rewarded by them. Therefore, it is interesting and important to examine empirically the existence of the diversification service and market recognition of it.

Abnormal Performance of MNCs

Acknowledging possible benefits from international diversification, together with some difficulties faced by individual investors, many studies have raised some interesting questions with respect to the shares of MNCs. From the investor's point of view, some studies give evidence that investors tend to realize higher risk-adjusted performance with MNCs' shares than that with domestic firms. These studies imply that to investors, some
benefits can be gained from an investment in the shares of MNCs that cannot be realized through a comparable investment in the shares of domestic firms. On the other hand, other studies suggest the opposite view that purchase of shares of MNCs is not a good alternative way of achieving risk-reduction benefits from international portfolio investments. The existing literature has provided conflicting evidence with respect to benefits of investment in MNCs to individual investors. In this section, several representative studies are surveyed, and the theoretical and empirical problems involved in those studies are discussed.

Studies Indicating Benefits from MNCs

Hughes, Logue and Sweeney\(^{15}\) employ two different measures of systematic risk and examine the risk-adjusted returns for MNCs and domestic firms. First, when systematic risk is measured in association with a domestic market index, the Treynor index of performance of investment in MNCs is superior to that of domestic firms. However, when systematic risk is calculated using an international market index, no superiority of performance of MNCs is found. Their findings indicate that under a segmented pricing hypothesis, MNCs provide higher risk-adjusted performance to investors. However, several problems should be pointed out

\(^{15}\)Hughes, Logue and Sweeney, "Corporate International Diversification," pp. 627-637.
before accepting their findings. First, as indicated by Brewer\textsuperscript{16} their empirical tests may be subject to the measurement problems described by Miller and Scholes\textsuperscript{17} since they employ systematic risk measures for individual stocks instead of portfolios. Furthermore, Roll\textsuperscript{18} questions the testability of the theoretical CAPM due to problems with the identification of the true market portfolio.

In addition, a question arises with respect to an appropriate measure of systematic risk for MNCs. Even in the context of the perfectly segmented pricing hypothesis, the systematic risk associated with a domestic market index is not expected to capture the total systematic risk of an MNC. The sum of systematic risks associated with domestic market portfolios of countries where the MNC has operational bases would be related to the expected rate of return. Thus, the domestic systematic risk may be only a portion of the total systematic risk of an MNC. Such an error in measurement of systematic risk would bias the performance index. Assuming an efficient capital market where all publicly available information is reflected in the value of risky assets instantaneously and without bias, a group of firms could not provide a persistently


higher risk-adjusted performance. Their second result using an international market index, tends to show more reasonable evidence on the nature of MNCs. Specifically, the result shows no differences in risk-adjusted performance between MNCs and domestic firms and supports an integrated pricing hypothesis. In conclusion, Hughes, Logue and Sweeney deal with the problem in terms of two extreme cases, the perfectly segmented pricing hypothesis and the perfectly integrated pricing hypothesis. Mikhail and Shawky\textsuperscript{19} also find some evidence supporting the superiority of performance of investment in MNCs to that of domestic firms during the period of 1968-1975. Employing Jensen's performance index together with a systematic risk measured relative to a domestic market index, they show that MNCs earn a higher return than would be expected for their systematic risk level. In other words, MNCs outperformed the average market (S&P 500 index) at least during the period of 1968-1975. Aggarwal\textsuperscript{20} argues that use of the Standard and Poor's 500 index as a proxy for domestic average firms makes Mikhail and Shawky detect only a portion of the actual differences in performance between MNCs and domestic firms. Aggarwal further provides some findings that systematic risk when


measured relative to the U.S. market index declines with an increase in the multinationality of a firm (foreign income, sales or assets). These findings are in some respects, consistent with the findings of Rugman that the percentage of foreign sales are inversely related to the variance of the profits for these firms. Aggarwal attributes the general low level of domestic systematic risk of MNCs to the fact that U.S. investors do not believe in fully integrated international capital markets or that MNCs offer opportunities for risk reduction not available to individual investors. In conclusion, Aggarwal finds it natural that MNCs should have lower systematic risks since multinationality of MNCs implies less dependence on a domestic capital market and economy. According to his interpretation, under the perfectly segmented capital market, other systematic risks of an MNC are ignored by domestic investors. However, it is not acceptable to use only the domestic portion of the total systematic risk of an MNC to judge if the return is excessive. If such a low level of systematic risks is regarded as risk reduction benefits, investors may be willing to pay a premium for the shares of MNCs, and thus in equilibrium, the expected return on the shares of MNC also is reduced.

In conclusion, for MNCs, systematic risk relative to a domestic market index is not an appropriate measure. Therefore, errors in measurement of systematic risk of MNCs may result in bias

in favor of abnormal performance of MNCs. Recognizing the special pricing problem for MNCs, Agmon and Lessard\textsuperscript{22} employ the following two-factor pricing model:

$$\tilde{R}_j = \alpha_j + \beta_j \tilde{R}_{us} + \gamma_j \tilde{R}_w + \epsilon_j$$

where $\tilde{R}_j$ is the return on a share of the jth firm with non-U.S. sales, $\tilde{R}_{us}$ is the return of the New York Stock Exchange index and $\tilde{R}_w$ is the return of the rest of the world index, designed to be orthogonal to $\tilde{R}_{us}$. Agmon and Lessard hypothesize that if the movements of share prices indicate that the market perceives international corporations as different from those less internationally involved, this evidence, together with some evidence of barriers to homemade diversification, lends support to the argument that the MNC's ability to diversify internationally is an advantage to investors. Their results show that portfolios with a high degree of multinationality, measured by the proportion of non-U.S. sales, have relatively high coefficients relating to the rest of the world index. Conversely, the coefficients in association with the U.S. market index are much higher for those portfolios with little international investment. Their findings indicate significant differences between the market-assigned systematic risk measures for MNCs and domestic firms, which supports the argument that U.S. investors recognize the multinationality of U.S.-based firms. Agmon

and Lessard further argue that the market recognition of multinationality of a firm combined with the existence of some barriers to homemade diversification support the diversification motive of foreign direct investments by MNCs. However, it is questionable whether these two conditions are sufficient for the diversification service motive. Evidently, these are necessary conditions. Their study provides evidence that the market recognizes the multinationality of a firm, but it is silent on the question of whether a diversification service is provided by MNCs.

The hypothesis of market recognition of multinationality is also supported by the recent study of Brewer and Miller. They examine whether the change in the exchange rate system in 1971 affected market perceptions of the risk and return characteristics of domestic firms as opposed to MNCs. Employing a residual analysis method with a sample of domestic firms and MNCs, Brewer and Miller find that the international economic event that is expected to affect firms with higher multinationality actually increases the systematic risk of MNCs measured domestically relative to domestic firms.

Studies Indicating No Benefits from MNCs

Jacquillat and Solnik\textsuperscript{24} reach the opposite conclusion that investing in U.S.-based MNCs cannot be regarded as a direct substitute for international portfolio diversification. They hypothesize that, provided a share of an MNC is indeed equivalent to an international portfolio in terms of risk reduction benefits, its price should be affected by foreign factors to the extent of the MNC's degree of foreign involvement. Jacquillat and Solnik employ a multi-regression analysis in which a domestic market factor and several other foreign market factors are employed as independent variables. Their test leads to the rejection of the hypothesis with a few exceptions and tends to show that only the coefficient of domestic beta is significant whereas the coefficients of foreign betas are insignificant and small. Their results appear to be contradictory to the results of Agmon and Lessard. A plausible reason for the different results may be the different methods employed to create the foreign market factor. While the foreign market factor employed by Agmon and Lessard is orthogonal to the domestic market factor by design, the ones used by Jacquillat and Solnik are somewhat correlated because national market indices are not perfectly independent of one another. Therefore, the coefficient of foreign betas may be biased downward since the foreign market factor includes any factors that are supposedly related to the

domestic component of total returns. More recently, Senchack and Beedles\textsuperscript{25} examine the extent and speed of diversification benefits of U.S.-based MNCs and comparable domestic firms. To measure the rate of reduction in portfolio risk, the following least-square regression equation is fitted:

$$G_{pN} = a + b \frac{1}{N} + e$$

where $G_{pN}$ denotes the average standard deviation of a portfolio with $N$ shares. Senchack and Beedles hypothesize that increases in the number of shares, $N$, in a portfolio cause $G_{pN}$ to decrease and that the extent and speed of a reduction in $G_{pN}$ for a portfolio with MNCs' shares will be larger and faster than for a portfolio consisting of domestic firms. Surprisingly, their test results indicate that MNCs do not appear to provide diversification benefits that are as extensive as the typical shares. More specifically, randomly selected domestic shares diversify away unsystematic risk more quickly than do the portfolio of MNCs. Finnerty, Hill and Schneeweis\textsuperscript{26} provide similar evidence that in the portfolio selection procedure, there are no significant differences in the amount of risk reduction regardless of whether the new shares added to a portfolio are MNCs, domestic firms or a combined group of firms. They argue that MNCs still contain substantial non-systematic risk.


that can be diversified away. Consequently, the risk adjusted performance of a portfolio with MNCs is not superior to that of domestic firms.

The extent and speed of risk reduction and risk-adjusted performance of a portfolio generally depend on the correlations among constituent shares. One does not expect the correlations of returns among MNCs to be lower than those of domestic firms. The central issue lies in the fact that each share of MNCs might have a diversification function like a portfolio itself would have in the sense that domestic systematic risk could be diversified away internationally. Therefore, a desirable test is to examine the risk-return relationship of MNCs' shares. If there are significant benefits which are recognized and rewarded by the market, they should be reflected in the risk-return relationship. Brewer employs a version of the Black, Jensen and Scholes procedures to examine the risk-return relationship of MNCs. He uses a single domestic beta as an independent variable in an ex ante linear pricing relationship. Brewer finds no significant differences in the coefficient of the slope term which represents a risk-premium at a given amount of systematic risk between MNCs and domestic firms. His finding indicates that MNCs tend to have the same security market line as domestic firm have. His hypothesis is that


if MNCs have a larger risk-premium at a given level of systematic risk, investors will be benefited permanently through buying shares of MNCs. However, if diversification service exists and is recognized, the risk-premium of a MNC should be less than that of a domestic firm. In other words, MNCs can reduce a required risk-premium due to their valuable service.

Concluding Remarks

A survey of previous studies indicates that testing the possible existence of diversification service is not simple. One difficulty is that one needs to examine not only the existence of diversification service but also market recognition of it and reward for it. Furthermore, one cannot depend on a capital asset pricing model that cannot be applied commonly to both MNCs and domestic firms. In the following chapter, several hypotheses related to the central hypothesis will be derived and tested.
CHAPTER 4

SEVERAL HYPOTHESES AND A SAMPLE DESCRIPTION

Assuming an efficient U.S. capital market, any benefits provided by MNCs should be recognized and rewarded by investors. Most previous studies seemingly fail to realize that even if a diversification service exists, it may not result in risk-adjusted abnormal performance of MNCs. Instead, if there are diversification services which transform a portion of domestic systematic risk into international unsystematic risk, the expected rate of return on the share of a MNC should be adjusted downward. In other words, provided that MNCs can diversify away a portion of domestic systematic risk successfully, a risk premium associated with such internationally diversifiable risk should be zero. Thus the required rate of return (cost of equity) of MNCs should be reduced.

Some evidence\(^1\) supporting abnormal performance of MNCs' shares is based on the finding that MNCs tend to have lower domestic systematic risk than comparable domestic firms. According

\(^1\)For more details, see the studies by Hughes, Logue and Sweeney, "Corporate International Diversification," pp. 627-637, Mikhail and Shawky, "Investment Performance," pp. 53-66 and Aggarwal, "Investment Performance," pp. 98-104.
to Aggarwal's\textsuperscript{2} interpretation, such a finding may be due to the market recognition of the international operations of a U.S. firm, which makes the firm less dependent on U.S. economic fluctuations. Thus, stock prices of MNCs are less likely to move with the rest of the U.S. stock market. However, a firm with international involvement depends more on foreign economic fluctuations. As Agmon and Lessard\textsuperscript{3} argue, the total systematic risk of a MNC is the sum of the domestic systematic risks associated with market portfolios of countries where the MNC has an operational base. Thus, the domestic systematic risks of MNCs employed in the previous studies represent only a portion of total systematic risks. Consequently this downward biasedness of the systematic risk results in the appearance of abnormal performance of MNCs. The empirical findings by Hughes, Logue and Sweeney\textsuperscript{4} show that when the systematic risk of a firm is measured using a domestic market index, Treynor's performance index of MNCs is higher than that of domestic firms. However, when systematic risk is measured in association with an international market index, the superior performance of MNCs disappears. In equilibrium, any risk adjusted excess return will be arbitraged away. Thus, if the risk of a firm

\textsuperscript{2}Ibid. \\
\textsuperscript{3}Agmon and D. Lessard, "Investor Recognition," p. 1050. \\
\textsuperscript{4}Hughes, Logue and Sweeney, "Corporate International Diversification," pp. 627-637.
is measured and employed appropriately, no persistent abnormal performance is expected.

Instead of examining the issue of whether potential benefits are realized by investors with MNCs' shares, this study deals with the existence of a diversification service and the corresponding reduction in a risk premium for MNCs. Since a necessary condition for the existence of a diversification service is that the market should recognize the multinationality of a firm, this study also examines whether the market considers international factors of a firm in determining share prices. Several hypotheses are derived with respect to the above central issue. A description of the samples employed in this study is introduced and is followed by a simple financial profile of MNCs and domestic firms in the sample.

Hypotheses

First, the relationship between domestic systematic risk of a firm and the stability of earnings stream is examined to see if multinationality of a firm reduces the variability of earnings and has effects on the systematic risk. The hypothesis is that MNCs have lower earnings variability than domestic firms due to the multinationality of operations. Furthermore, such low earnings variability may explain low domestic systematic risk of MNCs. More details are discussed later.

Second, if the multinationality of a firm's operations is recognized by investors, the domestic Capital Asset Pricing Model (CAPM) would be an improper pricing model for MNCs. As
mentioned earlier, any empirical evidence on MNCs found by employing the domestic CAPM may be biased due to the inappropriate specification of the risk-return relationship. Only the domestic portion of total systematic risk is captured and incorporated in explaining the variation of returns. For MNCs, the risk premium associated with domestic systematic risk does not capture all compensation for total systemic risk. Consequently, the hypothesis is that if investors recognize the multinationality of a firm, the explanatory power of the domestic CAPM will be poorer than when the domestic CAPM is applied to domestic firms. Furthermore, the risk premium term (the slope of the empirical security market line) of MNCs is expected to be lower than that of domestic firms since this risk premium only represents a partial compensation.

Third, if U.S. investors recognize the multinationality of a firm, it is expected that a firm with a high degree of multinationality would depend less on a pure U.S. market factor and more on a world market factor. The hypothesis is that MNCs have higher systematic risk relative to the world market factor and lower systematic risk associated with the pure domestic market factor than domestic firms. This hypothesis is important because the recognition of the multinationality of a firm by investors is a necessary condition for the existence of diversification service.

Finally, if investors recognize the multinationality of a firm, then a change in policy directed specifically at MNCs or domestic firms is expected to affect MNCs and domestic firms differently. Furthermore, if there is a diversification service, market reaction to
an economic event that is expected to affect the diversification service should show the unbiased implication of the event. The hypothesis is that the price movement of MNCs' shares should incorporate investor's perceptions of the impact of events on MNCs in an unbiased way. In other words, any events that have effects only on MNCs should affect the MNCs and domestic firms differently.

Sample and Data Description

For the following four empirical tests, a sample of 135 U.S. based MNCs is selected based on two previous studies. First, 187 U.S. based MNCs are identified by Vaupel and Curhan5 through the following criteria:

1. Each firm must be on Fortune's list of the 500 Largest U.S. Industrial Corporations for the year 1963 or 1964.
2. By the end of 1963, each firm holds equity interests in manufacturing firms located in 6 or more countries outside the United States. In each case, the equity interest amounts to 25% or more of total equity.
3. A firm is not a subsidiary of another firm.

These 187 MNCs are matched against 187 MNCs suggested by Bruck and Lees,6 who classify firms in the 1965 Fortune 500 Directory on

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the basis of foreign operations. Based on the statistics with respect to the extent of foreign involvement (sales, earnings, assets and employment) from 281 firms, Bruck and Lees identify 187 MNCs with more than 10% of foreign involvement. The data on the extent of foreign involvement (the ratio of foreign earnings to total earnings) are obtained for MNCs from this study. From these 187 MNCs, a sample of 135 MNCs are selected which meet following criteria:

1. Each firm must have continuous data available on the Center for Research in Security Prices (CRSP) daily and monthly file and on the COMPUSTAT industrial annual file from 1962 to 1979.\(^7\)

2. Each firm must have been identified by both Vaupel and Curhan and Bruck and Lees.\(^8\)

A sample of domestic firms is obtained from the 1963 Fortune's list of the 500 Largest U.S. Industrial Corporations after eliminating the 187 MNCs suggested by Bruck and Lees. From these firms, 135 domestic firms with less than 10% of foreign involvement are selected arbitrarily after eliminating firms without continuously available data or which have increased the extent of

\(^{7}\)Since the daily returns file contains daily returns for NYSE and AMEX common stocks starting on July 2, 1962, firms that have enough monthly return data but do not have continuous daily return data from June, 1962 to December 1978 are also eliminated.

\(^{8}\)Note that firms with more than 10% of foreign involvement are selected.
foreign involvement substantially from 1965 to 1979. The statistical
data for this screen are obtained from the publication by Forbes in
1979. Monthly dividend-adjusted rates of return and daily
dividend-adjusted rates of return are obtained from the CRSP
monthly file and the CRSP daily file respectively for the time period
of January 1963 to December 1978. The monthly and daily market
indices are drawn from the market-value weighed index and equal-
weighted index of the CRSP index file. For the world market
index, the monthly market index published by International Capital
Perspective is employed. For other financial profiles, all data are
obtained from the Annual Compustat Industrial file. Note that two
samples are actually obtained from large U.S. firms listed on the
NYSE since the CRSP monthly data file only contains firms listed on
the NYSE.

Financial Profile of MNCs and
Domestic Firms

A substantial amount of evidence has shown the need to
consider explicitly size effects and dividend effects when com­
paring the risk-adjusted performance of stocks. Recent studies by

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9For example, Xerox and Sun Oil Company that were not
included in the sample of MNCs based on 1965 data have increased
foreign involvement substantially during this time period. Source:


11The world market index is an average of 18 developed
countries stock market indices weighted by GNP. The Standard
and Poor's 400 stock index is used as the U.S. stock market
index.
Banz\textsuperscript{12} and Reinganum\textsuperscript{13} have shown that small firms realize higher average rates of return than large firms, even after accounting for differences in estimated betas of firms. Banz only conjectures that since information is more readily available for large firms, investors may tend to avoid small firms. Consequently, this lack of information about small firms, in turn, leads to limited diversification and therefore to higher returns for the share of small firms. Roll,\textsuperscript{14} however, suggests that the size effect might be attributed to inappropriate estimation of security betas for small firms, an underestimation that is induced by autocorrelated returns, which is probably due to infrequent trading of the shares of small firms. More recently, however, Reinganum\textsuperscript{15} shows evidence that, while the direction of the bias in beta estimation is consistent with Roll's conjecture, the magnitude of the bias is not large enough to explain the firm size effect. While the traditional estimation (ordinary least squares) seems to underestimate beta of small firms, the excess returns of small firms cannot be fully explained by the bias in the estimation of beta.


A substantial number of studies has shown the effects of dividend yield on common stock returns. Brennan,\textsuperscript{16} Elton and Gruber,\textsuperscript{17} Pettit\textsuperscript{18} and Litzenberger and Ramaswamy\textsuperscript{19} show a positive and significant relationship between dividend yield and common stock returns, which is mainly attributed to the disadvantage of dividends with respect to personal taxes. However, the explanation for the dividend yield effect is controversial. Miller and Scholes\textsuperscript{20} attribute the dividend yield effects to the informational effects of dividends while Hess\textsuperscript{21} argues that dividends are proxying for changes in expected returns.


Hamada\textsuperscript{22} and Rubinstein\textsuperscript{23} show that the systematic risk of a firm is positively related to its financial leverage. A firm with lower financial leverage is expected to have less systematic risk than another firm with a higher financial leverage, assuming the two firms are identical in every other respect. If the two samples are different from one another with respect to these financial variables, any empirical results might be biased. Table 1 shows some financial data of the sample of MNCs and domestic firms. Also, ANOVA test statistics for differences in such data between the samples are reported. Although all firms in both samples are derived from the 1963 Fortune's list of the 500 Largest U.S. Industrial Corporation, the average market value of MNCs is significantly larger than that of domestic firms during 1963 to 1978. On the other hand, the systematic risk of MNCs measured in association with the domestic monthly market index (the CRSP dividend-adjusted value-weighted market index) is significantly


**TABLE 1**

FINANCIAL PROFILE OF MNCs AND DOMESTIC FIRMS

<table>
<thead>
<tr>
<th></th>
<th>SIZE(^2)</th>
<th>LV(^3)</th>
<th>DP(^4)</th>
<th>BETA(^5)</th>
<th>RETURN(^6)</th>
<th>CV(^7)</th>
<th>DY(^8)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MNC</strong></td>
<td>1077.69</td>
<td>0.47</td>
<td>0.52</td>
<td>1.07</td>
<td>0.0161</td>
<td>0.031</td>
<td>0.033</td>
</tr>
<tr>
<td><strong>DC</strong></td>
<td>375.30</td>
<td>0.48</td>
<td>0.48</td>
<td>1.33</td>
<td>0.0175</td>
<td>0.53</td>
<td>0.033</td>
</tr>
<tr>
<td>Std</td>
<td>1469.03</td>
<td>0.93</td>
<td>0.75</td>
<td>0.23</td>
<td>0.0097</td>
<td>0.24</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>635.90</td>
<td>0.22</td>
<td>0.22</td>
<td>0.31</td>
<td>0.0116</td>
<td>0.42</td>
<td>0.02</td>
</tr>
<tr>
<td>ANOVA</td>
<td>F-value</td>
<td>23.57**</td>
<td>0.61</td>
<td>1.94</td>
<td>35.50**</td>
<td>1.23</td>
<td>14.58**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)All data are calculated employing observations from 1963 to 1978.

\(^2\)Market value of equity (closing stock price multiplied by number of shares outstanding) is employed as a proxy for firm size ($ mil).

\(^3\)LV (leverage ratio) is measured by long-term debt/common equity.

\(^4\)DP (dividend payout ratio) is measured by dividends per share/earnings per share.

\(^5\)BETA is measured in association with the CRSP dividend-adjusted value weighted monthly market index.

\(^6\)RETURN is the average of monthly returns.

\(^7\)CV (coefficient of earnings variation) is measured by the standard deviation of annual earnings/average earnings.

\(^8\)DY (dividend yield) is measured by dividends/previous closing stock price.

\(^9\)DC denotes domestic firms.

**Significant at the 0.01 level.**
smaller than the average beta of domestic firms.\textsuperscript{24} The earnings variability, measured by the coefficient of variation, of MNCs is also significantly smaller than that of domestic firms, which is consistent with findings by Rugman.\textsuperscript{25} Other financial data (financial leverage ratio, monthly returns, dividend payout ratio and dividend yield) show no significant difference between the sample of MNCs and the sample of domestic firms. Thus, as far as Treynor's performance index is concerned, MNCs tend to have higher risk-adjusted performance than domestic firms, which is consistent with previous findings.\textsuperscript{26}

Even though the sample of domestic firms shows significantly smaller market value than that of MNCs, the small firm size effect is not expected to affect excess returns of the domestic firms significantly since the domestic firms are relatively large.\textsuperscript{27}

\textsuperscript{24}This relationship is robust when the equal-weighted CRSP market index is employed. Furthermore, even when betas are measured by the ordinary least square method and the method suggested by Scholes and Williams employing daily returns and daily CRSP market indices (value-weighted and equal-weighted), this relationship still remains. For more details about the method suggested by Scholes and Williams, see, M. Scholes and J. Williams, "Estimating Betas from Nonsynchronous Data," \textit{Journal of Financial Economics}, pp. 309-327, December, 1977.

\textsuperscript{25}Rugman, "Risk Reduction," pp. 75-80.

\textsuperscript{26}See, Hughes, Logue and Sweeney, "Corporate International Diversification," p. 634.

\textsuperscript{27}The domestic firms are relatively large firms when compared with all firms listed on the AMEX and the NYSE (over 2500 firms), which were employed by Reinganum. The domestic firms are expected to be ranked at least within the third largest market value portfolio out of ten portfolios employed by Reinganum. Thus, we cannot conclude with confidence that the small firm effect is still
Furthermore, the firm size effect is reduced by employing monthly
data instead of daily data. 28 Each sample is further classified into
two groups according to the degree of multinationality. 29 From the
sample of MNCs, firms with more than 25% of foreign involvement
are grouped into G1 and the others are grouped into G2. From the
sample of domestic firms, firms with more than zero foreign involve-
ment are grouped into G3 and the others are grouped into G4.
Table 2 reports some data for each group. Except for the coef-
ficients of variation of earnings (CVs) between G1 and G2, there is
a monotonic ordering of market value size, beta and earnings
variability among the four groups. Note that G4 has a much
smaller firm size than the other groups. Table 3 reports results of
three tests (ANOVA, Median test and Kruskal-Wallis test) 30 for the
null hypothesis of the equality of these variables among groups.
All tests can reject the null hypothesis at the 0.01 level. This
four-way classification fails to produce statistically identical groups
with respect to the market value of a firm. However, the large


significant among firms on the list of the 500 largest firms. For
more details, see Reinganum, "A Direct Test of Roll's Conjecture," p. 29.

28 For more details, see Reinganum, ibid, 1982.

29 This grouping procedure is based on the average ratio of
foreign earnings to total earnings reported in 1965 by Bruck and
Lees and data reported in 1979 by Forbes. Four groups are
derived based on only the 1965 data for the residual analyses.

30 For a detailed discussion of these two non-parametric
tests, see, W. Daniel, Applied Nonparametric Tests (Boston:
### TABLE 2

**FOUR-WAY CLASSIFICATION AND FINANCIAL PROFILE OF EACH GROUP**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Group</th>
<th>Number of Firms</th>
<th>Degree of Multinationality</th>
<th>Size</th>
<th>Beta</th>
<th>CV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MNC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>G1</td>
<td>47</td>
<td>over 25%</td>
<td>1150.01</td>
<td>1.07</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[37%]</td>
<td>(1428.12)</td>
<td>(0.19)</td>
<td>(0.34)</td>
</tr>
<tr>
<td></td>
<td>G2</td>
<td>88</td>
<td>10%-25%</td>
<td>1038.15</td>
<td>1.08</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[19%]</td>
<td>(1498.64)</td>
<td>(0.25)</td>
<td>(0.16)</td>
</tr>
<tr>
<td></td>
<td>G3</td>
<td>28</td>
<td>0%-10%</td>
<td>864.15</td>
<td>1.13</td>
<td>0.48</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[6%]</td>
<td>(1180.81)</td>
<td>(0.25)</td>
<td>(0.45)</td>
</tr>
<tr>
<td></td>
<td>DC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>G4</td>
<td>107</td>
<td>0%</td>
<td>237.68</td>
<td>1.25</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[0%]</td>
<td>(225.00)</td>
<td>(0.32)</td>
<td>(0.40)</td>
</tr>
</tbody>
</table>

The figures in brackets denote average degree of multinationality.
The figures in parentheses denote standard deviations.
TABLE 3
RESULTS OF TEST STATISTICS
AMONG GROUPS

<table>
<thead>
<tr>
<th></th>
<th>ANOVA</th>
<th>K-W</th>
<th>MEDIAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>F=10.33**</td>
<td>CHISQ=85.24**</td>
<td>CHISQ=72.59**</td>
</tr>
<tr>
<td>Beta</td>
<td>F=7.49**</td>
<td>CHISQ=18.35**</td>
<td>CHISQ=15.09**</td>
</tr>
<tr>
<td>CV</td>
<td>F=5.38**</td>
<td>CHISQ=18.98**</td>
<td>CHISQ=15.08**</td>
</tr>
</tbody>
</table>

**Significant at the 0.01 level.
K-W denotes Kruskal-Wallis test.
test statistics are mainly due to the extremely small size of G4. Once G4 is excluded, there is no significant difference in size among groups.\footnote{F-value is only 0.33. Furthermore, there is no significant difference in size between G1 and G3 \( (F = 0.75) \).}
CHAPTER 5

EMPIRICAL TESTS

A. The Variability of Earnings and Systematic Risk of a Firm

The international diversification of operations may have two effects on the risk of a firm. First, to the extent that foreign earnings are not perfectly correlated with those from the domestic operation, the variability of earnings stream may be reduced. Second, the international diversification allows a firm to depend on the domestic economy less than without the foreign diversification. If multinationality of the firm is recognized in the market, then shares of the firm should be less dependent on a domestic capital market than a domestic firm would be. Therefore, as reported in the previous section, the systematic risk of MNCs associated with the domestic market is significantly smaller than domestic firms would have. Rugman\(^1\) emphasizes the first reduction in the total risk of earnings as an important economic motive behind foreign direct investments by MNCs. He shows that the variance of profits is inversely related to the percentage of foreign sales. However, as noted earlier, the incentive to stabilize earnings stream may be beneficial to management rather than shareholders through the

\(^1\)Rugman, "Risk Reduction," pp. 75-80.
reduction of management's unemployment risk.\(^2\) Shapiro\(^3\) conjectures that such a reduction in the total earnings variability could allow MNCs to achieve higher financial leverage, leading to a reduction in their marginal cost of capital since the risk of bankruptcy for a firm is dependent on total earnings variability instead of systematic earnings variability.

The studies supporting abnormal performance of MNCs emphasize and rely on the reduction in the systematic risk of earnings and market systematic risk. Although it is questionable whether a reduction in the systematic risk in association with a domestic market necessarily benefits shareholders, multinationality of a firm can provide a reduction in the systematic risk of earnings as well as a reduction in the variance of the earnings stream. The multinationality of a firm can transform a portion of domestic systematic risk into nonsystematic risk that can be diversified away by operational diversification. Empirically, Severn\(^4\) finds that the greater the foreign involvement of a firm, the lower the covariance of its earnings per share with the earnings per share of Standard and Poor's Composite Index. Moreover, Gordon and Halpern\(^5\)

\(^2\)The first section of Chapter 3 discusses the argument in detail.


demonstrate a close positive correlation between the systematic risk of a firm's earnings and its market systematic risk, which implies that the market recognizes operational characteristics of a firm. If the market does recognize the multinationality of a firm and MNCs actually achieve reductions in total and systematic risk of earnings, the result may be lower systematic risk for MNCs relative to domestic companies.

Bowman\(^6\) shows that the earnings variability does not have a direct relationship with market systematic risk. Instead, the systematic risk of earnings (accounting beta) should be related to market systematic risk. There has been no direct empirical evidence regarding the relationship of a firm's market systematic risk with its degree of earnings variability adjusted for the size of earnings. A significantly positive relationship might imply that multinationality of a firm also reduces the systematic risk of earnings, which is consistent with the findings by Severn.\(^7\) Such a finding may imply that the market recognizes multinationality of a firm. In this instance, we can explain at least why MNCs have domestic systematic risk that is significantly smaller than domestic firms would have.

---


\(^7\)He finds that MNCs have low accounting betas in relation to a domestic market. For more details, see Severn, "Investor Evaluation," pp. 545-550.
Model and Procedure

The market systematic risk of a firm is obtained from the domestic market model given by:

\[ \tilde{R}_{jt} = \alpha_j + \beta_j \tilde{R}_{dt} + \delta_{jt} \]

where \( \tilde{R}_{jt} \) is the rate of return on stock \( j \) at time \( t \).

\( \tilde{R}_{dt} \) is the rate of return on a domestic market index (the CRSP value weighted monthly market index).

\( \beta_j = \text{COV} (\tilde{R}_j, \tilde{R}_d)/\sigma^2(\tilde{R}_d) \)

\( \delta_{jt} \) is a random term with the following stochastic properties.

\[ E(\delta_{jt}) = 0, \]
\[ E(\delta_{is}, \delta_{jt}) = \delta_{ij} \quad \text{for all} \ s=t \text{ and} \]
\[ = 0, \quad \text{otherwise}. \]

Note that for MNCs, \( \beta_j \) represents the domestic portion of the total systematic risk. Monthly data from 1963 to 1978 are employed to measure the domestic systematic risk of a firm. The coefficient of variation of earnings (CV) is employed as a proxy for size-adjusted earnings variability. The annual data from 1963 to 1978 are used for CV.

In order to examine the relationship between a firm's market systematic risk and its degree of earnings variability, the following two linear regressions are estimated and tested.

\[ \tilde{\beta}_i = \alpha_0 + \alpha \_1 \text{SIZE}_i + \epsilon_i \quad (5.1) \]
\[ \tilde{\beta}_i = \alpha_0' + \alpha \_1' \text{CV}_i + \epsilon_i' \quad (5.2) \]

These regressions are fitted both for all sample firms as well as for the sample of MNCs and the sample of domestic firms separately.
Empirical Results and Implications

The results of the regression analyses are reported in Table 4. The first regression line is obtained by regressing the domestic systematic risk of a firm ($\beta_1$) on the size (market value) of a firm. The hypothesis of zero slope of the regression line is rejected at the 0.01% significance level. The sign of the coefficient of the slope term ($\alpha_1$) is negative (-0.0653) and significant at the 0.01 level. This result implies that larger systematic risk tends to be associated with smaller firm size, which is consistent with the relationship shown by Reinganum. This result is intact when the regression line is fitted for the sample of MNCs and the sample of domestic firms respectively at the 0.05 level. The second regression line is constructed by regressing cross-sectionally $\beta_1$ on the coefficient of variation of the annual earnings (earnings before interest expenses and taxes). The second block in Table 4 indicates that the slope and its test statistic are large enough to show significance at the 0.01 level when all firms are employed. The sign of the slope term is positive (0.2358) and it is significantly different from zero. This result does not support the argument by Bowman that the earnings variability is not directly associated with market systematic risk. This finding remains

---

8This test employs the value-weighted CRSP monthly market index. Similar results are found using the equal-weighted CRSP monthly market index.

9Reinganum, "A Direct Test of Roll's Conjecture," p. 34.

### TABLE 4
THE RELATIONSHIP BETWEEN SYSTEMATIC RISK AND EARNINGS VARIABILITY

<table>
<thead>
<tr>
<th>Model</th>
<th>Sample</th>
<th>Number of Firms</th>
<th>( \alpha_0 )</th>
<th>( \alpha_1 )</th>
<th>PR&gt;F</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ALL</td>
<td>270</td>
<td>1.2002**</td>
<td>-0.0653**</td>
<td>0.0001</td>
<td>0.074</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(50.53)</td>
<td>(-4.39)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-1</td>
<td>MNC</td>
<td>135</td>
<td>1.1248**</td>
<td>-0.0411**</td>
<td>0.0038</td>
<td>0.069</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(44.49)</td>
<td>(-2.95)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DC</td>
<td>135</td>
<td>1.2634**</td>
<td>-0.1071*</td>
<td>0.0146</td>
<td>0.048</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(39.68)</td>
<td>(-2.48)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Sample</th>
<th>Number of Firms</th>
<th>( \alpha_0 )</th>
<th>( \alpha_1 )</th>
<th>PR&gt;F</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ALL</td>
<td>270</td>
<td>1.0427**</td>
<td>0.2358**</td>
<td>0.0001</td>
<td>0.086</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(36.61)</td>
<td>(4.73)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-2</td>
<td>MNC</td>
<td>135</td>
<td>0.9766**</td>
<td>0.2641**</td>
<td>0.0021</td>
<td>0.077</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(26.50)</td>
<td>(3.15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DC</td>
<td>135</td>
<td>1.1314**</td>
<td>0.1739**</td>
<td>0.0099</td>
<td>0.055</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(25.17)</td>
<td>(2.62)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\*\*Significant at the 0.01 level.
\*Significant at the 0.05 level.
The figures in parentheses indicate t-values.
This test employs the value-weighted CRSP monthly market index.
Size (average market value of equity) in eq. (5.1) is divided by 1,000 million before running the regression.
unchanged when the second regression line is fitted for the sample of MNCs and the sample of domestic firms. The coefficient of the slope term (0.2641) of MNCs is more than three standard errors away from zero. A similar result is found for domestic firms. A firm with a relatively stable earnings stream tends to have a low level of systematic risk. This finding, however, does not necessarily contradict the arguments by Bowman. At a given level of earnings variability for the market portfolio, a firm with a stable earnings stream is also expected to have also a low level of covariability with the variability of the earnings of the market portfolio. Based on the results from the two regression analyses, it is still unclear whether earnings variability can add to the explanatory power of the size effect in explaining the variation of domestic systematic risks. Thus, two new regressions are fitted based on the following models:

\[ \tilde{\beta}_i = \gamma_0 + \gamma_1 \text{SIZE}_i + \gamma_2 \text{CV}_i + z_i \]  
\[ \tilde{\beta}_i = \gamma_0 + \gamma_1 \tilde{R}_i + z_i \]  

where \( \tilde{R}_i \) is the pure earnings variability of the ith firm measured by a residual from regressing \( \text{CV}_i \) on \( \text{SIZE}_i \). The results of these regression analyses are reported in Table 5. The first regression line seems to suffer from econometric problems due to a high degree of multicollinearity.\(^{11}\) The estimates of the regression coefficients may be imprecise because of the large variances of the least

\(^{11}\)The correlation coefficient between \( \text{SIZE}_i \) and \( \text{CV}_i \) is 0.18.
squares estimators. However, since the difference between $R^2$ (0.16) and the highest of the "$R^2$ deletes" (0.08) is not small, the degree of multicollinearity is not harmful.\footnote{For a detailed discussion on the measure of multicollinearity, see J. Kmenta, \textit{Elements of Econometrics} (New York: Macmillan Publishing Co., 1971).} The introduction of $CV_1$ into the regression equation (5.1) leads to a substantial increase in the value of $R^2$ (from 0.03 to 0.16). All regression coefficients are significantly different from zero at the 0.05 level and the signs of $\hat{\gamma}_1$ and $\hat{\gamma}_2$ are consistent with results shown in Table 4. In particular, the coefficients of CV are still positive and significantly different from zero at the 0.01 level for all cases. The $\hat{\gamma}_1$ in the second regression line, which represents the effects of pure earnings variability on the variation of $\hat{\beta}$ are significantly positive at the 0.05 level for all cases. Thus, even after adjusting for firm size, a firm with lower earnings variability tends to have lower domestic systematic risk. It can be presumed that the market seems to interpret a stable earnings stream of a firm as a less dependence on the U.S. economy and thus enables its stock price less likely to move with the rest of the U.S. stock market.

We have shown that MNCs tend to have earnings streams that are significantly more stable than those of domestic firm, and that there is a significantly positive relationship between the earnings variability and the systematic risk of a firm. As hypothesized, stable earnings streams of MNCs can explain why MNCs tend to have a low level of domestic systematic risk. This is also evidence
### TABLE 5
THE RELATIONSHIP BETWEEN SYSTEMATIC RISK AND SIZE-ADJUSTED EARNINGS VARIABILITY

<table>
<thead>
<tr>
<th>Model</th>
<th>Sample</th>
<th>$\hat{y}_0$</th>
<th>$\hat{y}_1$</th>
<th>$\hat{y}_2$</th>
<th>PR&gt;F</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ALL</td>
<td>1.0877**</td>
<td>-0.0535**</td>
<td>0.2340**</td>
<td>0.0001</td>
<td>0.16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(34.69)</td>
<td>(-3.67)</td>
<td>(4.72)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-3</td>
<td>MNC</td>
<td>1.0351**</td>
<td>-0.0365**</td>
<td>0.2309**</td>
<td>0.0003</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(25.76)</td>
<td>(-2.68)</td>
<td>(2.82)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DC</td>
<td>1.1570**</td>
<td>-0.0871**</td>
<td>0.1948**</td>
<td>0.0008</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(23.05)</td>
<td>(2.02)</td>
<td>(2.89)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Sample</th>
<th>$\hat{y}_0$</th>
<th>$\hat{y}_1$</th>
<th>$\hat{y}_2$</th>
<th>PR&gt;F</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ALL</td>
<td>1.1539**</td>
<td>0.2340**</td>
<td></td>
<td>0.0001</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(65.43)</td>
<td>(4.53)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-4</td>
<td>MNC</td>
<td>1.0917**</td>
<td>0.1733</td>
<td></td>
<td>0.0414</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(50.98)</td>
<td>(2.06)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DC</td>
<td>1.2136**</td>
<td>0.2110**</td>
<td></td>
<td>0.0125</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(43.36)</td>
<td>(3.09)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at the 0.05 level.
**Significant at the 0.01 level.
that the market recognizes the multinationality of a firm. However, it is still unclear whether stable earnings streams due to operational diversification benefit shareholders. Instead, managers may be benefiting through the reduction of their unemployment risk. Shapiro\(^{13}\) proposes that a reduction in total earnings variability could allow MNCs to leverage themselves more highly, leading to a reduction in their marginal cost of capital. However, it is still unclear whether an increase in leverage at any stage necessarily reduces the cost of capital. Furthermore, Table 1 shows that MNCs, on average, tend to have numerically lower leverage than domestic firms in this sample.\(^{14}\)

B. The Domestic CAPM Analysis

In the previous section, it was shown that MNCs, when compared to domestic firms have, on average, significantly lower systematic risk associated with the U.S. stock market. This finding is not surprising since the systematic risk relative to the U.S. stock market is only a part of the total systematic risk for which the expected rate of return is compensation. Agmon and Lessard\(^{15}\) suggest that returns to MNCs follow the following multi-factor market model.

---

\(^{13}\)Shapiro, "Financial Structure," pp. 211-226. Galai and Masulis also suggest that an increase in leverage may be the economic rationale behind conglomerate mergers. For more details, see D. Galai and R. W. Masulis, "The Option Pricing Model," pp. 52-82.

\(^{14}\)When leverage is measured by long-term debt/common equity, MNCs have 0.47 while domestic firms have 0.55.

\(^{15}\)Agmon and Lessard, "Investor Recognition," p. 1050.
\[ E(\tilde{R}_{jt}) = \alpha_j + \beta_{jd} \tilde{R}_{dt} + \sum_{k=1}^{N_j} \beta_{jk} \tilde{R}_{kt} + \tilde{\varepsilon}_{jt} \]

where, \( \tilde{R}_{jt} \) = rate of return on the stock of MNC\(_j\) at time \( t \).
\( \tilde{R}_{dt} \) = rate of return on the U.S. market portfolio at time \( t \).
\( \tilde{R}_{kt} \) = rate of return on a foreign market portfolio, \( k \) at time \( t \) where the MNC has operations.

\( \beta_{jd} = \frac{\text{COV}(\tilde{R}_{j}, \tilde{R}_{d})}{\sigma^2(\tilde{R}_{d})} \)

\( \beta_{jk} = \frac{\text{COV}(\tilde{R}_{j}, \tilde{R}_{k})}{\sigma^2(\tilde{R}_{k})} \)

\( \tilde{\varepsilon}_{jt} \) = a random term

\( N_j \) = number of countries where MNC\(_j\) has operations

Agmon and Lessard provide evidence that as the foreign involvement of a firm increases, the international portion of systematic risk increases while the domestic portion decreases. It is expected that a risk-premium associated with a partial systematic risk would be lower than would be the case with total systematic risk. Consequently, the overall explanatory power of the domestic CAPM is expected to decline substantially when it is applied to a sample of MNCs. A more detailed discussion with respect to some econometric problems in the application of the domestic CAPM to a sample of MNCs is presented in Appendix A.

In this section, it is hypothesized that if the market recognizes multinationality of a firm, the explanatory power of the domestic CAPM will be lower when it is applied to MNCs than to domestic firms. Furthermore, the domestic CAPM gives a smaller
risk-premium associated with domestic systematic risk for MNCs than for domestic firms. Thus, this hypothesis states that any abnormal performance measured by the realized rate of return and domestic systematic risk of an MNC would be biased.

Model and Methodology

The domestic CAPM postulates a linear relationship between the expected rate of return on a risky asset and its systematic risk associated with a domestic market portfolio. Black's version of the CAPM is: 16

\[ E(R_j) = E(R_0) + [E(R_m) - E(R_0)] \beta_j \] (5.5)

where, \( R_j \) = rate of return on asset \( j \).
\( R_0 \) = rate of return on a zero-beta portfolio
\( R_m \) = rate of return on a domestic market portfolio
\( \beta_j \) = \( \frac{\text{COV}(R_j, R_m)}{\sigma^2(R_m)} \)

For empirical use of the CAPM, equation (5.5) can be transformed from the ex ante form into an ex post form that employs observable data by assuming that the rate of return on a risky asset has a fair game property. 17 The ex post CAPM is given by:

\[ R_{jt} = \gamma_{0t} + \gamma_{lt} \beta_j + \tilde{z}_{jt} \] (5.6)


where \( \gamma_{0t}, \gamma_{1t} = \) market-determined variables denoting the ex post relationship between risk and return at \( t \).

\( z_j = \) a disturbance term.

Empirical estimates, \( \gamma_{0t} \) and \( \gamma_{1t} \) for \( \gamma_{0t} \) and \( \gamma_{1t} \) are obtained by fitting the empirical market line given by:

\[
\tilde{R}_{jt} = \gamma_{0t} + \gamma_{1t} \tilde{p}_j + \tilde{z}_{jt}
\]  
(5.7)

where \( \tilde{p}_j \) is the estimate of \( \tilde{p}_j \), which can be measured from the market model defined as:

\[
\tilde{R}_{jt} = \alpha_j + \beta_j \tilde{R}_{mt} + \tilde{\epsilon}_{jt}
\]  
(5.8)

In order to reduce bias in results due to measurement errors in the use of equation (5.7) for the cross-sectional test of equation (5.5), the grouping procedure suggested by Black, Jensen and Scholes is adopted for the sample of MNCs and for the sample of domestic firms. For each sample, the procedure involves the following steps:

1) Estimate the beta of each stock over the period of January 1963 to December 1969 employing CRSP monthly return data based on equation (5.8).

\[\text{For an excellent discussion of the econometric problems involved in testing the CAPM, see M. Miller and M. Scholes, "Rates of Return in Relation to Risk," pp. 47-78.}\]

\[F. \ Black, \ M. \ C. \ Jensen \ and \ M. \ Scholes, \ "The \ Capital \ Asset \ Pricing \ Model," \ pp. \ 79-124. \ A \ similar \ grouping \ procedure \ is \ suggested \ by \ Fama \ and \ MacBeth. \ For \ more \ details, \ see \ E. \ F. \ Fama \ and \ J. \ MacBeth, \ "Risk, \ Return \ and \ Equilibrium: \ Empirical \ Test," \ Journal of Political Economy, \ pp. \ 607-636, May/June, 1973.]}
2) Rank the stocks by beta and place into 27 portfolios (each portfolio has 5 stocks).

3) Calculate the monthly returns for these portfolios for January 1970 to December 1970.

4) Obtain the monthly returns for 1971 by repeating the above steps using years from 1964 to 1970 for forming portfolios, and so on. This procedure produces a time series of 96 monthly returns for each of the 54 portfolios over the period of January 1970 to December 1978.

Applying these 96 monthly returns to the portfolio version of the market model produces estimate of beta for each portfolio, \( \hat{\beta}_p \). Finally, in order to estimate \( \hat{\gamma}_0 \) and \( \hat{\gamma}_1 \), a second-stage pooled cross-sectional regression is constructed based on the following equation:

\[
R_{pt} = \hat{\gamma}_0 + \hat{\gamma}_1 \hat{\beta}_{pt} + \tilde{z}_{pt}
\]  

(5.9)

The grouping procedure is expected to reduce the measurement errors in estimating the beta of a stock.\(^{20}\) However, in the second-stage regression analysis no procedure is employed to reduce bias in the \( \hat{\gamma}_1 \) of MNCs due to the omission of possibly relevant explanatory variables (foreign systematic risks). If the

\(^{20}\) Appendix B discusses the grouping procedure in detail.
market recognizes multinationality of a firm, the foreign systematic risks (or the international systematic risk) may be relevant explanatory variables. In this case, the omission of such variables will reduce the explanatory power of the domestic CAPM.

Since the main purpose of the test is not to investigate the validity of the domestic CAPM, no more devices are adopted. Instead, the objective is to compare the explanatory power of the domestic CAPM when it is applied to MNCs and domestic firms. Any test results with respect to security performance should be interpreted carefully. Roll\textsuperscript{21} warns that as long as the true market portfolio is not identified and employed, any test results must be interpreted with caution. Finally, to test for a firm size effect,\textsuperscript{22} the following regression is run in each of the 96 months from 1970 through 1978.

\[
R_{pt} = \gamma_0 + \gamma_1 \beta_{pt} + \gamma_2 S_{pt-1} + z_{pt} \tag{5.10}
\]

where $S_{pt} =$ logarithm of average firm size (market value of equity) in portfolio P at the end of year t. A log transformation is applied to the market value variables since the observed relationship between those and returns is nonlinear.\textsuperscript{23} If the average value of


\textsuperscript{22}Note that all firms are large enough not to be affected by the small firm size effect.

\textsuperscript{23}For more details, see Banz, "The Relationship Between Return and Market," pp. 3-18 and Reinganum, "A Direct Test of Roll's Conjecture," p. 32, 1982.
\( \hat{\gamma}_2 \) is statistically different from zero, then any conclusions drawn from Eq. (5.9) may be biased by a firm size effect. On the other hand, if the average value of \( \hat{\gamma}_2 \) is not statistically different from zero, then any differences in the estimated coefficients in Eq. (5.9) between MNCs and domestic firms may be attributable to the multinationality of a firm.

**Empirical Results and Implications**

Test results from the second-stage cross-sectional regression for the sample of MNCs and the sample of domestic firms are reported in Table 6. The coefficient of the intercept term of MNCs is larger than that of domestic firms while the coefficient of the slope term of MNCs is smaller than that of domestic firms regardless of the market index employed for estimating \( \beta_p \). When all firms are employed, \( \hat{\gamma}_0 \) and \( \hat{\gamma}_1 \) are significantly different from zero at the 0.01 level and \( R^2 \) is 0.26 with the equal-weighted CRSP market index. However, when only MNCs are employed, \( \hat{\gamma}_1 \) is significant at only the 0.05 level and \( R^2 \) is 0.19. On the other hand, \( \hat{\gamma}_1 \) of domestic firms is significant at 0.01 level but \( \hat{\gamma}_0 \) is insignificantly different from zero. With the value-weighted CRSP market index, \( \hat{\gamma}_1 \) of MNCs is not significantly different from zero and \( R^2 \) is 0.13 while \( \hat{\gamma}_1 \) of domestic firms is significant at 0.01 level. The \( R^2 \)'s provide evidence that the domestic CAPM loses explanatory power when applied to MNCs, which implies that the domestic systematic risk cannot explain as much of the variation of rate of return of MNCs as that of domestic firms. Furthermore, as hypothesized
### TABLE 6
**POOLED CROSS-SECTIONAL SINGLE REGRESSION**

<table>
<thead>
<tr>
<th></th>
<th>$\hat{y}_0$</th>
<th>$\hat{y}_1$</th>
<th>$\bar{\hat{\beta}}_p$</th>
<th>$\bar{\hat{\beta}}_p$</th>
<th>PR&gt;F</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEWR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL</td>
<td>0.0052**</td>
<td>0.0064**</td>
<td>0.0099</td>
<td>0.85</td>
<td>0.0001</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>(3.72)</td>
<td>(4.28)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MNC</td>
<td>0.0061**</td>
<td>0.0052*</td>
<td>0.0094</td>
<td>0.77</td>
<td>0.0217</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>(3.41)</td>
<td>(2.45)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC</td>
<td>0.0038</td>
<td>0.0078**</td>
<td>0.0104</td>
<td>0.94</td>
<td>0.0040</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>(1.54)</td>
<td>(3.17)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DVWR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL</td>
<td>0.0045*</td>
<td>0.0058**</td>
<td>0.0102</td>
<td>1.13</td>
<td>0.0009</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>(2.35)</td>
<td>(3.54)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MNC</td>
<td>0.0062*</td>
<td>0.0040</td>
<td>0.0097</td>
<td>1.07</td>
<td>0.0710</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>(2.60)</td>
<td>(1.89)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC</td>
<td>0.0021</td>
<td>0.0078**</td>
<td>0.0107</td>
<td>1.19</td>
<td>0.0081</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>(0.65)</td>
<td>(2.88)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$\bar{\hat{\beta}}_p$ = average monthly portfolio return.
$\bar{\hat{\beta}}_p$ = average monthly portfolio beta.
DEWR = equal-weighted CRSP monthly market index.
DVWR = value-weighted CRSP monthly market index.
The figures in parentheses are t-value.

**Significant at the 0.01 level.
*Significant at the 0.05 level.
the risk-premium ($y_1$) of MNCs appears to be smaller than that of domestic firms would provide.

In conclusion, MNCs appear to have a different security market line (SML), which has a smaller slope but a larger intercept than domestic firms would have. In order to examine the equality of SMLs between MNCs and domestic firms, Chow's\textsuperscript{24} pooling test is employed. The test statistics reported in Table 7 show that the null hypothesis of equality cannot be rejected at 0.05 level. This result implies that statistically MNCs and domestic firms have homogeneous security market lines. The risk-premium provided by MNCs appears to be smaller but statistically it is not significantly smaller than that of domestic firms. However, together with the evidence of relatively poor $R^2$ of the domestic CAPM for MNCs, numerically small risk-premia of MNCs imply that domestic systematic risk cannot capture all the systematic risk of MNCs. Thus, any empirical findings regarding the performance of MNCs based on the domestic CAPM or the domestic systematic risk must be accepted with great caution. For example, even if one found statistically significant small risk-premia for MNCs, one cannot conclude that MNCs have a reduced risk-premium due to the diversification service because a misspecification of the pricing model for MNCs may result in a significantly small risk-premium term.

The result from a pooled cross-sectional multiple regression analysis based on Eq. (5.10) is reported in Table 8. The coefficients of the size term in all three cases are insignificantly different from zero. Except for the coefficient of the size term for only MNCs, others are positive. The average premium on the size term for all sample firms is 0.00009, which is less than 0.2 standard errors away from zero. Furthermore, the signs of these coefficients are different between MNCs and domestic firms. On the other hand, the evidence indicates that during this time period the average risk premia associated with domestic betas are all significantly greater than zero for all cases. The systematic ordering of risk premia associated with domestic betas and $R^2$s of the domestic CAPM for three cases remains. To elaborate, the domestic firms seem to provide larger risk premia associated with domestic beta and have larger explanatory power with the domestic CAPM than MNCs do. Differences in firm sizes can explain little of the differences in average portfolio returns for sample firms during this time period. Therefore, the overall conclusion drawn from Table 6 can be attributable to the difference in the degree of multinationality of a firm.

---

25When the absolute value of size is employed without a log transformation, the average premium on it for all sample firms is -0.00002, which is not significantly different from zero.

26The risk premia reported in Table 6 are related to betas measured in association with the DVWR. The overall conclusion remains unchanged when betas are calculated relative to the DEWR.
<table>
<thead>
<tr>
<th></th>
<th>DEWR</th>
<th>DVWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>COINCIDENCE</td>
<td>F=0.286</td>
<td>F=0.778</td>
</tr>
<tr>
<td></td>
<td>(4.03)</td>
<td>(4.03)</td>
</tr>
<tr>
<td>PARALLEL</td>
<td>F=0.571</td>
<td>F=1.222</td>
</tr>
<tr>
<td></td>
<td>(3.18)</td>
<td>(3.18)</td>
</tr>
</tbody>
</table>

The figures in parentheses are critical F-values at the 0.05 level.

Coincidence denotes the null hypothesis of equality in the intercept and the slope of two regression lines.

Parallel denotes the null hypothesis of equality in the slope of two regression lines.
<table>
<thead>
<tr>
<th></th>
<th>$\gamma_0$</th>
<th>$\gamma_1$</th>
<th>$\gamma_2$</th>
<th>PR$&gt;$F</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL</td>
<td>0.0052**</td>
<td>0.0064**</td>
<td>0.00009</td>
<td>0.0049</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>(3.20)</td>
<td>(3.39)</td>
<td>(0.17)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MNC</td>
<td>0.0061**</td>
<td>0.0052**</td>
<td>-0.00024</td>
<td>0.0735</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>(3.36)</td>
<td>(2.36)</td>
<td>(-0.24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC</td>
<td>0.0025</td>
<td>0.0101*</td>
<td>0.00054</td>
<td>0.0638</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>(0.64)</td>
<td>(2.46)</td>
<td>(0.53)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Significant at the 0.01 level.
*Significant at the 0.05 level.
Betas are measured in association with the DVWR.
The figures in parentheses are t-values.
In this section, we have shown that the domestic CAPM is not a proper pricing model for MNCs. The domestic systematic risk of a MNC cannot explain as much of the variation in rates of return as can the systematic risk of a domestic firm. This finding is indirect evidence of market recognition of multinationality of a firm. However, no direct statistical test was performed to show whether the market recognizes the multinationality of a firm or not. Furthermore, the existence of the diversification service was not examined.

C. The Two-Factor International CAPM Analysis

In the previous section, we saw that the segmented pricing hypothesis is improper for explaining the rate of return on stocks of MNCs. Indirect evidence of market recognition of multinationality of a firm is suggested by the fact that the domestic CAPM shows poor explanatory power when applied to MNCs. However, a direct test with respect to the issue of market recognition requires a model which incorporates foreign factors.

There has been a substantial number of studies which consider international factors in the risk-return relationship of risky assets. Solnik\(^{27}\) presents an equilibrium model of the international capital market where exchange risk stems from

differences in consumption tastes between countries. Under the assumption that foreign exchange risk results from pure monetary uncertainty, Grauer, Litzenberger and Stehle\textsuperscript{28} suggest an equilibrium model of an international capital market in which an investor's portfolio decision depends on the non-diversifiable fluctuations of relative prices. Stehle\textsuperscript{29} advances the equilibrium model suggested by Grauer, Litzenberger and Stehle to a two-factor testable pricing model. Black\textsuperscript{30} and Stulz\textsuperscript{31} present equilibrium models which incorporate additional costs (barriers) for domestic investors to hold foreign assets. Recently, Stulz\textsuperscript{32} presents a more advanced model that admits differences in consumption opportunity sets across countries. The Stehle's two-factor international market model is employed to examine whether the market recognizes multinationality of a firm. In this section, the hypothesis of the market recognition of multinationality of a firm will be examined employing a two-factor international market model.


\textsuperscript{31}Stulz, "On the Effects of Barriers," pp. 924-934.

Model

Assuming the rates of return on risky assets are stationary with a multivariate normal distribution and serially uncorrelated, Stehle specifies the following two-factor international market model as given by:

\[ \tilde{R}_{jt} = \alpha_j + \beta_{jw} \tilde{R}_w + \beta_{jd} \tilde{R}_{dt} + \tilde{\varepsilon}_{jt} \]  (5.11)

where \( \alpha_j \), \( \beta_{jw} \) and \( \beta_{jd} \) are regression parameters respectively and

- \( \tilde{R}_{jt} \) = rate of return on asset \( j \) at time \( t \)
- \( \tilde{R}_w \) = rate of return on the world's market portfolio at time \( t \)
- \( \tilde{R}_{dt} \) = the portion of the rate of return of a domestic market portfolio (\( \tilde{R}_{mt} \)) that is uncorrelated with \( \tilde{R}_w \) at \( t \);
- \( \tilde{\varepsilon}_{jt} \) = a disturbance term.

Note that \( \beta_{jw} \) is the systematic risk of a risky asset in association with the world's market portfolio and \( \beta_{jd} \) denotes another component of systematic risk that is diversifiable internationally but undiversifiable domestically. This model takes the multinationality of a firm into consideration through \( \beta_{jw} \) that is missed in the domestic market model. Furthermore, by design, this model avoids the multicollinearity problem in a multiple regression since \( \tilde{R}_w \) and \( \tilde{R}_{dt} \) are independent of each other. This model will be employed to test whether the market recognizes multinationality of a firm. The
hypothesis is that the greater the foreign involvement of a firm, the lower the dependence on the pure U.S. market factor ($\beta_{jd}$). In return, the world market should become more important to a firm with foreign involvement.

Methodology

In order to test the hypothesis that the market recognizes multinationality of a firm, the following procedure is employed.

1) The following regression line is obtained by regressing the value-weighted CRSP monthly market index ($\bar{R}_{mt}$) on the world market index ($\bar{R}_{wt}$) for the time period of January 1965 to December 1978.

$$\bar{R}_{mt} = \alpha_{mw} + \beta_{mw} \bar{R}_{wt} + z_t$$

where a disturbance term, $z_t$, is used as a proxy for the pure domestic market factor ($\bar{R}_{dt}$) in Eq. (5.12).

2) Following the method suggested by Agmon and Lessard,\textsuperscript{33} $\beta_w$ and $\beta_d$ in Eq. (5.11) for the two samples (MNCs and domestic firms) and the four groups (G1, G2, G3 and G4) are

\textsuperscript{33}Agmon and Lessard, "Investor Recognition," pp. 1049-1055. In their study, monthly returns for 168 months from January 1959 to October 1972 of a sample of 217 U.S. firms are employed. The 217 firms are ranked according to their degree of multinationality (ratio of foreign sales to total sales reported in 1973 by Standard and Poor's "The Outlook") and then classified into ten groups. Furthermore, their model is

$$\bar{R}_{jt} = \alpha_j + \beta_{jm} \bar{R}_{mt} + \beta_{jk} \bar{R}_{kt} + z_{jt}$$

where $\bar{R}_{kt} = \bar{R}_{wt} - \alpha_{wm} - \beta_{wm} \bar{R}_{mt}$. 

estimated, respectively by regressing time series of 168 monthly returns on the CRSP value-weighted monthly market index and the world market index over the period of January 1965 to December 1978. Similarly, $\hat{\beta}_{iw}$ and $\hat{\beta}_{id}$ for each firm are also estimated. To test differences in $\hat{\beta}_{w}$ and $\hat{\beta}_{d}$ among groups, four tests are performed: the ANOVA, the Wilcoxon-signed rank test, the median test and the Kruskal-Wallis test. Furthermore, second-stage cross-sectional regressions on the risk parameters of all firms are performed to test the relationship between a firm's domestic ($\beta_{id}$) and international ($\beta_{iw}$) dependence and its degree of multinationality ($M_i$). The following regressions are fitted:

$$\hat{\beta}_{iw} = a_j + b_j M_i + \mu_i$$ (5.13)
$$\hat{\beta}_{id} = a^* + b^* M_i + \mu^*$$ (5.14)

Empirical Results and Implications

Table 9 presents the values for $\hat{\beta}_{w}$ and $\hat{\beta}_{d}$ based on the full 168-month period for each group. F-values and $R^2$ are also reported. When all firms are broken down into two samples, $\hat{\beta}_{d}$ of domestic firms tends to be larger than that of MNCs. Furthermore, $R^2$ of MNCs is larger than $R^2$ of domestic firms, which indicates that the two-factor market model has more explanatory power for MNCs than for domestic firms. This relationship holds consistently when all firms are classified into four groups in which the first group has the highest degree of foreign involvement: The greater foreign involvement of a firm, the more dependence on international factors and the less reliance on pure domestic factors. Also, the
TABLE 9
THE REGRESSION PARAMETERS OF RISK PREMIA

<table>
<thead>
<tr>
<th>Number of firms</th>
<th>$\hat{\alpha}$</th>
<th>$\hat{\beta}_w$</th>
<th>$\hat{\beta}_d$</th>
<th>PR&gt;F</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNC</td>
<td>0.0068**</td>
<td>1.198**</td>
<td>0.986**</td>
<td>0.0001</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>(8.49)</td>
<td>(59.90)</td>
<td>(22.60)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC</td>
<td>0.0062**</td>
<td>1.113**</td>
<td>1.178**</td>
<td>0.0001</td>
<td>0.24</td>
</tr>
<tr>
<td></td>
<td>(6.61)</td>
<td>(46.38)</td>
<td>(22.60)</td>
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<td></td>
</tr>
<tr>
<td>G1</td>
<td>0.0062**</td>
<td>1.218**</td>
<td>0.944**</td>
<td>0.0001</td>
<td>0.35</td>
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<td></td>
<td>(4.87)</td>
<td>(38.06)</td>
<td>(14.10)</td>
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</tr>
<tr>
<td>G2</td>
<td>0.0071**</td>
<td>1.152**</td>
<td>1.001**</td>
<td>0.0001</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>(6.95)</td>
<td>(44.65)</td>
<td>(17.32)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G3</td>
<td>0.0079**</td>
<td>1.119**</td>
<td>1.127**</td>
<td>0.0001</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>(4.19)</td>
<td>(23.47)</td>
<td>(10.73)</td>
<td></td>
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</tr>
<tr>
<td>G4</td>
<td>0.0057**</td>
<td>1.075**</td>
<td>1.239**</td>
<td>0.0001</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>(5.34)</td>
<td>(41.53)</td>
<td>(20.74)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This test employs the value-weighted monthly CRSP market index. Similar results are found with the equal-weighted monthly CRSP market index. The figures in parentheses are t-values. **Significant at the 0.01 level.
### TABLE 10

**MEAN VALUE OF RISK PARAMETERS AND TEST STATISTICS**  
MNC vs DC

<table>
<thead>
<tr>
<th>Number of Firms</th>
<th>MNC</th>
<th>DC</th>
<th>ANOVA</th>
<th>WILCOXON</th>
<th>MEDIAN</th>
<th>K-W</th>
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<tbody>
<tr>
<td></td>
<td>MNC</td>
<td>DC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\hat{\beta}_{iw}$</td>
<td>135</td>
<td>1.21</td>
<td>1.08</td>
<td>F=16.74**</td>
<td>Z=3.88**</td>
<td>CHISQ=11.27** CHISQ=12.53**</td>
</tr>
<tr>
<td>$\hat{\beta}_{id}$</td>
<td>135</td>
<td>0.98</td>
<td>1.23</td>
<td>F=17.21**</td>
<td>Z=-3.76**</td>
<td>CHISQ=12.08** CHISQ=15.21**</td>
</tr>
</tbody>
</table>

**Significant at the 0.01 level.**  
K-W denotes Kruskal-Wallis test.
TABLE 11
MEAN VALUE OF RISK PARAMETERS AND TEST STATISTICS
BY GROUPS

<table>
<thead>
<tr>
<th>No. of Firms</th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>ANOVA</th>
<th>WILCOXON</th>
<th>MEDIAN</th>
<th>K-W</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>47</td>
<td>88</td>
<td>28</td>
<td>107</td>
<td>CHISQ=14.21**</td>
<td>CHISQ=18.39**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.94</td>
<td>1.00</td>
<td>1.19</td>
<td>1.24</td>
<td>CHISQ=15.33**</td>
<td>CHISQ=19.27**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Beta** represents the mean value of risk parameters and test statistics by groups.

**Significant at the 0.01 level.**

K-W denotes Kruskal-Wallis test.
explanatory power of the model is the largest when applied to the group with the greatest foreign involvement and the lowest when it applied to the group with the lowest foreign involvement. Significance tests are performed by applying the three tests on the estimates of the risk parameter of each firm. Table 10 and 11 report test statistics for the two-classification case and the four-classification case, respectively. All test statistics can reject the null hypothesis of no significant differences in risk parameters among groups at the 0.01 level. This result is compared with the result of a significance test employing Eq. (5.13) and (5.14). The estimates of parameters are reported in Table 12 for two separate regression lines, respectively. As hypothesized, the \( \hat{b} \) is positive (0.295) and significantly different from zero while the \( \hat{b}' \) is negative (-0.213) and significantly less than zero.

The overall result is consistent with the empirical findings of Agmon and Lessard, who employ a different two-factor market model and a different time period. Furthermore, the overall result holds consistently with the equal-weighted CRSP monthly market index. The results support the hypothesis that the market recognizes the multinationality of a firm as well as the degree of its foreign involvement. Furthermore, these results also indicate that a firm without international diversification of operations is related to the international factor significantly in addition to the pure domestic
## TABLE 12
RELATIONSHIP OF FOREIGN INVOLVEMENT AND RISK PARAMETERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Number of Firms</th>
<th>( \hat{a} )</th>
<th>( \hat{b} )</th>
<th>PR&gt;F</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-13</td>
<td>270</td>
<td>0.9766**</td>
<td>0.2948**</td>
<td>0.0001</td>
<td>0.091</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(37.33)</td>
<td>(4.92)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>Number of Firms</th>
<th>( \hat{a}' )</th>
<th>( \hat{b}' )</th>
<th>PR&gt;F</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-14</td>
<td>270</td>
<td>1.1978**</td>
<td>-0.2127**</td>
<td>0.0019</td>
<td>0.079</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(26.27)</td>
<td>(3.17)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** Significant at the 0.01 level.
The figures in parentheses denote t-values.
factor. A fairly strong co-movement of the U.S. market index and the world market index may explain the significant dependence of domestic firms on the international factor.

D. Event Analyses

In this section, residual analyses are employed to measure the effects of changes in governmental policies that are supposed to have impacts on MNCs. Specifically, reactions of the U.S. stock market to two types of regulatory decisions by the U.S. government are examined to infer whether the market recognizes multinationality of a firm and rewards the diversification services by MNCs. The first event is the imposition of the interest equalization tax on purchase of foreign securities that took place in July, 1963. The second is the mandatory control on foreign direct investment by U.S. firms in January, 1968.

Event Description

(1) The Interest Equalization Tax

On July 18, 1963, President Kennedy in a special message to Congress, requested a special tax on the purchase of foreign securities by U.S. investors from foreigners and on long-term lending to foreigners. This request specified a 15% tax on the value of foreign stocks purchased by U.S. investors from

---

\(^{34}\) The correlation coefficient between the value-weighted CRSP market index and the world market index is 0.922 during the time period of 1965 to 1978. With the equal weighted CRSP market index, the world market index has the correlation coefficient of 0.787 during the same period.
foreigners and a sliding-scale tax, ranging from 2.75% to 15% on American purchases of foreign debt securities with at least a three-year term. The 15% tax was increased to 18.5% in August 1967. The purpose of the tax was to curb the outflow of long-term private capital in order to reduce the continuing balance of payments deficits that the U.S. had experienced from the early 1960s. The tax was intended to equalize the differential between borrowing costs in foreign countries and those in the U.S. through flotation of bond or stock in the U.S. capital market, thereby discouraging foreigners from issuing securities in the U.S. capital market. As a result, trades in foreign stocks and bonds in the U.S. capital market were sharply reduced. The tax was expected to be harmful to internationally oriented individual investors and institutions unless foreign borrowers were willing to pay higher returns to compensate for the tax. For example, Edward A. Merkle, President of the Madison Fund charged the law "stops the

The following table traces the evolution of the tax rate:

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Tax rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/19/63</td>
<td>1/25/67</td>
<td>15%</td>
</tr>
<tr>
<td>8/26/67</td>
<td>8/29/67</td>
<td>22.5%</td>
</tr>
<tr>
<td>8/30/67</td>
<td>4/04/69</td>
<td>18.75%</td>
</tr>
<tr>
<td>4/05/69</td>
<td>12/31/73</td>
<td>11.25%</td>
</tr>
<tr>
<td>1/01/74</td>
<td>1/28/74</td>
<td>3.75%</td>
</tr>
<tr>
<td>1/29/74</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

flow of free commerce, which is wrong to do anytime." Transactions in Canadian and certain other securities as well as foreign direct investment by U.S. firms were not subject to this law. This law was effective on both the NYSE and the AMEX on August 19, 1963 and was abolished in January 1974.

This regulatory decision practically prohibited U.S. investors from international portfolio diversification. For domestic firms, this tax is not expected to have had any direct impact and all indirect implications of it should be reflected in a market rate of return. The Dow Jones industrial average declined 3.82 points to close at 695.50 on July 19, after the announcement of the tax, which can be regarded as a slight decline. However, for MNCs, if they could provide diversification service to investors, the imposition of a tax on international portfolio investment made investors appreciate more the MNCs' diversification service. Therefore, they would be willing to purchase MNCs' shares as substitutes for international portfolio diversification and thus boost the price of MNCs' shares. Thus it is expected that if the diversification service existed and was valuable to investors, market reaction toward MNCs with respect to the interest equalization tax would be favorable while no particular reaction would occur for domestic firms. The necessary condition for the above hypothesis is that the market must recognize multinationality of a firm. Thus, we employ another

event from which a direct test regarding the market recognition of the multinationality of a firm can be performed.

(2) Foreign Direct Investment Program

On January 2, 1968, President Johnson placed mandatory limits on overseas investments by U.S. firms. Thus, foreign direct investment was subject to tight mandatory controls as part of a stringent new crackdown on the U.S. worsening balance of payments deficits. In 1965, voluntary controls on new foreign direct investment by U.S. firms were imposed, and these were followed by this mandatory control as the U.S. balance of payments deficits was not improved. This program also included lowering of the still-voluntary ceilings on bank lending to foreigners and proposals of legislation to restrain tourist travel abroad and expedite the return of foreign profits. This program also included provisions for more financial aids for exporters. The main effects of this control on MNCs shown on the Wall Street Journal on January 2, 1968 are as follows.

1) U.S. companies are forbidden to make "any new capital outflows" for direct investment in their subsidiaries in western Europe (except in Greece and Finland) and in most other developed nations. However, companies are permitted to reinvest annually from foreign earnings up to 35% of their average total investment (of funds from the U.S. and reinvested earnings) during 1965 and 1966.
2) The dollars that may be sent from the U.S. when added to the reinvested earnings in less-developed countries, cannot produce a total that exceeds in any one year 110% of the company's average investments in the countries in the 1965-1966 base period.

3) Canada, Japan, Australia, Britain and oil-producing nations are treated separately. In these nations, a U.S. company's new capital transfers from direct investment, together with reinvestment earnings, is limited to 65% of the average of such investment in 1965-1966.

4) Each direct-investor company must return to the U.S. at least once a year a share of its foreign earnings. The amount is equal to the greater of:
   a) The same percentage of its share of total earnings from the three areas as it repatriated during 1964-1966 or
   b) As much of its share of earnings as may exceed the limits set for capital transfers in each group.

It was expected that the direct investors affected would be defined as a company or individual in the U.S. which owned or acquired an interest of 10% or more of the earnings or capital of a foreign business venture.\(^{37}\) Obviously, this regulatory decision is

\(^{37}\) This is the opinion of Mr. Trowbridge, Commerce Secretary at that time, expressed in the Wall Street Journal "President Act to Narrow Payments Gap: Bankers Are Critical, Industrialists Wary," p. 3 on January 2, 1968. The above description of the main effects is also expressed in that Wall Street Journal.
expected to have an adverse effect on MNCs. However, to domestic firms, this program was beneficial since it also contained other efforts such as strengthening the voluntary program of wage-price restraint, urging other nations to ease tax and other barriers to U.S. imports and attracting more foreign visitors and investment. Furthermore, restraints on foreign lending by U.S. banks helped U.S. firms obtain funds from U.S. sources more easily. Thus, it is expected that market responses to this regulatory decision would be significantly different between MNCs and domestic firms, if the market recognizes the multinationality of a firm. MNCs are expected to have negative a response while domestic firms are expected to have a positive one.

Methodology and Procedure

The event residual analysis requires an equilibrium model of a firm's expected rate of return. In this study, the market model is assumed to be well specified.

\[
\tilde{R}_{it} = \alpha_i + \beta_i \tilde{R}_{mt} + \tilde{\varepsilon}_{it}
\]

where

- \(\tilde{R}_{it}\) = return on asset i at time t
- \(\tilde{R}_{mt}\) = return on the market portfolio at time t (the value-weighted CRSP monthly market index.)

\[
\beta_i = \frac{\text{COV}(\tilde{R}_{it}, \tilde{R}_{mt})}{\text{Var}(\tilde{R}_{mt})}
\]

\[
\alpha_i = \bar{R}_i - \beta_i \bar{R}_m
\]
If monthly returns are stationary with a multivariate normal distribution and serially uncorrelated, the equation is justified.\textsuperscript{38} Note that the market model is a statistical statement rather than one derived from financial theory. This model is estimated outside of the event period and the forecast errors of the model during the event period serve as a proxy for event-related abnormal performance, which represents market reaction to the event. Specifically, abnormal returns, \( \hat{\varepsilon}_{it} \), are calculated for stock \( j \) on month \( t \) as the difference between the actual return on month \( t \) and the return predicted from the market model.

\[
\hat{\varepsilon}_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt})
\]

where \( t \) denotes the month relative to announcements of events. There are two problems in estimating parameters \( \hat{\alpha}_i \) and \( \hat{\beta}_i \). First, if the event influences returns, the estimates will be biased. Secondly, if the event alters the true parameters of Eq. (5.15),

estimates of the abnormal component of returns, $\hat{\varepsilon}_{it}$, will be biased in the opposite direction. To eliminate these sources of bias, a procedure suggested by Ruback is employed. Defining AM as the announcement month, one set of parameters before the event, $\hat{\alpha}_{ib}$ and $\hat{\beta}_{ib}$ is estimated based on data from AM-65 months to AM-6 months. A second set of parameters after the event, $\hat{\alpha}_{ia}$ and $\hat{\beta}_{ia}$ is estimated using the 60 months beginning 6 months after AM (from AM+6 months to AM+65 months). Abnormal returns are calculated by:

$$\hat{\varepsilon}_{it} = R_{it} - (\hat{\alpha}_{ib} + \hat{\beta}_{ib} R_{mt}) \text{ for } t \leq \text{AM}$$
$$= R_{it} - (\hat{\alpha}_{ia} + \hat{\beta}_{ia} R_{mt}) \text{ for } t > \text{AM}$$

For each month $t$ within the interval of 6 months prior to and 6 months after AM, the prediction errors are averaged across observation to obtain the average residual, $AR_t$ as:

$$AR_t = \frac{1}{N} \sum_{i=1}^{N} \hat{\varepsilon}_{it}, \quad t = -6, -5, -0, +1, +2, \ldots, +6$$

where $N = \text{number of observations (firms)}$.

These monthly average residuals are summed over event time to obtain cumulative average residuals for each of the 13 months surrounding AM.

---

CAR_{-6,6} = \sum_{t=-6}^{6} AR_t

If no unusual price movements surround the announcement month, both the $AR_t$ and $CAR_t$ should fluctuate randomly about zero. Any significant deviation from zero will reflect particular effects of the event. Comparisons of both $AR_t$ and $CAR_t$ between MNCs and domestic firms (or among the four groups Gl, G2, G3 and G4) would indicate whether systematic differences exist.

Classification of Samples

The classification of two samples or four groups are based solely on the data on the degree of foreign involvement (a ratio of foreign earnings to total earnings) in 1965 published by Bruck and Lees. The degree of foreign involvement of each firm is assumed to have been this same value in 1963 and in 1968 when the two events took place, respectively. Table 13 shows the number of firms in each classification and the range of foreign involvement. However, for the tests, some firms are deleted due to the lack of continuous monthly rates of return data.

Statistical Significance Test

Statistical significance of the abnormal performance is assessed by constructing t-statistics for the $AR$ and the $CAR$ over an interval of event-related time. However, in this study, the securities of the sample experienced an event during the same

---

40 Bruck and Lees, "Foreign Investment."
# TABLE 13

**SAMPLE CLASSIFICATION**

<table>
<thead>
<tr>
<th>Sample Group</th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>Original</th>
<th>First Event</th>
<th>Second Event</th>
<th>Involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNC</td>
<td>44</td>
<td>91</td>
<td>25</td>
<td>110</td>
<td>44</td>
<td>77</td>
<td>87</td>
<td>over 25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10%-25%</td>
</tr>
<tr>
<td>DC</td>
<td>25</td>
<td>23</td>
<td>25</td>
<td>100</td>
<td>25</td>
<td>83</td>
<td>100</td>
<td>0%-10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0%</td>
</tr>
</tbody>
</table>

1. First Event denotes the Interest Equalization Tax.
2. Second Event denotes the Foreign Direct Investment Program.
calendar time. It is expected that events such as government regulations would affect a group of securities' prices simultaneously. The so called "event month clustering" has implications for statistical significance tests. As Brown and Warner warn, in the announcement month (AM), many securities are correlated, thus the market model residuals ($\hat{e}_{it}$) are positively correlated across securities in calendar time. Consequently, the variance of the $AR_t$ increases and hence the power of the t-test will be reduced. 41

Two methodologies are employed in order to avoid bias in the t-test due to cross-sectional dependence of $\hat{e}_{it}$ in the AM. First, three nonparametric tests that make less restrictive assumptions than the t-test are employed: the Wilcoxon signed rank test, the median test and the Kruskal-Wallis tests. These tests are performed to examine whether there are significant differences in $AR_t$ and $CAR_t$ between MNCs and domestic firms or among four groups from AM-6 months to AM+6 months. Second, a modified t-test is used in which the standard deviations of AR and CAR are obtained based on the data 60 months prior to AM-6 months. The modified t-value is calculated as follows: First, the average sample residuals and the cumulative residuals in the examining period (AM-6 months through AM+6 months) are given by:

\[ AR_{st} = \frac{1}{NS} \sum_{i=1}^{NS} \epsilon_{it}, \quad t = 1 \ldots 13 \]

and \[ CAR_{st} = \sum AR_{st} \quad t = 1 \ldots 13 \]

where NS is the number of firms in each sample. For estimating the variability of \( AR_{st} \) and \( CAR_{st} \), \( AR_s \) and \( CAR_s \) are calculated once again for each of 60 months before \( t \).

\[ AR_{s\xi} = \frac{1}{NS} \sum_{i=1}^{NS} \epsilon_{i\xi}, \quad \xi = t-60, \ldots, t-1 \]

and \[ CAR_{s\xi} = \sum AR_{s\xi}, \quad \xi = t-60, \ldots, t-1 \]

where NS is the number of firms in each sample. Then, the standard deviations of \( AR_{s\xi} \) and \( CAR_{s\xi} \) are calculated respectively as:

\[ \hat{S}_s(AR_{\xi}) = \sqrt{\frac{1}{K-1} \sum_{\xi} [AR_{s\xi} - \frac{1}{K} \sum_{\xi} AR_{s\xi}]^2} \]

\[ \hat{S}_s(CAR_{\xi}) = \sqrt{\frac{1}{K-1} \sum_{\xi} [CAR_{s\xi} - \frac{1}{K} \sum_{\xi} CAR_{s\xi}]^2} \]

where \( K = 60 \) for \( \xi = t-60, \ldots, t-1 \).

These statistics serve as proxies for the standard deviations of \( AR_{st} \) and \( CAR_{st} \), respectively. Consequently, adjusted t-statistics are given by:

---

\[^{42}\) The parameters, \( \alpha \) and \( \beta \), for \( \epsilon_{i\xi} \) are estimated based on data from \( t-120 \) months through \( t-61 \) months. Several firms are deleted in this stage due to the lack of available data.
and

\[ t_s(\text{AR}_t) = \frac{\text{AR}_{st}/\hat{S}_s(\text{AR}_t)}{\sqrt{K}} \]

\[ t_s(\text{CAR}_t) = \frac{\text{CAR}_{st}/\hat{S}_s(\text{CAR}_t)}{\sqrt{K}} \]

Measurement of Performance

Two methods are employed to measure the performance of each sample for two periods around the AM. Let M1 denote the prior period (AM-6 months through AM) and M2 denote the post period (AM+1 month through AM+6 months). The first test statistic is calculated as follows: At first a standardized average residual is calculated for each sample.

\[ Q_{st} = \frac{\text{AR}_{st}/\hat{S}_s(\text{AR}_t)}{\sqrt{K}} \]

It is assumed that \( Q_{st} \) are identically distributed independent random variables from a t-distribution with \( K \) degree of freedom. Finally, the test statistic for each period is the ratio of the sample mean of \( Q_{st} \) to the standard deviation of this sample mean, which is given by:

\[ p = \frac{\sum_{M=F}^{L} Q_{st}/NM}{\sigma(\sum_{M=F}^{L} Q_{st}/NM)} = \frac{\sum_{M=F}^{L} Q_{st}}{\sqrt{NM}} \]

where \( F \) and \( L \) are the first and last calendar months respectively and \( NM \) is the number of months in the period. Note that \( \sigma(Q_{st}) = 1 \) due to the standardization.\(^{43}\)

The second test statistic is a measure by the portfolio method\(^{44}\) of testing for the performance of two different samples of securities. For each sample, 27 portfolios are constructed according to \(\hat{\beta}_1\).\(^{45}\) Portfolio residuals, \(AR_{pt}\) are calculated as an equally-weighted averages of the \(AR_{it}\) in that portfolio. Twenty-seven \(AR_{pt}\) of the sample of domestic firms are employed as \(AR_{pt}\) of a control sample. Let's introduce a variable, \(D_{pt}\), which is the difference between \(AR_{Mt}\) and \(AR_{Dt}\), where \(AR_{Mt}\) is the \(AR_{pt}\) of MNCs while \(AR_{Dt}\) is the \(AR_{pt}\) of domestic firms. \(D_{pt}\) is the portfolio residual difference during the examining period. The portfolio test statistic is derived according to the following procedure: In order to standardize \(\hat{D}_{pt}\), the standard deviation of \(\hat{D}_{pt}\) is measured by:

\[
\hat{S}_p(D_{pt}) = \sqrt{(1/K-1) \sum_{\xi} (\hat{D}_{p\xi} - (1/K)\sum_{\xi} \hat{D}_{p\xi})^2}
\]

where \(K = 60\) for \(\xi = t-60, \ldots, t-1\)

The standardized portfolio residual is thus given by:

\[
F_{pt} = \frac{\hat{D}_{pt}}{\hat{S}_p(D_{pt})},
\]


\(^{45}\) The number of firms for each portfolio is sometimes different (3, 4, or 5) since the number of firms for each sample is different.
Under the null hypothesis of no difference in performance between two samples, $E[F_{pt}] = 0$. It is also assumed that the $F_{pt}$ are identically distributed independent drawings from a t-distribution with $K$ degrees of freedom. Next, average standardized residual differences, $SF_t$ are computed as follows: First, the mean of $F_{pt}$ is calculated as $\bar{F}_t = \frac{1}{NP} \sum_{p=1}^{NP} F_{pt}$, where $NP$ is the number of portfolios (27 portfolios). Now, $SF_t$ is measured by

$$SF_t = \frac{\bar{F}_t}{\sqrt{NP}}$$

$SF_t$ is expected to be drawn from a t-distribution with $(K-1)M$ degrees of freedom (1593 degrees of freedom). It is expected that $SF_t$ has a standard normal distribution since $(K-1)M$ is large. Finally, the cumulative portfolio t statistics are calculated for the period of M1 and for the period of M2 respectively. For 7 months from AM-6 months to AM,

$$CSF_1 = \frac{1}{\sqrt{NM}} \left[ \sum_{t=AM-6}^{AM} SF_t \right]$$

where $CSF_1$ is the cumulative portfolio t statistic for the M1. Similarly, $CSF_2$ is measured for M2. The test statistics will indicate whether the differences in abnormal returns for the examining time period are significantly different from zero.

**Empirical Results**

*(The Interest Equalization Tax)*

The abnormal performance of stocks on months relative to the announcement month of the Interest Equalization Tax is examined,
and Table 14 reports the $\text{AR}_t$ and $\text{CAR}_t$ of the sample of MNCs and of the sample of domestic firms and corresponding t-values. Figures 3 and 4 show the $\text{AR}_t$ and $\text{CAR}_t$ of MNCs and of domestic firms. The CAR of MNCs begins at 0.25% and reaches -1.26% by the announcement month. The CAR of MNCs declines further to -4.35% six months later. During this 13 month period, MNCs appear to have experienced a 4.6% decrease in the CAR. However, the t statistics associated with $\text{AR}_t$ and $\text{CAR}_t$ show no significant deviations from zero during this time period, which indicates random movements of the $\text{AR}_t$ and the $\text{CAR}_t$. In particular, in the announcement month, the AR of MNCs is negative but insignificantly different from zero, which tends to refute the argument that market response to MNCs should be favorable if MNCs provide diversification service. If MNCs had provided diversification service, one would have noticed a significantly positive AR in the announcement month and the CAR after the announcement month should have been positive. The CAR of domestic firms begins at 3.47%, which is statistically different from zero at the 0.01 level and then declines to 2.53% in the announcement month. During the time period, three ARs of domestic firms are significantly different from zero at the 0.01 level. No particular reasons or events are found which might explain such significant deviations. The CAR in the last month is negative and insignificantly different from zero, which is similar to the finding for MNCs. As shown by Brown and Warner, the CARs for a given sample may appear to fluctuate greatly from zero, even
### TABLE 14
**AR\(_t\) AND CAR\(_t\) AROUND THE ANNOUNCEMENT OF INTEREST EQUALIZATION TAX**

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of Firms</th>
<th>MNC</th>
<th>AR</th>
<th>CAR</th>
<th>Number of Firms</th>
<th>DC</th>
<th>AR</th>
<th>CAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM-6</td>
<td>121</td>
<td>0.00256</td>
<td>0.00256</td>
<td>106</td>
<td>0.03466</td>
<td>0.03466</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.3617)</td>
<td>(0.3617)</td>
<td></td>
<td>(4.5213)**</td>
<td>(4.5213)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM-5</td>
<td>121</td>
<td>0.00103</td>
<td>0.00259</td>
<td>106</td>
<td>0.01292</td>
<td>0.04758</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.1479)</td>
<td>(0.1677)</td>
<td></td>
<td>(1.6468)</td>
<td>(2.0326)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM-4</td>
<td>121</td>
<td>-0.01226</td>
<td>-0.00867</td>
<td>106</td>
<td>-0.02429</td>
<td>0.02329</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-1.7033)</td>
<td>(-0.3588)</td>
<td></td>
<td>(-3.1015)**</td>
<td>(0.8243)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM-3</td>
<td>121</td>
<td>-0.00440</td>
<td>-0.01306</td>
<td>106</td>
<td>-0.00559</td>
<td>0.01770</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>(-0.5871)</td>
<td>(-0.4147)</td>
<td></td>
<td>(-0.6886)</td>
<td>(0.5535)</td>
<td></td>
<td></td>
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<tr>
<td>AM-2</td>
<td>121</td>
<td>0.00414</td>
<td>-0.00892</td>
<td>106</td>
<td>0.01380</td>
<td>0.03150</td>
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<td></td>
</tr>
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<td></td>
<td></td>
<td>(0.5537)</td>
<td>(-0.2596)</td>
<td></td>
<td>(1.6964)</td>
<td>(0.8481)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM-1</td>
<td>121</td>
<td>0.00578</td>
<td>-0.00314</td>
<td>106</td>
<td>0.00206</td>
<td>0.03352</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.7862)</td>
<td>(-0.0876)</td>
<td></td>
<td>(0.2649)</td>
<td>(0.8243)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM</td>
<td>121</td>
<td>-0.00947</td>
<td>-0.01261</td>
<td>106</td>
<td>-0.00826</td>
<td>0.02529</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>(-1.4198)</td>
<td>(-0.3310)</td>
<td></td>
<td>(-1.1099)</td>
<td>(0.5683)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM+1</td>
<td>121</td>
<td>0.00065</td>
<td>-0.01196</td>
<td>106</td>
<td>-0.01678</td>
<td>0.00851</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>(0.0953)</td>
<td>(-0.2339)</td>
<td></td>
<td>(-2.1580)*</td>
<td>(0.1763)</td>
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<td></td>
</tr>
<tr>
<td>AM+2</td>
<td>121</td>
<td>-0.00938</td>
<td>-0.02134</td>
<td>106</td>
<td>-0.01234</td>
<td>-0.00383</td>
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<tr>
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<td></td>
<td>(-1.3633)</td>
<td>(-0.4886)</td>
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<td>(-0.0923)</td>
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<tr>
<td>AM+3</td>
<td>121</td>
<td>-0.00505</td>
<td>-0.02639</td>
<td>106</td>
<td>-0.01375</td>
<td>-0.01758</td>
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<td>(-0.5690)</td>
<td></td>
<td>(-1.8118)</td>
<td>(-0.3534)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM+4</td>
<td>121</td>
<td>-0.00375</td>
<td>-0.03015</td>
<td>106</td>
<td>0.00950</td>
<td>-0.00808</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.6228)</td>
<td>(-0.6303)</td>
<td></td>
<td>(1.4415)</td>
<td>(-0.1356)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM+5</td>
<td>121</td>
<td>-0.00907</td>
<td>-0.03921</td>
<td>106</td>
<td>-0.02905</td>
<td>-0.03714</td>
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<tr>
<td></td>
<td></td>
<td>(-1.3695)</td>
<td>(-0.7871)</td>
<td></td>
<td>(-4.40449)**</td>
<td>(-0.6732)</td>
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</tr>
<tr>
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<td>-0.00431</td>
<td>-0.04352</td>
<td>106</td>
<td>-0.01004</td>
<td>-0.04718</td>
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<tr>
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<td></td>
<td>(-0.6553)</td>
<td>(-0.8405)</td>
<td></td>
<td>(-1.4353)</td>
<td>(-0.8322)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

AM indicates the announcement month.
The figures in parentheses are t-values.
* Significant at the 0.05 level.
** Significant at the 0.01 level.
FIGURE 3

AVERAGE RESIDUALS
MNC VERSUS DOMESTIC FIRM
(The Interest Equalization Tax)
FIGURE 4

CUMULATIVE AVERAGE RESIDUALS
MNC VERSUS DOMESTIC FIRM
(The Interest Equalization Tax)
in the absence of abnormal performance. According to their simulation, by the end of AM+10 months, the 0.95 fractile of CARs takes on a value of over 9% and the 0.05 fractile takes on a value of about -9% even in the absence of abnormal performance. Based on the value of CARs in AM+6 months and corresponding t-statistics, there does not appear to be any abnormal performance for the MNCs or the domestic firms. This finding implies that the Interest Equalization Tax did not have any significant effect on the market value of MNCs or domestic firms, which tends to deny the existence of a diversification service. However, such a result could have happened because the market did not recognize the multinationality of a firm.

Table 15 shows results of the t-test and three non-parametric tests with respect to the null hypothesis of no significant differences in AR\textsubscript{t} and in CAR\textsubscript{t} between MNCs and domestic firms. These tests are extended to the four classifications of firms, and results are reported in Table 16. Except for ARs in the 6 months prior to AM, there are no statistically significant differences in AR\textsubscript{t} between MNCs and domestic firms. The AR at 6 months prior to AM is significantly different from zero at the 0.01 level. CARs are also significantly different until two months prior to AM, mainly due to the AR for 6 months prior to AM. However, after AM-2 months, no significant differences are found. Table 16 shows that the ARs at 6 months prior to AM are still statistically different from each other, which implies that a firm with a high
TABLE 15

TEST RESULTS OF DIFFERENCES IN ABNORMAL PERFORMANCE BETWEEN MNCs AND DOMESTIC FIRMS

<table>
<thead>
<tr>
<th>Month</th>
<th>t-Test</th>
<th>WILCOXON</th>
<th>MEDIAN</th>
<th>K-W</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR-6</td>
<td>-3.7550**</td>
<td>Z=-3.3698**</td>
<td>CHISQ=8.89**</td>
<td>CHISQ=11.36**</td>
</tr>
<tr>
<td>AR-4</td>
<td>1.7521</td>
<td>Z= 1.5689</td>
<td>CHISQ=1.60</td>
<td>CHISQ=2.46</td>
</tr>
<tr>
<td>AR-2</td>
<td>-1.1705</td>
<td>Z=-1.3410</td>
<td>CHISQ=1.26</td>
<td>CHISQ=1.80</td>
</tr>
<tr>
<td>AR-0</td>
<td>0.1732</td>
<td>Z= 0.4902</td>
<td>CHISQ=2.34</td>
<td>CHISQ=0.24</td>
</tr>
<tr>
<td>AR+2</td>
<td>0.4472</td>
<td>Z= 0.2826</td>
<td>CHISQ=0.04</td>
<td>CHISQ=0.08</td>
</tr>
<tr>
<td>AR+4</td>
<td>-1.8947</td>
<td>Z=-1.0729</td>
<td>CHISQ=1.26</td>
<td>CHISQ=1.15</td>
</tr>
<tr>
<td>AR+6</td>
<td>0.6856</td>
<td>Z= 0.7951</td>
<td>CHISQ=1.60</td>
<td>CHISQ=0.63</td>
</tr>
<tr>
<td>CAR-4</td>
<td>-2.5417*</td>
<td>Z=-2.1614*</td>
<td>CHISQ=1.93</td>
<td>CHISQ=4.68*</td>
</tr>
<tr>
<td>CAR-2</td>
<td>-2.1817</td>
<td>Z=-2.0622*</td>
<td>CHISQ=4.78*</td>
<td>CHISQ=4.26*</td>
</tr>
<tr>
<td>CAR-0</td>
<td>-1.8083</td>
<td>Z=-1.4624</td>
<td>CHISQ=2.74</td>
<td>CHISQ=2.14</td>
</tr>
<tr>
<td>CAR+2</td>
<td>-0.7211</td>
<td>Z=-0.6290</td>
<td>CHISQ=0.11</td>
<td>CHISQ=0.40</td>
</tr>
<tr>
<td>CAR+4</td>
<td>-0.8718</td>
<td>Z=-0.5885</td>
<td>CHISQ=0.35</td>
<td>CHISQ=0.35</td>
</tr>
<tr>
<td>CAR+6</td>
<td>0.1414</td>
<td>Z= 0.4416</td>
<td>CHISQ=0.00</td>
<td>CHISQ=0.20</td>
</tr>
</tbody>
</table>

* Significant at the 0.05 level.
** Significant at the 0.01 level.
K-W denotes Kruskal-Wallis test.
### TABLE 16

**TEST RESULTS OF DIFFERENCES IN ABNORMAL PERFORMANCE AMONG GROUPS**

<table>
<thead>
<tr>
<th>Month</th>
<th>t-Test</th>
<th>WILCOXON</th>
<th>MEDIAN</th>
<th>K-W</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR-6</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ=17.48**</td>
<td>CHISQ=19.14**</td>
</tr>
<tr>
<td>AR-4</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ= 2.10</td>
<td>CHISQ= 2.49</td>
</tr>
<tr>
<td>AR-2</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ= 2.65</td>
<td>CHISQ= 2.64</td>
</tr>
<tr>
<td>AR-0</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ= 2.50</td>
<td>CHISQ= 0.36</td>
</tr>
<tr>
<td>AR+2</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ= 0.74</td>
<td>CHISQ= 0.26</td>
</tr>
<tr>
<td>AR+4</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ= 2.09</td>
<td>CHISQ= 3.42</td>
</tr>
<tr>
<td>AR+6</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ= 3.14</td>
<td>CHISQ= 1.74</td>
</tr>
<tr>
<td>CAR-4</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ= 2.49</td>
<td>CHISQ= 7.44</td>
</tr>
<tr>
<td>CAR-2</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ= 5.08</td>
<td>CHISQ= 4.80</td>
</tr>
<tr>
<td>CAR-0</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ= 3.15</td>
<td>CHISQ= 3.99</td>
</tr>
<tr>
<td>CAR+2</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ= 0.79</td>
<td>CHISQ= 0.85</td>
</tr>
<tr>
<td>CAR+4</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ= 1.06</td>
<td>CHISQ= 0.79</td>
</tr>
<tr>
<td>CAR+6</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ= 0.74</td>
<td>CHISQ= 0.38</td>
</tr>
</tbody>
</table>

N/A indicates that this test is not available for four classifications.

**Significant at the 0.01 level.
K-W denotes Kruskal-Wallis test.**
degree of multinationality tends to have a lower AR than a firm with a lower degree of foreign involvement. No more significant differences in either AR or CAR are found. In particular, CARs after AM+2 months are almost identical among groups regardless of the multinationality of a firm. Finally, the overall abnormal performances of MNCs and domestic firms for two time periods (the prior announcement period and the post announcement period) are reported in Table 17. This table also contains the differences in abnormal performance between MNCs and domestic firms for two time periods. MNCs have negative but insignificantly different from zero P values for both periods while domestic firms have a positive P value (0.1576) for the prior period and a negative P value (-0.5100) for the post period. Neither, however, is significantly different from zero. The statistic for the difference in abnormal performance (CSF) for the prior period is -0.9783 and for the post period is 0.1742, which are not significantly different from zero. These results indicate that no significantly positive abnormal performance was realized by shareholders of MNCs, which rejects the hypothesis of the existence of diversification service. Furthermore, there were no significant differences in abnormal performance between MNCs and domestic firm, which might have happened if MNCs had provided diversification service. The results also hold when the equal-weighted CRSP monthly market index is employed.
TABLE 17

ABNORMAL PERFORMANCE STATISTICS
(The Interest Equalization Tax)

<table>
<thead>
<tr>
<th>Period</th>
<th>P-Value</th>
<th>CSF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MNC</td>
<td>DC</td>
</tr>
<tr>
<td>M1</td>
<td>-0.0918</td>
<td>0.1576</td>
</tr>
<tr>
<td>M2</td>
<td>-0.2441</td>
<td>-0.5100</td>
</tr>
</tbody>
</table>

M1 indicates the prior time period from AM-6 months to AM.
M2 indicates the post time period from AM+1 months to AM+6 months.
In conclusion, the test fails to find an announcement effect of the Interest Equalization Tax on the value of MNCs. Furthermore, no positive abnormal performance is found after the announcement month. More importantly, no significant differences in abnormal performance are found in the announcement month and later. The overall results tend to support the idea that the market never expected the Interest Equalization tax to be beneficial to MNCs, even though it should have been beneficial if MNCs really had provided diversification service. Therefore, the hypothesis of the existence of diversification service seems to be rejected. However, this result could occur if there was a diversification service and the market failed to recognize the multinationality of a firm. Thus, a residual analysis with respect to the market recognition of multinationality of a firm will follow.

Empirical Result
(The Foreign Direct Investment Program)

In this test, the market recognition of multinationality of a firm is the central issue. Since the Foreign Direct Investment Program is expected to have had negative impacts on MNCs, the market is expected to have responded negatively if it recognized the multinationality of a firm. However, from a macroeconomic point of view, this program would supposedly improve deficits in the balance of payments and help U.S. firms to obtain funds more easily. For these reasons, the negative impact on MNCs might have been mitigated. Therefore, a proper test may be to compare abnormal performance between MNCs and domestic firms.
Table 18 reports $AR_t$, $CAR_t$ and corresponding $t$-values of MNCs and domestic firms, while Figures 5 and 6 show $AR_t$ and $CAR_t$ of MNCs and domestic firms surrounding the announcement month. Interestingly, in the announcement month, the AR of domestic firms is significantly positive (2.32%) while that of MNCs is negative (-0.43%) but insignificantly different from zero. A similar result is found in four months after the announcement. The CARs of MNCs are negative from AM-3 months through AM+6 months while those of domestic firms take on positive values from AM through AM+6 months. In particular, in the AM+4 month, the CAR of domestic firms reaches 4.07% and that of MNCs declines to -2.37%, which results in a 6.44% difference in CARs. If we only look at the AR of MNCs in the AM, the announcement effect is not statistically strong enough to accept the hypothesis of the market recognition of multinationality of a firm. But when the abnormal performance of MNCs is compared with that of domestic firms, it appears that market responses are different between MNCs and domestic firms with respect to the foreign direct investment program. The results of statistical tests regarding differences in abnormal performance between the two samples and among four groups are reported in Table 19 and Table 20, respectively. The test results show that in AM and AM+4 months, the ARs of MNCs are significantly smaller than those of domestic firms. Consequently, in the AM+4 month, the CAR of MNCs is significantly smaller than that of domestic firms. However, at the end of the examining period, no significant
TABLE 18

AR<sub>t</sub> AND CAR<sub>t</sub> AROUND THE ANNOUNCEMENT OF THE FOREIGN DIRECT INVESTMENT PROGRAM

<table>
<thead>
<tr>
<th>Month</th>
<th>MNC</th>
<th>Number of Firms</th>
<th>AR</th>
<th>CAR</th>
<th>DC</th>
<th>Number of Firms</th>
<th>AR</th>
<th>CAR</th>
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<tr>
<td>AM-6</td>
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<td>0.01335</td>
<td>125</td>
<td>0.01230</td>
<td>0.01230</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.8583)</td>
<td>(1.8583)</td>
<td></td>
<td>(1.4888)</td>
<td>(1.4888)</td>
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<td></td>
</tr>
<tr>
<td>AM-5</td>
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<td>0.01409</td>
<td>125</td>
<td>0.00390</td>
<td>0.01620</td>
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<tr>
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<td></td>
<td>(1.01069)</td>
<td>(0.6468)</td>
<td></td>
<td>(0.4772)</td>
<td>(0.6472)</td>
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</tr>
<tr>
<td>AM-4</td>
<td>131</td>
<td>-0.00322</td>
<td>0.01088</td>
<td>125</td>
<td>-0.01192</td>
<td>0.00428</td>
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<tr>
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<td>(0.5214)</td>
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<td>(0.1165)</td>
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<tr>
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<td>-0.00423</td>
<td>125</td>
<td>-0.02006</td>
<td>-0.01578</td>
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</tr>
<tr>
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<td>(-2.3772)*</td>
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<tr>
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<td>-0.01768</td>
<td>125</td>
<td>-0.00684</td>
<td>-0.02262</td>
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<td>(-0.8195)</td>
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<tr>
<td>AM-1</td>
<td>131</td>
<td>0.00783</td>
<td>-0.00985</td>
<td>125</td>
<td>0.00997</td>
<td>-0.01265</td>
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<tr>
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<td>(-0.4536)</td>
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<td>(2.7018)**</td>
<td>(0.2116)</td>
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<td>-0.02069</td>
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<td>(1.6057)</td>
<td>(0.2549)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM+4</td>
<td>131</td>
<td>-0.00089</td>
<td>-0.02368</td>
<td>125</td>
<td>0.02689</td>
<td>0.04068</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.1418)</td>
<td>(-0.5354)</td>
<td></td>
<td>(3.7436)**</td>
<td>(0.7683)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM+5</td>
<td>131</td>
<td>-0.00412</td>
<td>-0.02780</td>
<td>125</td>
<td>-0.00913</td>
<td>0.03156</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.6948)</td>
<td>(-0.6061)</td>
<td></td>
<td>(-1.3672)</td>
<td>(0.5520)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AM+6</td>
<td>131</td>
<td>-0.00541</td>
<td>-0.03221</td>
<td>125</td>
<td>-0.01542</td>
<td>0.01614</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-0.8048)</td>
<td>(-0.6861)</td>
<td></td>
<td>(-2.0349)*</td>
<td>(0.2737)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The figures in parentheses are t-values.
* Significant at the 0.05 level.
**Significant at the 0.01 level.
FIGURE 5

AVERAGE RESIDUALS
MNC VERSUS DOMESTIC FIRM
(The Foreign Direct Investment Program)
FIGURE 6
CUMULATIVE AVERAGE RESIDUALS
MNC VERSUS DOMESTIC FIRM
(The Foreign Direct Investment Program)
<table>
<thead>
<tr>
<th>Month</th>
<th>t-Test</th>
<th>WILCOXON</th>
<th>MEDIAN</th>
<th>K-W</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR-6</td>
<td>0.1000</td>
<td>Z= 0.1942</td>
<td>CHISQ=0.14</td>
<td>CHISQ=0.04</td>
</tr>
<tr>
<td>AR-4</td>
<td>-0.9110</td>
<td>Z=-2.1395*</td>
<td>CHISQ=1.88</td>
<td>CHISQ=4.58*</td>
</tr>
<tr>
<td>AR-2</td>
<td>-0.8660</td>
<td>Z=-0.9912</td>
<td>CHISQ=1.26</td>
<td>CHISQ=0.98</td>
</tr>
<tr>
<td>AR-0</td>
<td>-2.6889**</td>
<td>Z=-2.7305**</td>
<td>CHISQ=5.62*</td>
<td>CHISQ=7.46**</td>
</tr>
<tr>
<td>AR+2</td>
<td>0.3464</td>
<td>Z= 0.7134</td>
<td>CHISQ=1.88</td>
<td>CHISQ=0.51</td>
</tr>
<tr>
<td>AR+4</td>
<td>-3.1953**</td>
<td>Z=-3.2869**</td>
<td>CHISQ=5.62*</td>
<td>CHISQ=10.81**</td>
</tr>
<tr>
<td>AR+6</td>
<td>1.2083</td>
<td>Z= 1.3636</td>
<td>CHISQ=1.26</td>
<td>CHISQ=1.86</td>
</tr>
<tr>
<td>CAR-4</td>
<td>0.4123</td>
<td>Z= 0.4846</td>
<td>CHISQ=0.14</td>
<td>CHISQ=0.24</td>
</tr>
<tr>
<td>CAR-2</td>
<td>0.2449</td>
<td>Z= 0.4416</td>
<td>CHISQ=0.39</td>
<td>CHISQ=0.20</td>
</tr>
<tr>
<td>CAR-0</td>
<td>-1.0392</td>
<td>Z=-1.1381</td>
<td>CHISQ=1.26</td>
<td>CHISQ=1.30</td>
</tr>
<tr>
<td>CAR+2</td>
<td>-1.2689</td>
<td>Z=-1.2766</td>
<td>CHISQ=0.97</td>
<td>CHISQ=1.63</td>
</tr>
<tr>
<td>CAR+4</td>
<td>-2.0760*</td>
<td>Z=-1.9065*</td>
<td>CHISQ=1.88</td>
<td>CHISQ=3.64*</td>
</tr>
<tr>
<td>CAR+6</td>
<td>-1.4526</td>
<td>Z=-1.3256</td>
<td>CHISQ=1.26</td>
<td>CHISQ=1.76</td>
</tr>
</tbody>
</table>

* Significant at the 0.05 level.
** Significant at the 0.01 level.
K-W denotes Kruskal-Wallis test.
## TABLE 20
TEST RESULTS OF DIFFERENCES IN ABNORMAL PERFORMANCE AMONG GROUPS

<table>
<thead>
<tr>
<th>Month</th>
<th>t-Test</th>
<th>WILCOXON</th>
<th>MEDIAN</th>
<th>K-W</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR-6</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ=2.94</td>
<td>CHISQ=1.80</td>
</tr>
<tr>
<td>AR-4</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ=3.17</td>
<td>CHISQ=6.64</td>
</tr>
<tr>
<td>AR-2</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ=3.38</td>
<td>CHISQ=4.80</td>
</tr>
<tr>
<td>AR-0</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ=12.06**</td>
<td>CHISQ=10.74**</td>
</tr>
<tr>
<td>AR+2</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ=1.96</td>
<td>CHISQ=0.55</td>
</tr>
<tr>
<td>AR+4</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ=6.38*</td>
<td>CHISQ=11.40**</td>
</tr>
<tr>
<td>AR+6</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ=3.3</td>
<td>CHISQ=6.17</td>
</tr>
<tr>
<td>CAR-4</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ=0.18</td>
<td>CHISQ=1.13</td>
</tr>
<tr>
<td>CAR-2</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ=5.59</td>
<td>CHISQ=3.93</td>
</tr>
<tr>
<td>CAR-0</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ=1.67</td>
<td>CHISQ=2.74</td>
</tr>
<tr>
<td>CAR+2</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ=0.78</td>
<td>CHISQ=2.30</td>
</tr>
<tr>
<td>CAR+4</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ=2.89</td>
<td>CHISQ=4.42</td>
</tr>
<tr>
<td>CAR+6</td>
<td>N/A</td>
<td>N/A</td>
<td>CHISQ=1.63</td>
<td>CHISQ=2.60</td>
</tr>
</tbody>
</table>

N/A indicates that this test is not available.
* Significant at the 0.05 level.
** Significant at the 0.01 level.
K-W denotes Kruskal-Wallis test.
difference in CARs is found. When the tests are applied to four classifications, in the AM and AM+4 month, ARs are also significantly different from each other, which implies that a firm with a high degree of foreign involvement tends to have lower abnormal performance than a firm with a smaller degree of foreign involvement. No statistically different CARs among groups are found. Finally, the overall abnormal performances of MNCs and domestic firms for two time periods are reported in Table 21, together with the statistics for the differences in abnormal performance between MNCs and domestic firms. For both time periods, MNCs have negative P values while domestic firms have positive P values. However, none of the statistics are significantly different from zero. The statistic for the difference in abnormal performance (CSF) for the prior period is -0.8114 and for the post period is -0.9877, which are consistent with the hypothesis but are too weak to accept the hypothesis. This finding shows that for 13 months around the announcement month of the foreign direct investment program, the abnormal performance of MNCs (CAR) is in general negative and smaller than that of domestic firms, which is positive after the announcement. However, such differences in abnormal performance are not statistically significant.

To test the effect of firm size on the market reaction to the announcement of the Foreign Direct Investment Program, the market value of each firm is calculated employing 1967 data. Then
TABLE 21

ABNORMAL PERFORMANCE STATISTICS
* (THE FOREIGN DIRECT INVESTMENT PROGRAM)

<table>
<thead>
<tr>
<th>Period</th>
<th>P-Value</th>
<th>MNC</th>
<th>DC</th>
<th>CSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>-0.1258</td>
<td>0.0587</td>
<td>-0.8114</td>
<td></td>
</tr>
<tr>
<td>M2</td>
<td>-0.1442</td>
<td>0.0436</td>
<td>-0.9877</td>
<td></td>
</tr>
</tbody>
</table>

M1 indicates the prior time period from AM-6 months to AM.
M2 indicates the post time period from AM+1 month to AM+6.
the average values of firm size are calculated for each group\(^45\) and statistically compared with one another. The overall results are very similar to the statistics reported in Table 2 and Table 3. To elaborate, when all four groups are compared with respect to firm size, there is a statistically significant difference in firm size among groups. However, when G4 is excluded from the tests, no significant difference exists among groups. On the other hand, average residuals of each group except for G4, reported in Table 22 show a systematic descending order of ARs as the degree of multinationality of the group increases. Furthermore, non-parametric tests show a significant difference in ARs among three groups (G1, G2 and G3).\(^47\) However, no such relationship is found in the ARs of the first event. A more precise test is performed by regressing ARs of each firm at the announcement month on the degree of multinationality of the firm \((M_i)\) and on the size of the firm \((S_i)\) respectively.

\[
\begin{align}
AR_i &= y_0 + y_1 S_i + \varepsilon_i \\
AR_i &= y_0 + y_1 M_i + \eta_i
\end{align}
\]  

(5.16)  

(5.17)

Table 23 reports estimates of coefficients for \(M_i\) and \(S_i\), respectively. Furthermore, three correlation coefficients (Pearson, Spearman and

\(^{46}\)Four groups are classified based on the degree of multinationality reported in 1965 by Bruck and Lees. A more detailed description of the four groups is given in Table 13.

\(^{47}\)The median test gives a chi-square of 17.56 and the Kruskal-Wallis test produces a chi-square of 15.68. Both tests reject the null hypothesis of equality in ARs among three groups at 0.01 level.
**TABLE 22**

AVERAGE RESIDUALS FOR EACH GROUP AT THE ANNOUNCEMENT MONTH

<table>
<thead>
<tr>
<th></th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>-0.005174</td>
<td>-0.01193</td>
<td>-0.01037</td>
<td>-0.007671</td>
</tr>
<tr>
<td>Second</td>
<td>-0.01594</td>
<td>0.00192</td>
<td>0.03389</td>
<td>0.02047</td>
</tr>
</tbody>
</table>

First denotes the event of the Interest Equalization Act. Second denotes the event of the Foreign Direct Investment Program.

**TABLE 23**

CROSS-SECTIONAL REGRESSION

<table>
<thead>
<tr>
<th>Model</th>
<th>$\gamma_0$</th>
<th>$\gamma_1$</th>
<th>PR&gt;F</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.16</td>
<td>0.0118</td>
<td>-0.0045</td>
<td>0.3410</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>(1.93)</td>
<td>(-0.95)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model</th>
<th>$\gamma_0^\prime$</th>
<th>$\gamma_1^\prime$</th>
<th>PR&gt;F</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.17</td>
<td>0.0428**</td>
<td>-0.2592***</td>
<td>0.0001</td>
<td>0.192</td>
</tr>
<tr>
<td></td>
<td>(6.66)</td>
<td>(-7.74)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Size in Eq. (5.18) is divided by 1,000 million before running the regression.

$M_1$ in Eq. (5.17) is employed as a percentage.

** Significant at the 0.01 level.
Kendall are calculated between $AR_i$ and $S_i$ and between $AR_i$ and $M_i$. Table 24 presents these statistics. The test statistics reported in Table 23 and 24 support the argument that the differences in the average residuals for each group or each firm are mainly attributable to the differences in the degree of multinationality of a firm. Specifically, as reported in Table 23, the coefficient of $M_i$ is significantly smaller than zero, while the coefficient of $S_i$ is not significantly smaller than zero. Also, Table 24 shows significantly (at the 0.01 level) negative correlation coefficients between average residuals for each firm at the announcement month and the degree of multinationality of a firm. No significant relationships are found between the average residual and the size of a firm at the 0.05 level.

Finally, in an attempt to reaffirm the market recognition of the multinationality of a firm, average residuals for MNCs are calculated for 16 years (1963-1978). For each year, 12 monthly average residuals starting from January are calculated using the 60 months prior to January for estimating $\alpha_i$ and $\beta_i$. Sixteen average residuals out of 192 are significantly different from zero at the 0.01 level and 4 of them are greater or lesser than 3%, respectively. In particular, the AR in November, 1973 when the oil embargo crisis occurred is -3.44% while the AR in January, 1974 when the U.S. government eliminated the restrictions on foreign direct investments

For a detailed discussion of these non-parametric tests, see E. L. Lehmann, *Nonparametrics: Statistical Methods Based on Ranks* (San Francisco: Holden-Day, 1975).
### TABLE 24

**CORRELATION COEFFICIENTS**

<table>
<thead>
<tr>
<th></th>
<th>PEARSON</th>
<th>SPEARMAN</th>
<th>KENDALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\rho_{AR,S}$</td>
<td>-0.0599 (0.3410)</td>
<td>-0.1067 (0.0898)</td>
<td>-0.0732 (0.0832)</td>
</tr>
<tr>
<td>$\rho_{AR,M}$</td>
<td>-0.4383** (0.0001)</td>
<td>-0.3811** (0.0001)</td>
<td>-0.2913** (0.0001)</td>
</tr>
</tbody>
</table>

The figures in parentheses denote the significance probability of the correlations.
by MNCs is 5.06%. Other significant ARs are mainly affected by the movement of foreign exchange rates. For example, the AR in October, 1971 is -2.54% which is mainly attributed to the substantial decline in the value of the dollar relative to major currencies. These findings seem to reinforce the argument that the market considers the effects of international factors for the stock prices of MNCs.

The overall results seem to support the argument that the market recognizes the multinationality of a firm. The market tends to interpret the foreign direct investment program and evaluate its impact on the value of a firm taking multinationality of a firm into consideration. Even though the statistics for abnormal performance for the time period around the announcement show no significant difference for MNCs and domestic firms, their signs are consistent with the hypothesis of market recognition of multinationality of a firm. Furthermore, statistical tests on ARs in the announcement month strongly indicate that abnormal performance differs according to the degree of foreign involvement. Specifically, firms with the highest degree of multinationality suffered the most. Similar results are found when the equal-weighted monthly market index is employed.

Implications

Together with the findings from the second residual analysis that indicate the market recognition of multinationality of a firm, the findings from the first residual analysis may be attributed
mainly to the argument that there is no diversification service. The Interest Equalization Tax did not seem to affect MNCs and domestic firms differently.

The results that support the market recognition of multinationality of a firm are consistent with the findings by Agmon and Lessard and Brewer and Miller. However, as far as the existence of diversification service is concerned, the results of this study support the argument that shares of MNCs are poor substitutes for international portfolios, which indirectly suggests that no benefits are gained by investors through MNCs. Thus, the motivation for foreign direct investments by MNCs in order to provide diversification service and to reduce the cost of equity


seems to be too weak to explain foreign direct investment. Several reasons for such a negative conclusion can be enumerated. First, as Adler\textsuperscript{52} notes, when MNCs have the same degree of difficulty in diversifying operations internationally as investors would face in portfolio diversification, no diversification service can exist. Furthermore, the suboptimality of operational diversification is expected to reduce the magnitude of the diversification service. This suboptimality may result due to the non-competitive foreign direct investment market\textsuperscript{53} or other factors which prevent MNCs from diversifying operations on behalf of investors. These factors may be other motivations for foreign direct investment, which are derived from imperfect national real asset markets\textsuperscript{54} and imperfect factors of production markets.\textsuperscript{55} The political risk factor and tax

\textsuperscript{52} Adler, "The Cost of Capital," pp. 119-132.

\textsuperscript{53} For more details, see Lee and Sachdeva, "The Role of Multinational Firm," pp. 479-491.

\textsuperscript{54} The oligopolistic competition theory states that, in some cases, MNCs invest abroad only for the sake of market share or absolute sales growth regardless of profit potential and risks in order to defend their domestic market share as well as their world market share. For more discussion on the economic theory of foreign direct investment, see G. Ragazzi, "Theories of the Determinants," pp. 471-498 and C. P. Kindleberger, American Business Abroad: Six Lectures on Direct Investment (New Haven: Yale University Press, 1969).

\textsuperscript{55} The product cycle theory suggests that as a product that developed in the most advanced country matures, foreign direct investment may be made in order to relocate the production process in a country with a lower unit cost of production. For more details, see R. Vernon, "International Investment and International Trade in the Product Cycle," Quarterly Journal of Economics, pp. 190-207, May, 1966.
factor may induce MNCs to deviate from the optimal foreign direct investment decisions that satisfy the diversification desires of investors. Second, if risky assets are priced internationally (the integrated pricing hypothesis), any significant benefits to investors are not expected from shares of MNCs as well as from international portfolio investment. Investors may put little value on the diversification service on the grounds that there are other alternatives for reducing the risk of their portfolios within a domestic capital market. Lastly, if the imposition of the Interest Equalization Tax was predicted by the market, the effect of this tax on the value of MNCs around the announcement month might be reduced.

If the shares of MNCs indeed provide an investor with the benefit from international capital market imperfection (the diversification service), and investors recognize the benefit, one would expect shares of MNCs would be sold at a premium compared to shares of domestic firms. The premium should be roughly equal to the additional costs incurred in homemade international portfolios. Unfortunately, this central issue of the study is not supported empirically. Since the test consistently provides some evidence supporting the market recognition of multinationality of a firm, questions arise with respect to the existence of diversification

56 It is still unclear whether risky assets are priced internationally or domestically. Stehle shows some evidence that neither pricing hypothesis can be rejected in favor of the other. For more details, see Stehle, "An Empirical Test of the Alternative Hypotheses," pp. 493-502.
service. As Eiteman and Stonehill\textsuperscript{57} note, the foreign direct investment decision results from a complex decision process motivated by strategic, behavioral, and economic considerations. One of the economic rationales for foreign direct investment is to provide benefits from imperfect international capital markets to shareholders. This hypothesis is rejected by this study. However, investors may have the opportunity to capture the benefits of imperfections in the markets for real assets and factors of production provided by MNCs. MNCs may achieve a competitive advantage over local foreign firms through foreign direct investments. Technological superiority or managerial expertise may reduce labor or material costs. Foreign direct investment may avoid or reduce trade barriers associated with domestic manufacture for export. Wansley, Lane and Yang\textsuperscript{58} find some expected gains from international acquisition, even though these gains are not statistically significant.

\textsuperscript{57}Eiteman and Stonehill, "Multinational Business Finance," pp. 231-250.

\textsuperscript{58}Under the assumption that bid premiums are a proxy for expected gains in a merger, they examine the magnitude of abnormal returns to U.S. acquired firms in foreign and domestic mergers. Any significant difference is imputed to expected gains from international diversification. Results indicate that although differences appear to exist, these differences are insignificant when method of payment and merger type are considered. For more details, see J. W. Wansley, W. R. Lane and H. C. Yang, "Shareholder Returns to USA Acquired Firms in Foreign and Domestic Acquisitions," \textit{Journal of Business Finance and Accounting}, forthcoming 1983.
Limitations

The lack of data on foreign companies limits the scope of the tests for the hypothesis of diversification service to the U.S. based MNCs and domestic firms. Thus, any results from this study should be accepted as a partial conclusion for U.S. based MNCs. An extension of the data including foreign MNCs seems to be a proper step for further research.

Empirical tests employed in this study are subject to some criticisms. First, these tests based on specific pricing models (the domestic CAPM and the international two-factor market model) may be biased due to the use of a market index proxy instead of the true market portfolio, which is unobservable. Second, in the event analyses, the clustering problem tends to reduce the credibility of the test results. The average prediction errors in the examining period appear to have first-order autocorrelation even though they are not significantly autocorrelated. This problem may be due to the autocorrelation of monthly rates of return with a common factor still existing in the prediction errors. Two alternative methods can be suggested to eliminate a pattern of the prediction errors. First, for the estimation of regression parameters in the market model, the Seemingly Unrelated Regression (SUR) method may be employed instead of the Ordinary Least Square (OLS) method to capture any correlations among residuals. However, since a regression (the market model) for each firm has the same independent observation, regression parameters from the SUR will be equivalent to those from the OLS. Second, the two-factor market model can be employed to
measure prediction errors. However, some problems arise when the events also affect the international factor in the two-factor market model. Abnormal prediction errors may disappear even if they exist when the events affect the international market index positively. On the other hand, when the events have adverse effects on the international market index, abnormal prediction errors may appear even if there is no abnormal performance. In other words, the domestic market model should be employed in order to measure abnormal prediction errors due to foreign-related events.

Finally, examining the rates of return of international closed-end funds around the announcement of the Interest Equalization Tax Act may provide evidence regarding diversification service through a foreign portfolio investment. Even if this study does not support diversification service through MNCs, international closed-end funds may provide diversification service. However, the implications of the event with respect to international closed-end funds are not conclusive. The event may be beneficial owing to the previous holding of foreign securities while the event may be harmful due to the additional tax on the purchase of foreign securities. Two international closed-end funds (ASA Limited and Eurofund) that have sufficient data are available. In addition to statistical problems due to a small sample size, no particular evidence is found to support the hypothesis that international closed-end funds provide diversification service.
In conclusion, much work remains to be done before the issue of diversification service is empirically resolved. However, any bias caused by the above problems seems not to be strong enough to reverse the overall conclusions of this study.
CHAPTER 6

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

The effects of operational diversification by a firm on its value and shareholders' wealth are examined in the context of international capital markets and MNCs. The hypothesis of diversification service by MNCs is motivated by introducing three topics: (1) the risk reduction benefits of international portfolio diversification assuming no restrictions and no additional costs, (2) some barriers, additional costs and risks that prevent U.S. investors from diversifying their portfolio internationally, and (3) the complementary relationship between foreign direct investment and international portfolio investment, in which MNCs perform the useful function of making investment decisions on behalf of investors who have some difficulty in achieving a homemade international portfolio.

Assuming efficient capital markets in which investors recognize the multinationality of a firm, the diversification service, if it exists, is assumed to be recognized and rewarded by investors. Consequently, it is hypothesized that reducing the cost of equity by providing diversification service may be a purely financial motivation for the foreign direct investments by MNCs. It is also pointed out, however, that the complementary relationship
may collapse or may be suboptimal if MNCs have the same degree of difficulties in diversifying operations internationally as investors would have or if the foreign direct investment market is a non-competitive market. Furthermore, it is also emphasized that any benefits from international diversification in portfolio or operation should depend on the pricing hypothesis. If risky assets are priced in an integrated manner, no more benefits are expected from these international diversification, instead, only pure risk reduction is realized. These topics are discussed in Chapters 2 and 3.

Since the market recognition of multinationality of a firm is a necessary condition for validating the hypothesis of diversification service, several empirical tests on the hypothesis of market recognition are performed. First, in an attempt to explain the low level of systematic risk of MNCs in association with the domestic market index, the regression analysis employed earnings variability as an explanatory variable shows that a firm with low earnings variability tends to have low systematic risk associated with the domestic market. Since MNCs have lower earnings variability than domestic firms have, it follows that MNCs also have lower systematic risk. This finding is indirect evidence that the market recognizes multinationality of a firm. The validity of systematic risk of MNCs associated with the domestic market as a representative systematic risk of a firm is questioned and examined. This question is interesting because previous findings supporting abnormal performance from shares of MNCs are dependent on these systematic
risks of MNCs. Test results from the application of the domestic CAPM to the sample of MNCs and the sample of domestic firms show that for MNCs, the systematic risk associated with the domestic market does not represent a total systematic risk. Instead, the domestic systematic risk captures only a portion of the total systematic risk that is supposed to be related to the expected rate of return. These results are also indirect evidence that the market recognizes multinationality of a firm. Any empirical findings regarding abnormal performance of shares of MNCs based on such partial systematic risk must be interpreted with great caution. A more direct test of the hypothesis of market recognition is performed by employing a two-factor international market model. The result supports the hypothesis that the greater the foreign involvement of a firm, the more dependence on the international market and the less reliance on the domestic market. However, based on tests employing the two-factor international CAPM, it is still inconclusive whether a diversification service exists. Finally, two residual analyses are performed to test the hypothesis of market recognition and of the existence of the diversification service. While the results provide some evidence in favor of the market recognition of multinationality of a firm, the hypothesis of the existence of a diversification service is rejected. Since the necessary condition of market recognition is satisfied, the rejection of the hypothesis is mainly attributed to the argument that there is no valuable diversification service or that the market considers it of
little value. Two major reasons may be recalled to explain the rejection of the hypothesis. The suboptimality of operational diversification may result in no diversification service. Second, if investors believe that risky assets are priced internationally, the diversification service, even if it exists will have little value. Unfortunately, it is still unclear which reason is mainly responsible for the rejection of the hypothesis. A more sophisticated international pricing model would be a desirable goal for further research on this topic.

From a different point of view, this study provides additional evidence on the existence of abnormal performance in the shares of MNCs, an issue that has been debated for the last decade. In conclusion, this study supports the argument that purchasing the shares of MNCs is a poor substitute for international portfolio investment. Furthermore, it suggests that the diversification service motive is too weak to be a financial rationale behind foreign direct investment, at least among U.S. based multinational firms. The motive for foreign direct investment in imperfect international capital markets seems to have little empirical support. However, this result does not necessarily mean that there are no gains from international diversification of operations. Some gains may be realized via an imperfect real asset market or an imperfect factor market.
BIBLIOGRAPHY

Books


Papers


Others


APPENDIX A

SOME ECONOMETRIC PROBLEMS DUE TO THE OMISSION OF A RELEVANT EXPLANATORY VARIABLE

Gibbons\(^1\) shows that a fundamental class of financial asset pricing models has the following form:

\[
E(R_{it}) = \gamma_0 + \sum_{j=1}^{K} \beta_{ij} \gamma_j, \quad i = 1, \ldots, N
\]

(1)

where

- \(E(R_{it})\) = expected return on the \(i\)th asset at \(t\).
- \(\gamma_0\) = a risk-free rate or the expected return on a zero-beta portfolio.
- \(\beta_{ij}\) = a measure of association between the returns on security \(i\) and the returns on a portfolio designed to hedge risk \(j\).
- \(\gamma_j\) = a premium for risk \(j\).
- \(N\) = number of securities.
- \(K\) = number of risks.

Internationally, this relationship includes Stehle's two-factor international CAPM.\(^2\) As far as the multinationality of a firm is concerned, \(\beta_{ij}\) are defined as covariabilities between the \(i\)th firm's returns and the rates of return on market portfolios in the \(j\)th country in which the firm has an operational base. Thus, the \(\gamma_j\) are risk premia associated with \(\beta_j\) in the \(j\)th country.

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Suppose that for MNCs, there are at least two country-related risks (domestic systematic risk and international systematic risk) in the ex post form of the asset pricing model given by:

\[
\tilde{R}_{ij} = \gamma_0 + \gamma_1 \beta_{i1} + \gamma_2 \beta_{i2} + \tilde{z}_{it} \quad (2)
\]

where \( \beta_{i1} = \) domestic systematic risk of asset \( i \).

\( \beta_{i2} = \) international systematic risk of asset \( i \).

\( \tilde{z}_{it} = \) a random disturbance with the following stochastic properties.

\[
E(\tilde{z}_i) = 0
\]

\[
E(\tilde{z}_{is}, \tilde{z}_{jt}) = \sigma_{ij} \quad \text{for all } s=t \quad \text{and for all } i \text{ and } j
\]

\[
= 0 \quad \text{otherwise.}
\]

Now assume that we estimate the domestic CAPM instead of equation (2):

\[
\tilde{R}_{it} = \gamma_0 + \gamma_1 \beta_{i1} + \tilde{\varepsilon}_{it} \quad (3)
\]

If equation (3) were correct and once measurement errors in \( \beta_{i1} \) are corrected, the least square estimators of \( \gamma_0 \) and \( \gamma_1 \) would be unbiased and efficient. But if equation (2) is correct for MNCs, some problems occur to the least square estimators of \( \gamma_0 \) and \( \gamma_1 \) from equation (3). For \( \gamma_1 \), we have

\[
E(\hat{\gamma}_1) = E\left[ \frac{\sum (\beta_{i1} - \tilde{\beta}_{i1})(R_{it} - \bar{R}_t)}{\sum (\beta_{i1} - \tilde{\beta}_{i1})^2} \right]
\]
But from equation (2), we can see that \( (R_{it} - \bar{R}_t) = \gamma_1(\beta_{i1} - \bar{\beta}_1) + \gamma_2(\beta_{i2} - \bar{\beta}_2) + (z_i - \bar{z}) \) so that \( E(\hat{\gamma}_1) = \gamma_1 + \gamma_2 \cdot D_{21} \)

where \( D_{21} = \frac{\Sigma(\beta_{i1} - \bar{\beta}_1)(\beta_{i2} - \bar{\beta}_2)}{\Sigma(\beta_{i1} - \bar{\beta}_1)^2} \)

Similarly, for \( \hat{\gamma}_0 \) we have

\[
E(\hat{\gamma}_0) = E(\bar{R} - \gamma_1 \bar{\beta}_1) = \gamma_0 + \gamma_1 \bar{\beta}_1 + \gamma_2 \cdot \bar{\beta}_2 - (\gamma_1 + \gamma_2 \cdot D_{20}) = \gamma_0 + \gamma_2 \cdot D_{20}
\]

where, \( D_{20} = \bar{\beta}_2 - D_{21} \cdot \bar{\beta}_1 \)

If \( \gamma_2 \) is different from zero, the least square estimator of \( \gamma_1 \) based on the domestic CAPM (eq. (3)) will be biased unless \( D_{21} \) equals zero. In other words, \( \beta_{i1} \) and \( \beta_{i2} \) should be uncorrelated in order to get an unbiased estimator of \( \gamma_1 \). Furthermore, if the correlation between \( \beta_1 \) and \( \beta_{i2} \) does not disappear as the sample size increases such that

\[
\lim_{n \to \infty} D_{21} \neq 0,
\]

\( \hat{\gamma}_1 \) will also be inconsistent. Also, \( \gamma_0 \) will be biased as long as

\[
\bar{\beta}_2 - D_{21} \beta_1 \neq 0
\]

and \( \hat{\gamma}_0 \) will be inconsistent as long as

\[
\lim_{n \to \infty} (\bar{\beta}_2 - D_{21} \bar{\beta}_1) \neq 0
\]

And if \( \gamma_2 \) and \( D_{21} \) have the opposite sign, the bias of \( \hat{\gamma}_1 \) will be negative; otherwise, the bias will be positive. 3 We expect that

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when $\beta_{i2}$ is the systematic risk associated with a pure international factor, $D_{21}$ will be negative and $\gamma_2$ will be positive. Thus, $\hat{\gamma}_1$ of MNCs based on the single domestic CAPM may be biased downward.

\footnote{Agmon and Lessard show evidence that $\beta_{i1}$ and $\beta_{i2}$ are negatively correlated. For more details, see Agmon and Lessard, "Market Recognition," pp. 1049-1055.}
APPENDIX B

GROUPING PROCEDURE

All pricing models introduced in this study relate the ex-ante expected rate of return on a risky asset to its ex-ante covariances with given factors. Therefore, empirical tests of these models require a hypothesis to relate unobservable ex-ante rates of return to observable ex-post rates of return. The fair-game can be used to relate the ex-ante models to the ex-post models. However, risk variables can only be estimated, usually based on market models (one-factor domestic market models). The estimate of risk may be the sum of the true value and a measurement error. Thus, in the second-stage regression analysis, the ordinary least square estimate of the risk-premium term will be inconsistent. Methods suggested to avoid the problems caused by measurement errors include the grouping of observations or the use of instrumental variables. Specifically, portfolios are used rather than individual securities in the second-stage regression. However grouping reduces efficiency in the test and such loss in efficiency depends on the within group variation of the independent variable. In other words, if the portfolios contain many securities, the betas of the portfolios ($\hat{\beta}_p$) will be more closely concentrated about one than those of individual securities ($\hat{\beta}_i$). Consequently, we can expect to observe only a narrow range of the expected return-risk relationship, which means that employing portfolios instead of individual securities may reduce the information about the expected
return-risk relationship substantially. Grouping by the size of the
independent variable will minimize the loss in efficiency, which
maximize the between group variation of the independent variable.
This is done by allocating securities to portfolios based on a ranked
value of the estimate of the risk. However, Fama\textsuperscript{5} notes that such
a procedure could result in a "regression phenomenon," which
causes bunching of positive and negative measurement errors in
estimates of risk (portfolio betas, $\hat{\beta}_p$) within portfolios. As a
result, the larger values of $\hat{\beta}_p$ would tend to overestimate the true
$\beta_p$ and vice versa. The regression phenomenon can be avoided by
forming portfolios from ranked $\hat{\beta}_i$ calculated from data for one time
period, but the $\hat{\beta}_p$ for corresponding portfolios are computed from
data of a subsequent period. These $\hat{\beta}_p$ and rates of return on
portfolios are used in the second-stage regression analysis. For
the single-factor domestic CAPM, the grouping procedure is based
on the systematic risk of a security associated with a domestic
market. Note that this procedure uses an instrumental variable
rather than observed variable with errors. Stehle\textsuperscript{6} notes that if
there is a stable relationship between the true value of the
independent variable and an instrumental variable that can be

\textsuperscript{5}E. F. Fama, \textit{Foundation of Finance} (New York: Basic
Books, 1976), Ch. 9.

\textsuperscript{6}R. E. Stehle, "The Valuation of Risk Assets in an Inter-
identified, and the instrument variable is uncorrelated in the limit with both the disturbance term of the original regression and a measurement error, the estimate of the risk-premium term will be consistent. The instrumental variable that is simply an estimate of $\beta_i$ from the data in the previous time period will be highly correlated with an estimate of $\beta_i$ in the testing time period, but can be observed independently of the estimate of $\beta_i$. Grouping with an instrumental variable is adopted in this study.
APPENDIX C

LISTING OF SAMPLE FIRMS

MNCs

Abbot Laboratories
Addressograph Multigraph Corp.
Allied Chemical Corp.
Allis-Chalmers Corp.
Aluminum Company of America
American Can Co.
American Cyanamid Co.
American Home Products Corp.
American Machine & Foundry Co.
American Metal Climax Inc.
American Standard Inc.
Archer Daniels Midland Co.
Armstrong Cork Co.
ASARCO Inc.
Beatrice Foods Co.
Bendix Corp.
Black & Becker Manufacturing Co.
Borden Inc.
Bristol-Myers Co.
Brunswick Corp.
Budd Co.
Burlington Industries Inc.
Campbell Soup Co.
Carborundum Co.
Caterpillar Tractor Co.
Celanese Corp.
Champion Spark Plug Co.
Chemetron Corp.
Chesebrough-Ponds Co.
Chicago Pneumatic Tool Co.
Chrysler Corp.
Cities Service Co.
Clark Equipment Co.
Coca Cola Co.
Colgate-Palmolive Co.
Combustion Engineering Inc.
Continental Can Inc.
Continental Oil Co.
Crane Co.
Crown Cork & Seal Inc.
Deer & Co.
Del Monte Corp.
Dow Chemical Co.
Dresser Industries, Inc.
Du Pont E.I. De Nemours & Co.
Eastman Kodak Co.
Eaton Corp.
Emhart Corp.
Exxon Corp.
FMC Corp.
Federal Mogul Corp.
Firestone Tire & Rubber Co.
Ford Motor Co.
General American Transportation Corp.
General Electric Co.
General Foods Co.
General Mills Inc.
General Motors Corp.
General Telephone & Electronics Corp.
General Tire & Rubber Co.
Gillette Co.
Goodrich B. F. Co.
Goodyear Tire & Rubber Co.
Gulf Oil Corp.
Heinz H. J. Co.
Hercules Inc.
Honeywell Inc.
Ingersoll Rand Co.
International Business Machine Corp.
International Harvester Co.
International Paper Co.
International Telephone & Telegraph Corp.
Johns Manville Corp.
Johnson & Johnson
Joy Manufacturing Co.
Kellogg Co.
Kimberly Clark Corp.
Koppers Inc.
Libby, McNeill & Libby
Litton Industries Inc.
Mallory P. R. & Co. Inc.
Merck & Co. Inc.
Miles Laboratories Inc.
Minnesota Mining & Manufacturing Co.
Mobil Oil Corp.
Monsanto Co.
National Biscuit Co.
National Cash Register Co.
Norton Co.
Olin Mathieson Chemical Corp.
Owens Corning Fiberglas Corp.
Owens Illinois Inc.
Pennsalt Chemicals Corp.
Pepsi Co. Inc.
Pet Inc.
Pfizer Inc.
Pfizer Inc.
Pfizer Inc.
Pillsbury Co.
Procter & Gamble Co.
Quaker Oats Co.
Radio Corporation of America
Ralston Purina Co.
Raytheon Co.
Revlon Inc.
Reynolds Metals Co.
Richardson Merrell Inc.
Rohn & Hass Co.
SCM Corp.
St. Regis Paper Co.
Schering Plough Corp.
Scott Paper Co.
Scovill Manufacturing Co.
Simmons Co.
Smith Kline & French Laboratories
Sperry Rand Corp.
Standard Brands Inc.
Standard Oil Co. of California
Standard Oil Co. (Indiana)
Standard Oil Co. (New Jersey)
Sterling Drug Inc.
Sunbeam Corp.
TRW Inc.
Texaco Inc.
Texas Instruments Inc.
Timken Roller Bearing Co.
Union Carbide Corp.
UNIROYAL Inc.
United Merchants & Manufacturing Inc.
United Shoe Machinery Corp.
Upjohn Co.
Warner Lambert Pharmaceutical Co.
Westinghouse Electric Corp.
Wrigley W. M. Jr. Co.
Domestic Firms

A C F Industries Inc.
Air Products & Chemicals Inc.
AIRCO Inc.
AKZONA Inc.
Allegheny Ludlum Industries Inc.
Allied Products Corp.
Ambac Industries Inc.
Amerase Corp.
Amerada Hess Corp.
American Bakeries Co.
Amstar Corp.
Amsted Industries Inc.
Anchor Hocking Corp.
Armstrong Rubber Co.
Arvin Industries Inc.
Ashland Oil Inc.
Avco Corp.
Avnet Inc.
Babcock & Wilcox Co.
Bethlehem Steel Corp.
Boeing Co.
Briggs & Stratton Corp.
Carpenter Technology Corp.
CECO Corp.
Central Soya Inc.
Certain Teed Products Corp.
City Investing Co.
Cluett Peabody & Co. Inc.
Collins & Aikman Corp.
Colt Industries Inc.
Cone Mills Corp.
Consolidated Foods Corp.
Curtiss Wright Corp.
Cyclops Corp.
Dan River Inc.
Dayco Corp.
Di Giorgio Corp.
Diamond International Corp.
Diamond Shamrock Corp.
Donnelley R. R. & Sons Co.
Eagle Picher Industries Inc.
Eastern Gas & Fuel Association
Emerson Electric Co.
Evans Products Co.
Fairchild Industries Inc.
Fairmont Foods Co.
Fibreboard Corp.
Flintkote Co.
Freeport Minerals Co.
Fuqua Industries Inc.
Gardner Denver Co.
General Cable Corp.
General Dynamics Corp.
General Host Corp.
General Instrument Corp.
General Signal Clrp.
Georgia Pacific Corp.
Gerber Products Co.
Great Northern Nekoosa Corp.
Greyhound Corp.
Grumman Corp.
Hammermill Paper Co.
Hart Schaffner & Marx
Hershey Foods Corp.
Heublein Inc.
Hoover Ball & Bearing Co.
Houdaille Industries Inc.
I U International Corp.
Ideal Basic Industries Inc.
Inland Steel Co.
Insilco Corp.
Interco Inc.
Interlake Inc.
Kerr Mcgee Corp.
Keystone Construction Industries Inc.
Libbey Owens Ford Co.
Lone Star Industries Inc.
Lowenstein M. & Sons Inc.
Maytag Co.
McDonnell Douglas Corp.
McGraw Edison Co.
McGraw Hill Inc.
Mead Corp.
Midland Ross Corp.
Mohasco Corp.
National Can Corp.
National Gypsum Co.
National Steel Corp.
Morris Industries Inc.
North American Philips Corp.
Northrop Corp.
Northwest Industries Inc.
Panhandle Eastern Pipe Line Co.
Perkin Elmer Corp.
Phillips Van Heusen Corp.
Pennzoil Co.
Pittston Co.
Questor Corp.
Reliance Electric Co.
Republic Steel Co.
Revere Copper & Brass Inc.
Rexnord Inc.
Reynolds R. J. Industries Inc.
Rohr Industries Inc.
Roper Corp.
Smith A.O. Corp.
Southern Co.
Southern Pacific Co.
Square D. Co.
Stevens J. P. & Co. Inc.
Stokely Van Camp Inc.
Sundstrand Corp.
Sybron Corp.
Texasgulf Inc.
Thiokol Corp.
Toledo Edison Co.
Union Camp Corp.
Union Oil Co. of California
Union Pacific
United States Gypsum Co.
United States Shoe Corp.
United States Steel Corp.
Varian Association
Victor Comptometer Corp.
Vulcan Materials Corp.
Ward Foods Inc.
Westvaco Corp.
Wheeling Pittsburgh Steel Corp.
Whirlpool Corp.
White Construction Industries Inc.
White Meter Corp.
Williams Co.
Witco Chemical Corp.
Zenith Radio Corp.
VITA

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Date of Examination: April 12, 1983