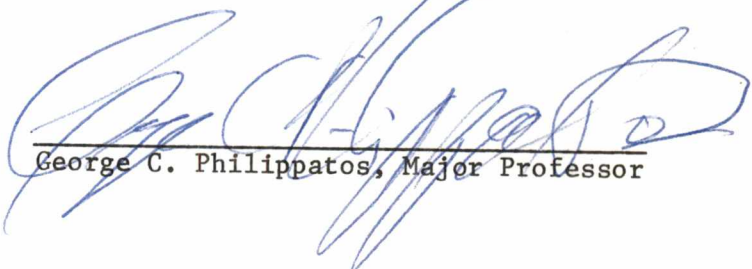


To the Graduate Council:

I am submitting herewith a dissertation written by Richard Armand DeFusco entitled "Risk and the Valuation of the Multinational Enterprise." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Business Administration.



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MULTINATIONAL ENTERPRISE

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Richard Armand DeFusco

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ABSTRACT

Inquires into the effects of multinational involvement have gone in a variety of directions. This research pursues the empirical relationship between a multinational firm's expected returns and market power. Data were collected on a sample of multinational firms and a "control" sample of domestic firms. Various pricing model tests are conducted for both sets of firms. The market power effect is studied over the time period 1970-1979 and two subperiods, 1970-1974 and 1975-1979. The former subperiod was characterized by foreign investment controls the most notable being the Interest Equalization Tax. The latter subperiod was virtually control free.

The results show that for the MNE sample, market power significantly affected expected returns. This result is consistent with two hypotheses raised as a rationale for the multinational enterprise. This market power effect, however is not present for the domestic firm sample. This finding suggests that there may be a link between an firm's expected returns and market power acquired via multinational involvement.

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CHAPTER 1

INTRODUCTION

The Multinational Enterprise (MNE) has been a topic of great interest in both finance and economics. Recent surveys by Calvet (1981) and Koutsoyiannis (1979) discuss the various theories and hypotheses of a U.S. domestic firm entering foreign markets. The rationale for such expansion might lie in the ability of the MNE to make higher profits. A possible reason for expansion might include the differences that exist in product and/or factor markets here and abroad. Using this argument foreign investment will proceed up to the point where the incremental return just equals that derived in domestic markets.

Such a theory however, lacks the ability to explain the long-run decision to enter foreign markets. Since disequilibrium situations in product, factor or exchange rate markets will eventually be competed away, flows of foreign investment will cease. Rather than invoke these "short-run" situations as an explanation of multinational status, the decision to enter foreign markets will usually center around a long-term commitment to develop products to be sold in foreign as well as domestic markets. Foreign direct investment (FDI) by U.S. manufacturing firms must therefore be a value enhancing investment decision. How is this decision to enter foreign markets perceived by U.S. investors? To answer this question, the MNE will be examined using a generalized multifactor asset pricing model.

Recently financial economists have begun to examine the MNE using concepts from industrial organization and financial models that describe

market equilibrium. Drawing on the structural characteristics of the MNE, researchers observe that the firm invests overseas to capture or appropriate rents (i.e., it is value enhancing). In light of this, Errunza and Senbet (1981), (1984), (henceforth ES) and Hirschey (1981) examined the relationship between market power and multinational status. These authors document that foreign involvement, as measured by a firm's foreign sales percent, results in higher market power. This evidence presents an interesting empirical regularity. First MNEs tend to be the larger firms traded on the NYSE. Second, for firms with a high degree of foreign involvement, research documents a higher measure of market power. While Banz (1981) and others have documented a small firm effect for those firms traded on the NYSE, a much more economically interesting effect may exist. Namely the effect of market power on expected returns. While the firm "size" effect documents a relationship between expected returns and firm size, the measure of firm size is not economically meaningful. In addition, large firms traded on the NYSE (which tend to be multinational) have very different structural characteristics from small firms. The one important difference is that multinational firms have higher market power than their purely domestic counterparts.

Can market power then affect expected returns for large powerful firms? In addition, if market power does affect expected returns, then would we expect it among those firms with higher measures of market power. To investigate this question, we will examine this effect among a class of firms that have documented high market power. This class of firms will include manufacturing firms that are multinational in

scope. For comparative purposes a sample of domestic firms will also be employed.

A Multifactor Model for the Multinational Enterprise

Past research on the effects of foreign involvement on firm risk traditionally employed the two factor CAPM. In most studies, the beta risk measure was correlated with measures of foreign involvement. Agmon and Lessard (1977) (henceforth AL) report a negative relationship between beta and the firm's foreign sales percent. They reason that U.S investors perceive the benefits of international diversification since these firms, as a result of foreign involvement, have lower beta. Other research by Hughes, Logue, and Sweeny (1975) (henceforth HLS), and Stehle (1977) examine the question of the benefits of corporate international diversification and pricing in segmented markets. While these questions are interesting in their own right, to date the use of the two factor (zero and beta) CAPM does not adequately address the question of value creation through foreign direct investment.

To analyze the issue of the effect of value creation on expected returns, we use an additional factor in a CAPM framework. This additional factor is the firm's market power. Specifically, this study will employ measures of market power, growth potential and foreign activity as cross-sectional factors that influence the level of a firm's expected returns. The market power measure to be employed is a firm's Excess Market Value (EMV) first employed by Thomadakis (1977). In addition this study will use a modified version of Tobin's q ratio as

an indicator of the firm's market power potential. The use of these measures is acceptable since the expectations of investors in terms of growth, monopoly rents, economic rents, and other such deviations from the perfect market paradigm are normally reflected in the current market value of the firm's equity.

The inclusion of an additional cross-sectional factor that influences expected returns has appeared quite often in extensions of empirical tests of the CAPM. Banz's small firm study as well as Litzenberger and Ramaswamy's (1979) (henceforth LR) dividend study employ this model structure. The model to be employed here is the following:

$$E(R_j) = a_0 + a_1 b_j + a_2 MP_j ,$$

where

$E(R_j)$ = firm j 's expected return,

b_j = firm j 's beta coefficient, and

MP_j = firm j 's market power.

Among those firms that are multinational in scope, we expect a_2 to be positive. Suppose we use Tobin's q ratio to measure market power. In perfectly competitive markets, the market power measure will be unity. Firms that derive economic rents due to unique factors of production, or monopoly rents due to concentration will have market power measures greater than unity. Subrahmanyam and Thomadakis (1980) (henceforth ST) show analytically that, *ceteris paribus*, firms with higher market power

(measured by demand elasticity) have lower beta. Since market powerful firms extract monopoly and economic rents from consumer/investors, these economic agents will consequently demand higher returns. This empirical relationship is expected only for those firms with market power. Since a priori we know that the most likely candidates for firms with market power are multinational, these firms will be employed for tests of the market power effect. While no theoretical model exists to predict the effect of market power and returns, we feel that uncovering this effect is important for two reasons. First it will expand our understanding of the multinational enterprise. Second the finding of a priced factor in the spirit of Banz's small firm effect may aid us in further rejecting the two factor CAPM. However, in contrast to Banz, market power is a much more meaningful economic characteristic than size. In our search for other factors that describe expected returns, this empirical finding may lead to an improved and more general model that describes the firm. Since the conventional two factor CAPM cannot even explain the existence of positive net present value investment decisions, our knowledge of a firm pricing relationship is limited. A priced market power effect may indicate that structural imperfections in product markets may influence investor's perception of pricing in capital markets. Since the CAPM based theory is devoid of a meaningful link with firm production decisions, a market power effect may force us to look more closely at this side of the firm.

This research then is a joint test of a linear pricing relationship and the additional cross-sectional dimension that affects expected returns. Interest in the multinational firm requires a departure from

the conventional CAPM in which foreign involvement would be no different from any investment. The addition of a market power variable is a first step in discovering the relationship between product and factor markets, and the capital market. However, since no theoretical model exists to answer this question, this research will pursue an empirical inquiry into an important area. Since multinational status positively affects a firm's excess valuation, a further inquiry into the relationship between returns and market power is warranted.

Limitations of the Study

As is the case in all tests of asset pricing models, the current research is a joint test of efficiency and the proposed linear model. Since we assume that the market power measure reflects all sources of rents, market efficiency is implicitly assumed. In addition we must also note that all market power measures are subject to measurement errors. This is partially due to the biases in the use of accounting numbers. An additional problem also exists in identifying a sufficient number of multinational firms for testing purposes. While the foreign sales percent figure is an imperfect measure of multinational status, the success with its use in past research makes this characteristic a logical choice. These problems notwithstanding, this research will augment the ongoing investigation of the MNE within the context of a generalized asset pricing model.

This study is comprised as follows. Chapter 2 will present a review of the relevant literature on the MNE. Chapter 3 will discuss

the methodology used to uncover the market power effect. Chapter 4 and 5 detail the results of the finding of a priced market power effect. Lastly, Chapter 6 concludes with some possible extensions for future research.

CHAPTER 2

RISK AND THE PRICING OF THE MULTINATIONAL FIRM

A Theory of the Multinational Enterprise

To begin our investigation of the Multinational Enterprise (MNE), some background on the rationale for its existence is necessary. A plausible explanation for the existence of the MNE can be derived from extensions of the theory of the firm. Within this framework, the MNE can be an outgrowth of market structure imperfections and/or market failure. In the former situation we have cases where domestic firms operate in either an oligopolistic or monopolistic market. To maintain or even enhance their current market position, these firms engage in foreign direct investment (FDI). Viewed within this light, FDI can enhance an already strong entry barrier or scale economy advantage. The latter proposition, market failure, is characterized by situations where the price system is not able to efficiently allocate resources over long periods of time. This is usually due to the sophisticated information generated by firms. From the standpoint of social efficiency, this knowledge having been produced, becomes a public good, and as such, it should then have zero cost. To circumvent the social good problem, the firm uses some sort of hierarchical structure to transfer knowledge. In instances such as this, the firm's internal workings substitute for the market. This concept of market failure can be easily applied to the case of foreign direct investment versus exporting. In certain cases

exporting may involve making sophisticated technology public. Rather than export, the firm internalizes these transactions by establishing foreign subsidiaries.

Here again we are confronted with Coase's (1937) classic question of why there exists a boundary between the administrative allocation of resources within the firm and the market allocation of resources between firms. The MNE can be viewed as a multiplant firm and as such can enjoy certain advantages that might arise due to (1) horizontal integration, (2) vertical integration in production, and (3) the diversification services provided by the MNE.

A thorough review by Calvet (1981) provides two complementary hypotheses concerning the MNE. According to Calvet, the MNE's existence may be explained along the lines of the appropriability and internalization hypotheses. The appropriability hypothesis states that firms sell or invest abroad to capture the returns from sophisticated technology. This investment is presumably done after the firm has exhausted the potential within its domestic market. Following this strategy, the firm acquires full knowledge of the products' characteristics and technology before entering the foreign market. Internalization, as alluded to earlier, is a direct outgrowth of market failure and market structure imperfections. Taken together, FDI may result in the creation of an added entry barrier, if such FDI deters new competition (possibly by lowering production costs). The observable outcomes of foreign involvement may then be related to value creation.

The MNE and Value Creation

The investment decision within the context of financial theory is concerned with the firm's ability to create value. To put this another way, managers should actively seek to invest in projects that have a positive net present value. By doing so the shareholders' wealth position is increased by the amount of the net present value. The firm's decision to operate in international markets can therefore be viewed as an investment that either creates or destroys value. The question of interest then centers on whether managers can successfully use international involvement to increase shareholder value. The answer to this question involves an analysis of the costs and benefits of foreign involvement. And if the benefits do exceed the costs, do the shareholders reap the gain? In addition will shareholders actively seek out those firms that are multinational in nature and pay a premium for those shares?

How can value be created through foreign involvement? This value may be created for any of the following reasons:

1. The firm may have specific advantages which may take the following form: (a) technological advantages in products or processes that are not easy to imitate; (b) excess entrepreneurial capacity; and (c) scale economies in marketing and advertising.

2. A supplement to No. 1 concerns the firm's commitment to investment in the form of research and development (R&D). Added R&D expenditures usually result in new products and/or processes. R&D also results

in the production of sophisticated knowledge, which must be internalized due to the public good problem raised earlier.

3. Entry into foreign markets may generate new entry related barriers. If the foreign market gives the firm an economy of scale, or an absolute cost advantage, then the decision to invest abroad may deter new competition. As brought out by Caves and Porter (1977) certain investments taken by the firm can be profitable partly because they deter entry. FDI may therefore create value if such an investment deters entry in the the industry.

Koutsoyiannis summarizes the basic traits of MNE's which are in support of the reasons stated for the possibility of value creation. The chief characteristics of the MNE and their subsidiaries can be noted by the following:

1. FDI usually originates with differentiated oligopoly in the home market and is directed to foreign markets which have similar market structure with product differentiation.

2. MNEs are usually large in size. They are also oligopolistic in the home market, and as mentioned earlier, have exhausted all possible sources of economies of scale.

3. MNEs usually invest in foreign markets which are protected by strong entry barriers. However, even in spite of this, the MNE has substantial advantages in products and/or processes to overcome most foreign barriers.

4. MNEs usually face greater risk in foreign countries in the form of: (a) costs of gathering information, (b) exchange rate fluctuations, and (c) political actions by government.

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Rationale for the MNE

How then can the decision to enter foreign markets create value? For this to be the case, foreign operations must be on the margin more profitable than purely domestic operations. In addition to No. 4 above the firm may also face higher monitoring or bonding costs associated with the management of overseas operations. In situations where market failure is present, the firm must consider the gains from internalizing transactions and the possible agency costs that arise in a multiplant type firm.

The intangible asset hypothesis supports the concept of value creation from foreign operations. Successful firms in most industries possess one or more types of intangible assets. An asset may represent technology (i.e., knowledge about how to produce a cheaper or better product at given input prices) and may take the form of a patented process or design. In many cases, this intangible asset yields a rent to the firm and makes the firm appear successful. As discussed earlier, the market failure associated with the transference of sophisticated knowledge prompts the firm to internalize transactions. Here the firm either becomes multiplant in nature, or, if it has exhausted its domestic market, becomes an MNE.

The evidence on the characteristics of the MNE is rather extensive, and supports the value creation due to market failure. In most tests the prevalence of MNEs in an industry is correlated with the structural traits of that industry. The presence of intangible assets as an encouragement to foreign involvement has been affirmed in most studies.

The indicator for intangible assets is usually the outlays for advertising and research and development undertaken by firms. Gruber (1967), Horst (1972), and Wolf (1975) in addition to many others have confirmed that the share of foreign-subsidary assets of U.S. corporations increases significantly with the importance of advertising and R&D expenditures. The market failure present in the market for technology is indirectly confirmed by these studies.

While these studies were solely concerned with confirming the prevalence of MNEs that are horizontally arranged, similar arguments also pertain to the vertical MNE. Horizontal foreign involvement is usually accompanied by the complementary aspects of a firm's domestic operations. In most cases, the foreign subsidiary does not just produce the parent's good for the local market; it also processes semifinished units of that good. Recently, some statistical evidence has appeared on U.S. exports and imports passing between corporate affiliates that sheds light on this mixture of vertical and horizontal foreign involvement. Lall (1980) studied the behavior of U.S. MNE's exports to their affiliates and found the following:

1. Trade is internalized where highly innovative and specialized goods are involved.

2. Trade is internalized where the ultimate sales to final buyers must be attended by extensive customer engineering.

All of this suggests that the usual substitute nature of parent and subsidiary output within a purely horizontal relationship may, in fact, be complementary due to the confluence of horizontal and vertical

relations within the MNE. Therefore, while it may seem that a purely horizontal relationship may yield substitutes in output between parent and subsidiary, this relationship may in fact yield the complementarities that come from vertical integration. This is true since inter-affiliate trade usually occurs in industries populated by large plants and companies capable of meeting the scale-economy problems that arise in disintegration of production (see Caves, 1983, p. 24).

Risk and the Multinational Enterprise

To study the observable effects of multinational involvement, the way in which risk measures are related to the market structure/failure issues is relevant. Many researchers have investigated the risk characteristics of the MNE within the context of the CAPM. One such test conducted by Agmon and Lessard (1977) (henceforth AL) investigated whether investors recognize the international composition of the real activities of U.S. MNEs. To test this hypothesis, AL used a two-stage regression. The first stage involved a two-index version of the international market model.

$$R_j = a_0 + a_1 R_{us} + a_2 R_w + e_j, \quad (1)$$

where

R_j = return on security j ,

R_{us} = return on the NYSE index, and

R_w = return on the Capital International World Index defined to be orthogonal to R_{us} .

Using the estimated coefficients from equation (1), AL suggest that cross-sectionally, a_1 was negatively and a_2 was positively correlated with the proportion of each firm's sales outside the U.S. In essence, AL test the behavioral hypothesis that the price changes of shares of MNEs traded on the NYSE are less responsive to U.S. financial and economic conditions (represented by movements in the NYSE index), but more responsive to changes in world-wide financial and economic conditions. While AL's work does not provide a comprehensive theory or explanation of the effects of international involvement, it does raise interesting questions regarding the possible misspecification of the risk-return relationship that exists for MNEs.

In a similar vein, Hughes, Logue and Sweeney (1975) (henceforth HLS), examine whether the market assigns different risk measures to MNEs, possibly because of operating economies or lower operating risk. In addition, does the market recognize the diversification aspects of the MNE? To examine these questions, HLS use the one factor market model.

$$R_j = a_{0j} + a_{1j}R_m + e_j, \quad (2)$$

where

R_m = return on a domestic or internationally diversified market portfolio.

Using data for 46 multinational firms and 50 domestic firms, where the latter are defined as firms with less than 10 percent foreign sales or

assets, HLS found the following over the period January 1970 to December 1973:

1. MNEs had lower systematic risk, lower unsystematic risk and, therefore lower total risk as defined in equation (2) above.
2. MNEs had lower average returns than comparable firms.
3. The Treynor measure of risk adjusted performance for MNEs exceeded that for domestic firms when R_m in equation (2) was the return on a domestic index.
4. When R_m was computed as the return on a world index, the Treynor measure was quite similar for MNEs and domestic firms.

HLS concluded that investors correctly perceive the possible benefits provided by diversification. They also concluded that this evidence provides support for MNEs being priced in an international context.

In contrast to the work of HLS and AL, Stehle (1977) examines the hypothesis of whether stocks traded on the NYSE were priced nationally or internationally during the period January 1956 to December 1975. As Stehle points out, determining whether assets are priced in segmented (national) markets or integrated (international) capital markets cannot be answered by comparing the results of two cross-sectional regressions using alternative risk measures as the single independent variable. In the regression using the incorrect measure, the model will suffer from the problems associated with errors in variables and as a result least squares estimates will be biased and inconsistent. Stehle therefore uses two different regressions to test his hypothesis of pricing in segmented or integrated capital markets. Specifically, he tests the following:

$$R_i = a_i + b_{iD} R_D + g_i v_w + u_i, \quad (3a)$$

$$R_i = a_i + b_{iw} R_w + d_i e_d + u_i, \quad (3b)$$

where

R_i = return on security i ,

R_D = return on a domestic market portfolio,

v_w = the component of an international market portfolio's rate of return uncorrelated with R_D (i.e., nondomestic international risk),

R_w = return on an international market portfolio,

e_d = the component of a domestic market portfolio's rate of return uncorrelated with R_w (i.e., risk that is diversifiable internationally but not domestically), and

u_i = random factor which is uncorrelated with either R_D or R_w .

Using portfolio test similar to those described in Fama and MacBeth (1973), Stehle finds the following:

1. Neither the segmented markets model nor the integrated capital markets model can be rejected in favor of the other.
2. Rate of return variations that are nondiversifiable in an international capital market (measure by b_{iD} and g_i) command a higher mean rate of return, while rate of return variations that are diversifiable internationally but not domestically (measured by d_i) do not command a positive premium.

3. b_{iD} and g_i are negatively correlated ($R = -.25$) implying that low beta firms tend to have higher nondomestic systematic risk than high beta stocks, and therefore, command a higher risk premium than that predicted by a model of segmented securities markets.

While Stehle's results are inconclusive, this may be attributable to the tests conducted on NYSE firms without regard for whether the firms were multinational or not. In addition the segmented markets approach may require that the degree of international involvement be taken into account. Another possibility for Stehle's inconclusive results stems from the possible misspecification of the appropriate factor model. If other factors are relevant for the pricing of capital assets then such a test as proposed by Stehle may not be appropriate.

Market Power and the Multinational Firm

Since we cannot accept either an integrated or segmented model of the pricing of NYSE firms, how can we resolve many of the anomalies present in the two-factor CAPM. Note that Stehle finds that low beta firms are the larger firms traded on the NYSE. In addition, we know that the larger firms on the NYSE are multinational. And as mentioned earlier, one salient characteristic of MNEs is the need to appropriate the rents from sophisticated technology. While the questions of investor recognition of international diversification and pricing in segmented or integrated capital markets are interesting in their own right, a more fruitful approach in the study of the MNE lies in the

concept of value creation. As alluded to earlier, the effects of foreign involvement may be more appropriately discussed in terms of the hypotheses of why firms invest abroad. These foreign investment effects may possibly take two forms: (1) the inability to assess accurately the beta of the firm, or (2) the presence of a missing factor. Earlier we mentioned that the MNE creates an internal market for the transfer of knowledge which replaces the missing external market for research. Therefore the results of the studies on the measurement of MNE risk may be misplaced since none considered the effects of market structure imperfections.

Evidence of the effect of monopoly power and its impact on valuation in an international context was independently studied by Errunza and Senbet (1981, 1984) (henceforth ES) and Hirschey (1981). ES study a variety of hypotheses related to international involvement using a specification employed by Thomadakis (1977). Specifically ES test for the impact of various risk and market structure oriented variables as they affect the firm's excess market value (EMV). Using the technique of partial correlation analysis, ES test for the significance of the variables appearing in equation (4).

$$EMV = a + b_1 R + b_2 M_c + b_3 M_{ic} + b_4 g_{if}^M + b_5 g_{if}^{M_1} , \quad (4)$$

where

EMV = excess market value defined to be the difference between the market value and book value of a firm's equity (normalized by sales).

R = risk of future excess returns attributable to foreign involvement; measured as the total variability of return.

M = firms' power of oligopolistic restriction regarding the output of currently held assets. M_c is hypothesized to be a function of the industrial concentration ratio (IC). M_{ic} , the international counterpart, is hypothesized to be a function of foreign sales.

M_f = The firm's monopoly power regarding future investments. Following Thomodakis this is computed as IC multiplied by the growth (g) in earnings. M_{if} is the international counterpart and is expressed as growth in foreign earnings (g_i) multiplied by M_{ic} .

Based on two subperiods (January 1968-December 1973 and January 1974-December 1977) ES find that EMV is positively related to the firm's current degree of international involvement. In addition, this relationship was stronger during the former period when there were restrictions in the form of FDI controls and the Interest Equalization Tax. Two points are worth noting concerning ES's results. The former time period was characterized by great turbulence in exchange rate markets. This clouds ES's conclusion concerning a positive market power effect regarding international involvement. In addition there does exist a slight accounting related bias in computing book equity. Accounting procedures require that advertising and R&D expenditures be immediately expensed in the period incurred. This Generally Accepted Accounting Procedure (GAAP) can produce a reduction in total profits and result in

a distortion in the figure reported for net worth. Because these outlays are immediately expensed, an asset does not appear on the balance sheet, and the corresponding entries for deferred taxes and net worth are also missing. While a controversy does exist over whether advertising and R&D expenditures generates long-lived assets (see Demsetz, 1979), some researchers feel that these expenditures do in fact produce the benefits of tangible capital assets (see Ayanian, 1983). Since advertising and R&D outlays can both produce economic benefits extending far into the future, Fruhan (1978) employs a simple heuristic method to control for this problem. He finds that the computed value for return on equity for a large sample of COMPUSTAT firms depends on whether advertising and R&D expenses are accounted for. Therefore a possible bias of unknown magnitude might exist in studies which simply use reported book equity for the computation of EMV. This measurement problem notwithstanding, ES results indicate that multinational involvement is rewarded with a higher excess valuation. The possible cause of this added valuation may be due to the rents appropriated in foreign operations.

Positive valuation effects due to multinationality have also been found by Hirschey (1981). Here valuation effects due to multinationality for 97 U.S. MNEs were examined in a manner similar to ES. Specifically Hirschey estimates the following ordinary least squares equation.

$$\begin{aligned} \text{EMV} = & b_0 + b_1 P/S_D + b_2 P/S_F + b_3 g + b_4 R \\ & + b_5 F/S + b_6 \text{AD}/S + b_7 \text{RD}/S + e, \end{aligned} \quad (5)$$

where

P/S_D , P/S_F = Lerner index for domestic and foreign operations respectively,

F/S = foreign sales/total sales,

AD/S , RD/S = advertising and R&D intensity respectively,

g = growth rate in earnings, and

R = stock price beta coefficient.

The results of equation (5) indicate that foreign market power offers superior valuation effects (i.e., $b_2 > b_1$) possibly due to the differences in competitive environments here and abroad. These findings are consistent with the hypothesis that firms seek out foreign markets to take advantage of economic rent opportunities. Hirschey's results are also consistent with both the appropriability and internalization hypotheses. To see this we can use Johnson (1970) and Magee's (1976) notion that the MNE is a monopolistic producer; not of goods but of information. Johnson and Magee both suggest that the MNE's effort to appropriate the externalities (i.e., the public good problem) tend to segment the information market between private information held by innovating firms and public information. This latter segmentation is nothing other than the internalization hypothesis. Here the firm's internal hierarchy substitutes for the market for information. These ideas are also consistent with the product life cycle concept which is derived under situations where the market for technology is segmented and monopolistic. In Hirschey's regression with all seven variables, the coefficient of the R&D intensity variable, b_7 is positive and

significant at the 1 percent level. This could possibly indicate that firms with higher levels of R&D intensity (and hence a high production of sophisticated technology) are rewarded with higher excess valuation. However, we are not entirely certain that this effect is due solely to multinationality since there are no domestic firms used in Hirschey's sample of 97 firms.

Further work on positive valuation effects is again documented in more recent work by ES (1984). They find that there exists a significant positive relationship between excess valuation (as measured by EMV) and a variety of foreign involvement measures. Rather than simply use the foreign sales percentage figure (FSP), ES also employ three other attributes of multinationality. These are (1) the number of foreign subsidiaries (NOS), (2) an entropy measure of a firm's geographical diversification (ENT), and (3) absolute foreign dollar sales (FAS). While ES state that the foreign earnings and asset percent are poor proxies for the degree of international involvement (DOI), there is really no theoretical justification for any of the four measures that they themselves employ. In addition to the significant relationship found between EMV and the various DOI measures, ES also find that the size and the P/E ratio effect as reported by Banz (1981) and Reinganum (1981) exist in their excess valuation framework. However since their sample firms are all rather large in size, it is not clear what this result really means.

The more interesting approach taken by ES involves a return based asset pricing model similar in spirit to the tests conducted by Banz in

the search for the size effect, Fama and MacBeth (1973), and Black and Scholes (1974). Specifically they propose a generalized asset pricing model similar to the one used by Black and Scholes. However in place of the dividend variable used by Black and Scholes, ES use various measures for the degree of international involvement. The generalized asset pricing model used by ES is of the following form.

$$\begin{aligned}
 R_{kt} = & a + gB_{kt} + d[(S_{kt} - S_{mt})/S_{mt}] \\
 & + t[(F_{kt} - F_{mt})/F_{mt}] + u_{kt} ; \\
 & k = 1, \dots, N, \quad t = 1, \dots, T,
 \end{aligned} \tag{6}$$

where

R_{kt} = return on security k in period t ,

S_{kt} = size or P/E ratio of security k ,

S_{mt} = average size of P/E of the market,

F_{kt} = DOI of security k ,

F_{mt} = average DOI for the market,

B_{kt} = beta coefficient for security k ,

a = expected return on a zero beta portfolio,

g = expected market risk premium,

d, t = contribution of the size effect or the DOI effect on returns, and

u_{kt} = random error terms.

To obtain time series estimates of a, g, d , and t ES use ordinary least squares (OLS), generalized least squares (GLS), and Maximum Likelihood

Estimation (MLE). ES state that the three methods give similar results, and as such only OLS and GLS results are reported. The MLE procedure used by ES follows the work of Litzengerger and Ramaswamy (1979), (henceforth LR) and will be discussed in Chapter 3. Note however that this method, unlike OLS and GLS does not use the portfolio grouping technique to overcome the errors-in-variable problem. Rather it is hypothesized that the error in beta estimation is related to the standard error of beta obtained from a market model regression. Based on this LR demonstrate how to correct asymptotically for this problem. Therefore is is not necessary to group securities into portfolios, and this method tests equation (6) with individual security data. As for the size and P/E effects, ES find this effect to be statistically insignificant over the entire period (1971-1978). This result is consistent with the latest period reported in Banz (1981), Basu (1983), and Brown, Kleindon and Marsh (1983). In most cases, the estimated coefficient of the degree of international involvement, t , is significant and negative. Within the framework established by ES, this measure should be negatively correlated with expected returns, since share prices of MNEs are bid up (and returns down) due to the diversification benefits of international diversification.

While ES provide evidence for a positive valuation effect with respect to DOI, all the return based tests together seem inconclusive. In one reported case the coefficient of the foreign sales percent is positive and significant at the 12 percent level. Since the sole role of the MNE in the ES model is to complete the market, a positive DOI

effect in the return based tests cannot be explained. The market completeness argument is used since it is assumed that there are barriers present which do not allow individuals to invest abroad. However this scenario ignores much of the empirical work on the MNEs ability to appropriate rents from sophisticated technology. In their particular model it may be reasonable to assume that the DOI effect should be negative. However, earlier arguments on the reason for foreign involvement stem from the value creation of the MNE's production and investment decisions. If the gain due to the value garnered from the appropriation of rents outstrips the possible gains from pure diversification, existing shareholders may demand added compensation in the form of higher expected returns (not lower as argued by ES). While ES do not posit any particular market (product or factor) scenario, it seems that the mere existence of the MNE would require one. The market completeness argument is not sufficient. It appears that foreign involvement causes additional "systematic" uncertainty not captured by beta.

How then can one investigate the MNE? Economists have long studied the effective performance of markets and the competitive effects of the MNE. Hypotheses about market power as an influence on the performance of domestic industrial markets has been tested by examining the influences determining an industry's profitability. Bergsten, Horst, and Moran (1979) studied the effects of foreign investments by U.S. companies on the profitability of their domestic operations. This is an important issue since investors would assume that resources placed

abroad will earn at the margin the same return as if they were placed in the U.S. However average profit may be augmented in three ways according to Bergsten et al.

1. Intangible assets discovered or developed in a firm's domestic market may yield rents when used abroad. The fixed costs of using these assets, spread over a larger business allow for higher profits. This is documented in Severn and Lawrence (1974) who conclude that the profits of U.S. MNEs were augmented through their ability to amortize the cost of research activities over worldwide markets.
2. The MNE's diversification allows it to undertake riskier activities than firms with fewer options for pooling their risks. However with enough MNEs, these rents should be competed away.
3. Assets acquired overseas may allow the U.S. MNE to block entry and to intimidate rivals. While not as strong an assertion as (1) and (2), this is a possibility. However, as yet, there is no decisive evidence that the MNE status feeds back to make domestic markets more or less concentrated.

Bergsten et al. found that the domestic profits of U.S. industries increased significantly with the extent of their overseas activities, as well as with their research and sales promotion outlays. As such, since average profits are augmented by overseas activity and intangible assets (measured by research outlays) this may further support the market power gained from internalizing the market for knowledge. Again this is an

effect among large firms. Rather in the search for the effects of market power, research should be directed to those firms where market power most likely exists--large firms. This is common in industrial organization. Smirlock, Gilligan and Marshall (1984), reexamine the structure-performance-conduct (SPC) relationship. In examining this question they employ the data used by Shepard (1972). This data consists of leading well established firms. If a SPC relationship exists it should be evident in this sample. Using a similar line of reasoning, a market power effect should be present in those firm that have market power. For present purposes, the market powerful firms are multinational.

Understanding the effects of corporate international diversification is further aided by the work of Fatemi (1984). Fatemi studied the effects of international involvement on 84 multinational firms and a control group of 54 domestic firms. The findings of the study are:

1. Disregarding risk, the returns on MNEs and domestic firms are the same.
2. The MNE's portfolio total return variance is less than that of a purely domestic portfolio.
3. MNE's portfolio betas are lower and more stable than their domestic counterparts.
4. Risk adjusted abnormal returns for the MNE and domestic portfolio are virtually identical.

While No. 2 is consistent with the findings of HLS, they find that domestic firm returns are higher than the returns of the MNE.

Fatemi also conducts an analysis of the cumulative average residuals surrounding the initial period of foreign involvement. During the 14 months preceding the initial foreign investment, abnormal returns rise by approximately 18 percent. Clearly this reflects the market's reaction to the favorable effects of foreign involvement. However it is not clear that this abnormal rise in residuals was due to the diversification that MNEs provide rather than to the added market power gained abroad. Recall that Hirschey found that foreign market power (measured by the Lerner Index) resulted in higher excess valuation than did domestic market power. Therefore the effect on shareholder's wealth may be due to the value associated with the rents appropriated in foreign markets.

Multifactor Models--The Arbitrage Pricing Model

We are now confronted with two empirical regularities. First, MNEs are some of the larger firms traded on the NYSE. Second, there does exist a positive valuation effect which is related to the firm's degree of international involvement. In addition to this, the size effect documented by Banz (1981) also adds more confusion to the issue. How then can this issue be resolved? The market power effect which has been well documented among large NYSE firms may provide a partial answer to the question. The issue of a size effect as presented by ES as well as Fatemi can be overlooked if attention is restricted to the pricing of large firms. Banz's research points to the possibility of a missing factor both among large and small firms. The research on the inability

of the two factor CAPM in explaining the cross-sectional behavior of security returns is now overwhelming. The alternative is the multi-factor Arbitrage Pricing Model.

The Ross APT has now become the competing model for explaining the cross-sectional behavior of security returns. Specifically the APT derives a pricing relationship of the following form:

$$E(R_i) = a_0 + a_1 b_{i1} + a_2 b_{i2} + \dots + a_n b_{in}, \quad (7)$$

where

$E(R_i)$ = expected return on security i ,

a_0 = expected return on a portfolio with all b coefficients equal to zero,

b_{in} = the sensitivity coefficient of security i with factor n ,
and

a_n = the market price associated with factor n .

As such the APT allows for the possibility of more than one priced factor. However a serious drawback of the APT is its silence on the actual description of the factors.

Tests of the APT are extremely difficult to formulate since the factors are not specified by the theory. To test such a theory both the factors and the sensitivity coefficients [i.e., the b coefficients in equation (7)] must be defined. One such approach taken by Roll and Ross (1980) uses the statistical technique of factor analysis to simultaneously specify both the factors and the loadings (i.e., the b coefficients). This approach is much like the first pass regression used in

tests of the CAPM. The second stage test involves cross-sectional regressions in the spirit of Fama and MacBeth (1973). However while Roll and Ross find evidence that supports the three factor version of the APT, the use of factor analysis renders the economic interpretation of these findings difficult.

An alternative to using factor analytic methods to test for the existence of additional priced factors is to either a priori specify the factors that affected stock returns or the characteristics of stocks that affect returns [e.g., see Elton and Gruber (1984)]. Within the context of the market power effect for MNEs, the latter approach seems appropriate. Tests for additional priced factors were originally conducted in the early tests of the CAPM. Recall the test conducted by Fama and MacBeth. Specifically they tested the following pricing relationship:

$$E(R_i) = a_0 + a_1 b_i + a_2 b_i^2 + a_3 S_i \quad (8)$$

where additionally S_i is the residual risk of security i . A test as is conducted for equation (8) is really a joint test of a multifactor model in general and the specific characteristics that Fama and MacBeth hypothesized as explaining expected returns. In addition to the test conducted by Fama and MacBeth, Litzenberger and Ramaswamy (1981) tested for the pricing of a dividend yield variable, and found it to be statistically significant. This latter finding may be viewed as support for a specific multifactor model. Other work that examines firm characteristics and expected returns is presented in Sharpe (1982).

Sharpe begins with a multifactor model which includes the following firm characteristics: (1) stock beta coefficient, (2) dividend yield, (3) market value of the firm's equity, (4) long term bond beta coefficient, (5) historical alpha from a past market model regression, and (6) eight industrial sector variables. Sharpe conducted tests on 2,197 stocks on a monthly basis for 1931-1979. While this model is rather ad hoc in nature, the findings are interesting. As Sharpe expected the coefficient of the beta and dividend variables were positive, while the coefficients for market equity, bond beta, and alpha were negative. The various sector membership variables varied in sign. In most cases the market price attached to each of these variables was significantly different from zero in 30 percent of the months.

Sharpe's results do prove encouraging in using this approach in tests of the APT. Recently Brown and Weinstein (1983) (henceforth BW), employed a technique referred to as the Bilinear Paradigm (BP). The rationale used by BW is that all equilibrium pricing models (either CAPM or APT) specify a constraint on the set of parameters in the model. The bilinear model tests for whether this constraint set is refutable. The constraint imposed by the equilibrium model is that there exists a linear relationship across securities relating expected returns to the prespecified characteristics. The model can be used for cases where the firm characteristics are specified a priori (i.e., Sharpe and Fama and MacBeth) or where neither the factors nor the loadings are prespecified (i.e., Roll and Ross).

BW find that the data does seem to support the three factor version of the APT, after accounting for the large number of observations used in their tests. The main contribution shows that the BP is an extremely simple method in testing the implications of most hypothesized asset pricing models. In addition we do not need to invoke the APT to use the bilinear paradigm.

Missing Factors and the MNE

The evidence on the influence of market power lends support for the presence of a missing factor. In Banz's study of the small firm effect, an oversight was not recognizing that the large firms were more likely to have foreign operations than small firms. Stehle's (1977) results do confirm this hypothesis. Therefore rather than look at the sheer size of a firm, it is argued that market power is a more meaningful variable to use. Since research has indicated that market power is related to foreign involvement, market power then may be the missing factor needed in the pricing of MNE securities. Also since size might be a proxy for foreign involvement, testing an asset pricing model (i.e., the APT) with variables that measure the economic outcome of foreign involvement is necessary (rather than use the foreign sales percent employed by ES).

To begin a discussion of how value creation can lead to the presence of another priced factor, we may refer to some of the original work by M&M. According to M&M the value of a firm is comprised of two parts. Specifically the value of the firm is:

$$V(F) = V(AIP) + V(GO) ,$$

where

$V(F)$ = the value of the firm,

$V(AIP)$ = the value of currently held assets, and

$V(GO)$ = the value of the firm's growth options.

In the perfect capital and product markets paradigm (within a steady-state classical economy), the latter term, the value of growth options, will be equal to zero, and the firm's market value will equal its book value. However if any market imperfections exist, then the value of the growth options will be positive. Where does the value of the growth options derive? Thomadakis (1977) examined the relationship between EMV (a measure of market power) and various characteristics of the firm. He finds that current market structure implies an ability for firms to maintain their advantage into the future. In essence firms are more than likely to be able to reproduce their oligopolistic advantages through the process of new investment and economic growth. Monopoly power then can give rise to growth options that have value. Using the theory put forth by the CAPM implies that growth options will all be transactions of zero net present value. However, since many firms do have valuable growth options, then using a single factor model is subject to question. This is so since beta measures the systematic risk of the entire return stream. However in the presence of growth options the components of the return stream will have different risk. That is in the presence of market power beta may be affected, and another factor may be relevant for pricing.

How can beta be affected by market power. Subramanyan and Thomadakis (1980) (henceforth ST) present a partial equilibrium model of the determinants of systematic risk. To accomplish this, they specify two markets. First is the capital market, where security prices are determined in accordance with the CAPM. Second the demand conditions on the product side are also specified. Essentially ST demonstrate that among those firms that use similar production technology, those with higher (lower) monopoly power will exhibit lower (higher) beta. While it is not clear how monopoly power can exist in a capital market described by the CAPM, it is equally unclear why the finance literature allows positive net present values to exist in capital budgeting problems solved with the CAPM. However the ST results are consistent with the M&M statement concerning the value of the firm. Given that beta measures the systematic risk of the entire return stream, then the higher the value of growth options the lower is the measured beta on assets in place. This is true since the value of assets in place represents a smaller proportion of total firm value [for a similar argument on the effects of growth and beta see Myers and Turnbull (1977)]. Therefore in the presence of market power beta alone is not able to describe expected returns.

The relationship between beta and the degree of foreign involvement has now been well documented. Recalling the results of AL, multinational firms are rewarded with lower beta. Additional support for the determinants of beta can be examined within the context of the model developed by Hill and Stone (1980) (henceforth HS). Fatemi examines

the effect of foreign involvement on beta using the HS model. Fatemi estimates the following linear model.

$$b^M = a_0 + a_1[b^O/(1 - f)] + a_2f + a_3f^2 + d_1DOI + d_2DOI^2, \quad (9)$$

where

b^M = market beta coefficient,

b^O = operating beta coefficient,

f = financial leverage, and

DOI = degree of international involvement net of the effects of all financial leverage variables.

Whether beta was computed against the NYSE index or a world market index, the results in equation (9) indicated that beta is negatively related to the degree of foreign involvement. This result therefore contradicts the results of Jaquillat and Solnik (1978). However since foreign involvement results in higher levels of EMV, an indirect relationship between EMV and beta may be proposed. This hypothesis based on the results of Fatemi and ES is consistent with the model developed by ST.

A Multifactor Model for the MNE

Among the larger firms traded on the NYSE (i.e., MNEs) there does exist a market power effect. However, as yet, there has been no research on testing whether this effect is priced. Only the latest work

by Errunza and Senbet has addressed the effects of multinationality within the context of an asset pricing model. However the intent of the statistical test conducted by ES was not to verify a particular form of an asset pricing model. This research proposes to test a general multi-factor model with a prespecified set of factors. As argued earlier, it is hypothesized that the missing factor in the pricing of multinationals is market power.

To investigate the presence of a missing factor, this research will employ a generalized asset pricing model that is consistent with some of the many forms of the APM.

$$E(R_j) = a_0 + a_1 b_j + a_2 MP_j, \quad (10)$$

where

$E(R_j)$ = expected return on security j ,

a_0 = expected return on a zero beta portfolio,

a_1 = expected market risk premium,

b_j = beta coefficient for security j ,

a_2 = the contribution of the market power effect to expected return, and

MP_j = the market power of firm j .

Note that this is a joint test of a linear model and the set of variables hypothesized to affect expected returns. Since this research will be concerned with documenting a market power effect for multinationals no attempt will be made to redocument the size effect. And since the

test is primarily among large firms, there is no need to include a size variable in equation (10). This is consistent with the findings of Banz, where the most pronounced size effect was between the largest and smallest firm portfolios.

The rationale for the inclusion of the market power variable relates to the inability of beta to explain the cross-sectional variability in expected returns. Hirschey states that his findings are consistent with the hypothesis that returns from U.S. markets tend to be less secure, and therefore less valuable, than are returns from foreign markets due to both real and institutional differences in competitive environments. Beta may pick up some of the significance of this effect, however it is not clear that the entire effect will be captured. How then will investors perceive the effects of situations that deviated from the perfect markets paradigm. In a general equilibrium framework the market power exercised by firms will result in a reduction of consumer surplus. If existing shareholders are rational, then it is reasonable to assume that they will demand compensation for the rents appropriated by the firm. Again any deviations from the perfect market model where the firm charges consumers the marginal cost of production, will come at the expense of the consumer (or investors who purchase the consumption good).

A model of the firm's market power, and returns will aid the argument for the inclusion of the variable MP in equation (10). Thomadakis (1976) has developed such a model that investigates the effect of monopoly power on the firm's price and output decisions. To state

the model simply, Thomadakis assumes the following equations for the economy.

1. Demand:

$$p_t = a_t X_t^{-n},$$

2. Revenue:

$$\text{Rev}_t = a_t X_t^{(1-n)},$$

3. Marginal Revenue:

$$\text{MR}_t = (1-un)a_t X_t^{-n},$$

where

p = price received in period t ,

X = quantity announced in period t ,

a_t = random demand parameter, and

u = monopoly power parameter in the range $0 \leq u \leq 1$. For $u = 1$

the firm prices as a monopolist.

In the single period model, the firm invests at the beginning of the period and liquidates all of its assets at the end of the period. Based on expectations, the firm decides on its output level at the beginning of the period. Using the CAPM to value the random end of period cash flows, Thomadakis finds:

1. The level of systematic risk of the firm's average returns is influenced by monopoly power.
2. As the share of monopoly rents grows, average cost diverges farther from marginal cost.

As long as there exist differences in the risk among revenue, cost, and end of period value Nos. 1 and 2 will hold.

A more interesting approach lies in the multiperiod application of such a model, since the concept of monopoly power is somewhat ambiguous in a single period context. Thomadakis employs a recursive valuation argument similar to that employed by Myers and Turnbull (1977). Specifically at the terminal period T , the value of the firm is simply:

$$V_T(\text{FIRM}) = V_T(\text{AIP}) + V_T(\text{GO}) .$$

Working backwards in a fashion analogous to dynamic programming, Thomadakis shows that uncertainty in stockholder's returns arises from two distinct sources:

1. First is the element that is associated with the intraperiod fluctuations in earnings.
2. Second is the element related to the interperiod variation of expectations and the consequent capital gains and losses.

The random character of rates of return will result from different stochastic mechanisms (i.e., for revenues and costs) whose weight will depend on monopoly power. What Thomadakis does describe is that the stochastic nature of shareholder returns is positively related to the ratio $V(\text{GO})/V(\text{Firm})$. Since $V(\text{GO})$ can be considered an option on the

assets already in place, we may assume that the risk of $V(GO)$ is greater than the risk of the assets in place using the logic of Galai and Masulis (1976).

If that is the case, then growth options should command a positive price. In equation (10) the estimated coefficient for the market power variable should then be positive for those firms exercising market power (i.e., multinationals).

CHAPTER 3

METHODOLOGY

A variety of statistical tests will be used to test for the market power effect. OLS and GLS estimates will be generated using portfolio based tests. In addition the MLE procedure outlined in LR will be used. Lastly, the Bilinear Paradigm (BP) will be used. For the BP, two separate tests will be conducted. First factor analysis will be used to specify both the factors and their loadings simultaneously. Second the characteristics that are hypothesized to affect expected returns will be specified, and a test similar to that performed with factor analysis will be conducted. A discussion of OLS, GLS, and the MLE procedures will be followed by a description of the BP.

Maximum Likelihood Estimation

Traditionally equation (10) has been estimated by pooling time-series and cross-section data. Specifically, since expectations are not observable, we need to assume rational expectations, and we therefore use historical returns as a proxy for expected returns. If the parameters in equation (10) are intertemporally stationary, then we may pool and estimate equation (10) as:

$$R_{jt} = a_0 + a_1 b_{jt} + a_2 MP_{jt} + e_{jt}, \quad (11)$$

$$j = 1, \dots, N_t \quad t = 1, \dots, T$$

Here MP_{jt} either refers to the market power for firm j in time period t or to the degree of international involvement. In addition N_t refers to the number of firms available in period t . Past evidence has shown that the variance-covariance matrix of the terms e in equation (11) is not proportional to the identity matrix. This renders OLS estimates of the parameters in equation (11) inefficient (i.e., the OLS estimates are not minimum variance). This is true for either the time series or cross-section regressions implied by equation (11). In addition to the inefficiency of the OLS estimates, a security's beta coefficient is measured with error, thereby causing the OLS estimates to be inconsistent due to the classic errors-in-variables problem. Following LR (1979), we will now derive MLE estimators that are asymptotically consistent for the parameters in equation (11).

For the moment, let us assume that the true values for all variables on the right hand side of equation (11) are known, so that the only statistical problem presented by equation (11) is heteroscedasticity. Defining the vector of realized returns as R and the matrix of explanatory variables as X , we can represent the system as:

$$R = XA + e, \quad (12)$$

where

$$\begin{aligned} R &= \{R_1, R_2, \dots, R_T\}, \\ R_t &= \{R_{1t}, R_{2t}, \dots, R_{N_t t}\}, \\ X &= \{X_1, X_2, \dots, X_T\}, \end{aligned}$$

and

$$X_t = \begin{bmatrix} 1 & b_{1t} & MP_{1t} \\ 1 & b_{2t} & MP_{2t} \\ \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot \\ \cdot & b_{Nt} & MP_{jt} \end{bmatrix}$$

The vector e in equation (12) follows the description for R above. For all subsequent models, we will assume the $E(e) = 0$ for all periods t and all firms N . In addition we assume that the variance-covariance matrix of the errors in period t are described by a positive semidefinite matrix V_t with dimensions N_t . Also as is done in most studies, security returns are assumed to be serially uncorrelated. Based on these standard assumptions, the variance covariance matrix, denoted by V , is block diagonal with variance-covariance matrices V_t appearing along the diagonals. Given the assumptions stated thus far, the best linear unbiased estimator of A is given by the Aitken or GLS estimator.

$$A = (X'V^{-1}X)^{-1}X'V^{-1}R. \quad (13)$$

Given that the values $\{a_0, a_1, a_2\}$ are assumed to be intertemporally stationary, A can be estimated by pooling the T independent GLS estimates of A from the available data in period t .

$$A_t = (X_t' V_t^{-1} X_t) X_t' V_t^{-1} R_t . \quad (14)$$

With the monthly estimates of a [the coefficients a in equation (10)], we can now estimate the overall market price and its associated error variance. These are

$$a_k = \sum_t (a_{kt}/T) , \quad (15)$$

and

$$s^2(g_k) = [\sum_t (a_{kt} - a_k)^2 / (T - 1)] . \quad (16)$$

Equations (15) and (16) can be used to estimate the significance of the intercept, the market price of risk, and the contribution of the size effect (i.e., a_k for k equal to 0, 1, or 2). A problem now arises since the matrices V_t cannot be specified a priori. To simplify this task, we will assume (as did LR) that the Sharpe single index model correctly describes the process generating returns.

$$R_{it} = a_{it} + b_{it} R_{mt} + e_{it} , \quad (17)$$

$$i = 1, 2, \dots, N_t ,$$

where

$$\begin{aligned} \text{cov}(e_{it}, e_{jt}) &= 0 \quad \text{for } i \text{ not equal to } j, \\ &= s_{ii} \quad \text{for } i \text{ equal to } j. \end{aligned}$$

Given this specification, V_t , can be specified as:

$$\begin{aligned} V_t(i, j) &= b_{it} b_{jt} s_{mm} \quad \text{for } i \text{ not equal to } j, \\ &= b_{it}^2 s_{mm} + s_{ii} \quad \text{for } i \text{ equal to } j, \end{aligned} \quad (18)$$

where s_{mm} is the variance of the market return in period t . With this specification the period t estimator of A is given by

$$A_t = (X_t' P_t^{-1} X_t)^{-1} X_t' P_t^{-1} R_t, \quad (19)$$

where P_t is a square matrix of dimension N_t whose elements are

$$\begin{aligned} P_t(i, j) &= 0 \quad \text{for } i \text{ not equal to } j, \\ &= s_{ii} \quad \text{otherwise.} \end{aligned} \quad (20)$$

LR show that the estimator given by equation (19) is the GLS estimator for A .

Given the method to correct heteroscedasticity, we must now confront the errors in variable problem. To address this problem, we note that in past studies (e.g., Fama and MacBeth) an instrumental variable approach was used to correct for the error in beta. Specifically, a market model regression was run using data prior to the period for all cross-sectional regressions. That is beta in period t was estimated from data covering the period covering the sixty preceding months.

$$R_{i\tau} = a_{i\tau} + b_{i\tau} R_{m\tau} + e_{i\tau}, \quad (21)$$

$$\tau = t - 60, \dots, t - 1.$$

Since the estimated beta equals the true beta plus some measurement error (denoted as v_{it}) in the presence of the assumed Sharpe single index model, the variance of the measurement error, $\text{var}(v_{it})$ is proportional to the variance of the residual risk term in equation (21) [i.e.,

$\text{var}(e_{it})]$. This is true since it is assumed that the $\text{cov}(e_{it}, e_{jt})$ equals zero, and therefore $\text{cov}(v_{it}, v_{jt})$ also equals zero. Note also that the regression given by equation (21) yields estimates for the variance in beta error $[\text{var}(v_{it})]$, as well as the variance of the residual risk term $[\text{var}(e_{it})]$.

The GLS estimator in equation (19) deflates each variable by a factor proportional to the residual standard deviation. To correct for the errors in variable problem, we note that the variance of error measurement in beta is proportional to $\text{var}(e_{it})$. Specifically, given the standard OLS model, the variance of the error in beta from equation (21) is the standard error of the estimate produced in all regression runs. Given these assumptions, LR show that the MLE estimator for month t , given that v_{it} and e_{it} are joint normal, is given by the following:

$$A_t = \left[\frac{X_t^*{}' X_t^* - \begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}}{N_t} \right]^{-1} \frac{X_t^*{}' R_t^*}{N_t} \quad (22)$$

The starred matrices and vectors indicate that the elements of the matrix X_t and vector R_t have been deflated by the term $\text{var}(v_{it})^{1/2}$. Given that v_{it} and e_{it} are jointly normal then the expression for A is

$$A = \Sigma_t (A_t/T) \quad (23)$$

Equations (22) and (23) give the period t and overall estimate of A respectively. We now have the methodology for MLE and GLS estimators for the parameters in equation (11). In essence in each period t a cross-sectional regression is run using all available data to obtain the estimates of the coefficients in equation (11). To obtain the significance of the estimated coefficients the average value of the estimated coefficients is computed [as given by equation (23)], and a simple t test is performed. In this test using MLE, the firm's market power, foreign sales percent and beta coefficient are updated annually. Note that the MLE method does not require any grouping. The cross-sectional regressions are therefore run using the data for individual securities. In addition to the MLE method used on individual security data, we can also compute OLS and GLS estimates using the portfolio grouping technique.

OLS and GLS Estimators: Portfolio Grouping Method

To assess the effect of the additional factor MP in equation (11), the portfolio grouping method used by Fama and MacBeth (1973), Black, Jensen, and Scholes (1972), and Banz (1981) can be used. To test whether the coefficients a_1 and a_2 are statistically different from zero, we need estimates of these coefficients. To obtain estimates, we form portfolios whose returns have expected values equal to a_1 and a_2 and whose expected returns reflect only the effects of b_j and MP_j . We can then compute the time series of returns on these portfolios and test whether the mean returns are statistically different from zero. In

essence we estimate the values a_1 and a_2 such that the effects of the other variable have been "zeroed" out. While this appears to be a formidable task, Fama (1976) shows that the method of ordinary least squares regression provides a convenient way to obtain portfolio returns that have the desired properties. The ML estimates also have these desirable properties.

As in the case of the MLE procedure, we assume rational expectations and use historical returns as a proxy for expected returns. In the case of this market power test, data availability warrants forming only twelve portfolios. Each portfolio will contain a minimum of 12 securities depending on each time period t . To begin, 12 equally weighted portfolios are constructed in the manner similar with previous studies. Starting from January 1965, for each of the available securities that have five years of stock return data prior to the month, a single factor model (market model hereafter) as stated in equation (21) is estimated. R_{mt} is the value weighted NYSE Index for month t .

The equal sized portfolios, are ranked in terms of the market power factor, MP and the size of the beta coefficient. Four groups of securities are formed in order of the market power factor, and three portfolios are constructed within each group in order of beta. Every year, from 1965 to 1979, the process is repeated such that 12 intermediate portfolios are revised using the market power factor at the beginning of the year, and using beta estimated for equation (21) with 60 months of prior return data. For each year, each intermediate portfolio has twelve monthly returns. Hence we have essentially twelve portfolios

with 120 monthly returns. This repeated revision of the twelve portfolios, is intended to ensure that the characteristics of the portfolios will be stable even though the individual stocks' characteristics are changing.

We then treat each intermediate portfolio as a single security and obtain parameter estimates of the testing model in equation (11). Again, for each month starting from January 1970 on, we reestimate the market model in equation (21) for each intermediate portfolio using 60 monthly returns prior to the month in question. Then for each month, we estimate the cross-sectional regression in equation (11) in order to obtain the α coefficients. Since the characteristics of the intermediate portfolios are relatively stable, the estimated α coefficients can be averaged over any examination period to provide final test statistics.

The above procedure generates OLS estimates. In addition, the second stage analysis can use the "intermediate" portfolio data deflated by the variance of the error term from the prior 60 month market model regression to provide GLS estimators for the portfolio grouping method. Using the arguments developed by LR, these estimates will be the GLS estimates.

The Bilinear Paradigm

Brown and Weinstein (1983) present a model referred to as the bilinear paradigm to test the propositions implied by the Ross APT. Since this research will test a joint hypothesis of a general multifactor model and a set of hypothesized characteristics, the use of this

model is appropriate. As stated earlier, the BP can be used to test many of the hypotheses found in Fama and MacBeth as well as Banz. For current purposes, the BP will be recast to test for differences between multinational and domestic firms. To introduce the general model, equation (10) will be recast into its stochastic form.

$$R_i = a_0 + a_1 b_i + a_2 MP_i + u_i . \quad (24)$$

Here R_i is the ex-post return on security i , a_0 , a_1 , and, a_2 represent the return on a zero beta portfolio, the market risk premium, and the contribution of the market power effect respectively. Now consider T observations on the process described by equation (24) in matrix form.

$$R = AB + U . \quad (25)$$

In this instance the matrices are defined as follows:

$$\begin{matrix} R \\ T \times N \end{matrix} = \begin{bmatrix} R_{11} & R_{12} & \dots & R_{1N} \\ R_{21} & R_{22} & \dots & R_{2N} \\ . & . & \dots & . \\ . & . & \dots & . \\ . & . & \dots & . \\ R_{T1} & R_{T2} & \dots & R_{TN} \end{bmatrix} .$$

$$\begin{matrix} A \\ T \times 3 \end{matrix} = [a_0 : a_1 : a_2] .$$

$$B_{3 \times N} = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ b_1 & b_2 & . & . & . & . & . & . & . & . & b_n \\ MP_1 & MP_2 & . & . & . & . & . & . & . & . & MP_n \end{bmatrix}$$

The elements of U are zero mean stochastic error terms uncorrelated across time, but potentially correlated across assets. The model represented by equation (25) was originally developed by Kruskal (1978). Models fitted to most multivariate data can be considered as special cases of equation (25). An interesting application of the BP will involve a test of equation (11) for multinational and domestic firms. The use of the BP will be outlined below.

Consider the BP in equation (25), and partition the N security universe in disjoint groups of n_1 and n_2 securities where the former partition represents multinational firms, and the latter partition represents domestic firms. In order to use the BP the included firms must have complete return data for the factor analysis tests. In addition, the included firms must also have complete data on market power, beta, and the foreign sales percent for tests of the market power effect. Due to the data availability problem tests of the bilinear paradigm will use information for 138 multinational firms and 138 domestic firms. These firms all had continuous data for the period 1972-1979. Therefore tests of the BP will not cover the period 1970-1979 as in the case of MLE, GLS, and OLS estimates described earlier.

With this partition, equation (25) can be rewritten as:

$$[R_1 : R_2] = [AB_1 : AB_2] + [U_1 : U_2] . \quad (26)$$

Note that equation (26) imposes the bilinear restriction that the market prices associated with the factors in matrix B are the same across groups of securities. In addition we can allow the prices to differ so that equation (26) is written as:

$$[R_1 : R_2] = [A_1B_1 : A_2B_2] + [U_1 : U_2] . \quad (27)$$

To test the BP expressed in equations(25) through (27), we can maximize the likelihood function implied by each model, and form the ratio of maximized likelihoods. In most circumstances minus two times the natural logarithm of this ratio is distributed a chi-square with degrees of freedom equal to the number of restrictions imposed by the null hypothesis.

To estimate equation (25), assume that the rows of U are distributed as multivariate normal with a mean vector of zero and a diagonal covariance matrix D. Given these assumptions the likelihood function for the observations in the bilinear model is given by the expression L.

$$\begin{aligned} L(A,B,D,|R) &= p(R|A,B,D) \\ &= cD^{-t/2} \exp\{-1/2\text{tr}D^{-1}[R - AB]'[R - AB]\} . \end{aligned} \quad (28)$$

BW show that the necessary conditions for a maximum of the logarithm of equation (28) implies the following regressions.

$$\begin{aligned}
 B &= (A'A)^{-1}A'R, \\
 A &= RD^{-1}B'(BD^{-1}B')^{-1}.
 \end{aligned}
 \tag{29}$$

These equations have the following simple interpretation. If the matrix A is known then the first line is a set of n time series OLS equations where the returns R are regressed on the matrix A one column at a time. If the matrices D and B were known, then the second line represents t cross-section GLS regressions with a heteroscedastity correction given by D^{-1} .

The bilinear model can test a multifactor model on subgroups specified as multinational and domestic firms. To begin, we must break the sample of 138 MNEs and domestic firms into workable subgroups for factor analysis. Six groups of multinational and six groups of domestic firms are chosen. This provides for group sizes of 23 securities, and 46 for the combined test. This breakdown will allow tests for the equivalence of factor structure for the 23 security groups. Here we are testing whether the same factor structure generate returns for the paired 23 security MNE group and the 23 security domestic group. In all, tests will be conducted on 6 groups. In addition three tests of the APT will also be performed.

1. A test of the constancy of the implied risk free rate across groups.
2. A test of the equality of factor prices across groups.
3. A test of both Nos. 1 and 2.

Tests using the bilinear paradigm will be conducted under two scenarios. First factor analysis will be used in a manner similar to BW. Tests for the equivalence of factor structure, as well as the three tests described above will be performed. In addition rather than use factor analysis to estimate the loading coefficients (i.e., the b coefficients), the characteristics that are hypothesized to influence expected returns will also be specified and a bilinear test will be conducted.

The tests of the BP involve the computation of a variety of F statistics. Essentially these tests are simply investigating whether the restrictions imposed by the proposed multifactor model hold. For example hypothesis 1 stated above in an APT world requires that the intercept among groups is equal. The alternate hypothesis would therefore be inequality. The BP tests whether the restriction imposed by the null hypothesis is valid. F statistics for these tests will be discussed.

Since factor analyzing large groups of data is costly, we will follow Roll and Ross and divide the universe of securities into manageable groups. In the factor analysis tests that proceed, six groups of 46 securities will be used. For instance group one will be comprised of 23 multinational firms and 23 domestic firms. To test for the similarity in factor structure maximum likelihood factor analysis (MLFA) will be used. Since the null hypothesis posits similarity in factor structure, MLFA will be conducted on the combined group of 46 securities. To test for equivalence in factor structure between the 23 security

groupings of MNEs and domestic firms, we can form the ratio of maximized likelihoods under the alternative and null hypotheses. BW show that the ratio of maximized likelihoods, l , is given by the following:

$$l = \frac{|D_u|^{-t/2}}{|D_c|^{t/2}} = |D_u D_c|^{-t/2} .$$

Here D_c and D_u represent the MLE estimate of the constrained and unconstrained error covariance matrices. It is known that in large samples minus two times the ratio of maximized likelihoods is distributed as chi-square with degrees of freedom equal to the number of restrictions required to go from the alternative to the null hypothesis. In this particular instance, the degrees of freedom are denoted by r , the product of the number of rows and columns of the matrix A . Large chi-square values relative to a critical value force us to reject the hypothesis of equal factor structure between the 23 security groupings of domestic firms and MNEs. BW show that there is a large sample F statistic that can be computed in place of the chi-square statistic. This F statistic is computed as:

$$F = \frac{(t \text{tr} D_c D_u^{-1} - mt)/r}{mt/(mt - 2r)} . \quad (30)$$

Here the degrees of freedom are $r, (tm - 2r)$. To test hypotheses 1-3 stated earlier, the following procedure is used.

For tests 1-3 of the unspecified multifactor model, the unconstrained error covariance matrix D_u is comprised of the diagonal

elements of the covariance matrix of errors U_u from the multivariate regression used to estimate A_u .

$$R = A_u B_u + U_u, \quad (31)$$

where

$$A_u = [a_{01} : A_{k1} : a_{02} : A_{k2}],$$

and

$$B_u = \begin{bmatrix} 1' & 0 \\ B_{k1} & 0 \\ 0 & 1' \\ 0 & B_{k2} \end{bmatrix}.$$

B_{ki} represents the factor loading matrix estimated using the SAS procedure FACTOR. The model given by equation (31) is thus a general model where both intercept and A_{ki} matrices are allowed to differ across groups. The matrix A_u is estimated as

$$A_u = R D_u^{-1} B_u' (B_u D_u^{-1} B_u)^{-1}. \quad (32)$$

To test hypotheses in 1 through 3 we now need to specify the computation of the constrained (by the null hypothesis) error covariance matrix. F statistics F_1, F_2, F_3 will be used to test these hypotheses. The statistic F_1 is used to test the hypothesis that the implied risk-free rates across the two groups are equal with the matrices A_{ki} possibly differing. The matrix D_{c1} (i.e., the constrained error covariance

matrix under hypothesis 1), is obtained from the covariance matrix of the errors estimated from the following multivariate regression.

$$\begin{aligned}
 R &= A_{c1} B_{c1} + U_{c1} , \\
 A_{c1} &= [a_0 : A_{k1} : A_{k2}] , \\
 B_{c1} &= \begin{bmatrix} & & i \\ & B_{k1} & 0 \\ 0 & & B_{k2} \end{bmatrix} .
 \end{aligned} \tag{33}$$

The first F statistic is computed as:

$$F_1 = \frac{(\text{tr} D_{c1} D_u^{-1} - mt)/t}{mt/t(m - 2(k + 1))} . \tag{34}$$

Here tr refers to the trace operator. To test for differences in the estimated A matrix (with a_0 possibly differing) we estimate D_{c2} with A and B defined as follows:

$$\begin{aligned}
 A_{c2} &= [a_{01} : a_{02} : A] , \\
 B_{c2} &= \begin{bmatrix} & & i' \\ & 0 & i' \\ & B & \end{bmatrix} .
 \end{aligned}$$

B is the estimated factor loading matrix for the overall group of 46 securities. The second statistic is computed as follows:

$$F_2 = \frac{(ttrD_{c2}D_u^{-1} - mt)/tk}{mt/t(m - 2(k + 1))} . \quad (35)$$

To examine the last hypothesis that a_0 and A are the same across groups, we estimate D_{c3} with A and B defined as follows:

$$A_{c3} = [a_0 : A] , \quad B_{c3} = \begin{bmatrix} 1 \\ B \end{bmatrix} .$$

The statistic F_3 is computed as follows:

$$F_3 = \frac{(ttrD_{c3}D_u^{-1} - tm)/t(k + 1)}{tm/t(m - 2(k + 1))} . \quad (36)$$

For these tests the denominator degrees of freedom equals $t(m - 2(k + 1))$. The numerator degrees of freedom is either t , tk , or $t(k + 1)$ for tests 1 through 3 respectively.

In the case where the characteristics that affect returns are specified a priori, there is no need for the grouping procedure required with factor analysis. Therefore in tests of the BP with the characteristics specified a priori, the 138 security universe for MNEs and the 138 security universe for domestic firms will be used. In the multivariate regressions used to estimate the matrix A , matrix B will be specified as in the equation used to define (25). From that point the computation of the F statistics will proceed as in the factor analysis case. Since this test will cover the period 1972-1979, a single beta coefficient is computed for each firm over this time horizon. In addition the market power variable used in this test is the average

market power over this horizon. Likewise the foreign sales percent used is the average over this time horizon for each firm included in this BP test.

The Sample

The data required to conduct tests of the pricing model are stock market returns and accounting information. To identify those firms that are multinational, the foreign sales percent as used in past studies was collected. The source of this data was The Outlook published by Standard and Poors. Each year Standard and Poor's conducts a survey of industrial companies for the percent of sales derived in foreign countries. As is commonly done in many studies [e.g., see Fatemi (1984)], firms with a foreign sales percent (FSP) greater than 20 percent are classified as multinational. Year end FSP figures were collected for all reporting firms from The Outlook for years 1968-1978. This allowed for tests to be conducted over the time period 1969-1979. In addition, available issues of Business International were also consulted. Using this Standard and Poor's data obviously introduces some bias, since the tests of the asset pricing model can only include those firms that reported to Standard and Poor's. However assuming that no significant differences exist between reporting and nonreporting firms, the results of the study will be robust. The number of firms available in each year are displayed in Table 1.

Stock market returns for all companies were collected from the University of Chicago's Center for Research in Security Prices (CRSP)

Table 1. Yearly Sample Composition^a

Year	Number of Available Multinationals	Number of Available Domestics
1970	138	150
1971	158	150
1972	142	170
1973	142	170
1974	157	165
1975	158	170
1976	152	152
1977	150	138
1978	150	158
1979	160	179

^aIn the tests of the bilinear paradigm, a total of 138 MNEs and 138 domestic firms had all the available data for the period 1972-1979. This continuous period had the most data available to conduct statistically meaningful tests.

monthly tape. The index used in this study is the NYSE value weighted market return. Balance sheet data was collected from the expanded COMPUSTAT Industrial file. For all the companies identified as multinational and domestic, year end values for book value of equity, advertising expense, R&D expense, net sales, number of common shares outstanding, and year end stock price were collected for the years 1968-1978. Based on this data the following variables were computed.

$$EMV = \frac{\text{Market value equity} - \text{book value equity}}{\text{Net sales}} .$$

$$AVB = \frac{\text{Market value of equity}}{\text{Book value of equity}} .$$

As discussed earlier, EMV and AVB are indicators of the firm's market power. We should recognize that these measures not only capture the capitalized value of monopoly rents, but also the capitalized value of economic rents. However since there is no way to separate the effects of monopoly and economic rents, the measures EMV and AVB at best indicate the firm's market power with error.

However, rather than use the reported book equity, the method described in Fruhan (1978) is used to account for the effects of expensed advertising and R&D expenditures. As recognized earlier, both of these expenditures are expensed in the period incurred rather than capitalized. Since an intangible asset is created, expensing these items results in an understatement of the value of owner's equity. To correct for this Fruhan follows the work of Weiss (1969). This is done by assuming that advertising creates an intangible asset with a useful

life of 6 years. In addition we assume that it is amortized over its useful life using the double declining balance method. For R&D expenditures, a 10 year life with straight line amortization is used. To account for the effects of advertising and R&D the following steps were followed to adjust the book value of equity figure used in the above equations. The steps described pertain to the adjustment for the year 1978. To adjust all other years, the same steps are followed.

1. In 1978, consider the expenditures made for advertising and R&D for years 1973-1978, and 1969-1978 respectively.
2. Compute the outstanding balance of advertising and R&D expenditures made that remains unamortized at the end of each year.
3. In 1978, if the firm had capitalized these expenses using the balances in No. 2, a new figure for expenses is computed.
4. Using the change in actual expense, from that calculated in No. 3, the effective change in taxes is computed.
5. The cost savings is then added to the historical value for book equity to arrive at the figure used in the market power calculations.

This process is repeated for all years. Since the annual COMPUSTAT Industrial tapes do not report data back to 1959, the book value of equity in years 1969-1971 will only reflect the cumulative effects of R&D expenses from 1962, and as the cumulative effect of expenses in these years will be small, there should be no bias.

The variable EMV first proposed by Thomadakis (1977) has been used successfully by Hirschey (1981) and ES (1981), (1984). The variable AVB

is another measure of market power similar in structure to Tobin's q ratio. While the former measure uses book equity in the denominator, Tobin's q use replacement cost data. This definition of market power differs from that proposed by Tobin in the following ways. First the q concept relates total capital, not just equity capital. Second in q , debt is valued at current market prices (i.e., replacement cost). The market power measures (EMV and AVB) value debt at book rather than market value. Rather than link the assumed future profitability of real investments to the historical profitability of real investments, we feel it is unreasonable either to enhance or burden the assumed future profitability of real investments with market gains or losses associated with past debt financing decisions. This approach taken here obviously assumes a constant level of future interest rates. A comparison made by Fruhan with a study by Holland and Myers (1977) indicates that there exist only slight differences between the AVB measure and the actual Tobin's q .

The proposed measures, EMV and AVB also pose some economic problems. Tobin's q measure, as proposed by Lindenberg and Ross does provide an accurate measure of the capitalized value of the rents attributable to both monopoly and firm-specific factors. That is the market power measure reflects monopoly rents that might accrue to an industry due to concentration, and Ricardian rents that characterizes the efficient structure that emerges from competition (i.e., these firms possess an advantage in production). The measures EMV, AVB, as well as q , will therefore reflect both sources of rents. Therefore the proposed

market power measures are at best imperfect indicators of monopoly power. However within the framework of the appropriability or internalization hypotheses, economic rents are just as important as monopoly rents in the firm's decision to invest abroad. Any measured market power effect is therefore due to both sources of rents.

CHAPTER 4

CHARACTERISTICS OF MULTINATIONAL AND DOMESTIC FIRMS

Summary Statistics

Based on the description of the data in the previous chapter, Table 2 presents the summary statistics for the sample of multinational and domestic firms. By definition, domestic firms derived less than 20 percent of their sales from foreign countries. In Table 2, summary statistics are reported for market value of equity, the market value to book value ratio, excess market value, and the foreign sales percent. As expected the multinational firms in the sample are on average three times larger than those firms classified as domestic. In addition, the multinational firm sample, on average has a larger excess market value, market value to book value ratio, and lower beta. These findings are consistent with other works that investigated the effects of corporate international diversification [e.g., Fatemi (1984)]. The average MNE derives approximately one-third of its sales from overseas operations, while the average domestic firm derives slightly more than three percent of its sales from foreign sources.

The finding that the average MNE has larger market power than its domestic counterpart is consistent with Hirschey's finding that foreign monopoly power contributes more highly to excess valuation than does domestic market power (assuming that firms invest abroad to capture rents). It is evident from the average figures that both the domestic and multinational firms used in subsequent tests do exercise some degree

Table 2. Summary Statistics for MNEs and Domestic Firms

	Market Equity ^a	AVB	EMV	Beta	FSP
A: MNE Sample					
Mean	2,808	1.5587	0.288	1.166	33.7
Std.Dev.	4,812	0.9030	0.491	0.284	10.9
Minimum	64	0.2750	-0.223	0.599	21.0
Maximum	37,525	5.6800	2.761	1.828	70.0
B: Domestic Sample					
Mean	879	1.2700	0.138	1.400	3.61
Std.Dev.	2,047	1.3410	0.344	0.388	6.30
Minimum	5.78	0.1830	-0.392	0.382	0.0
Maximum	24,178	5.4800	2.030	2.888	20.0

^aIn millions of dollars.

of market power. That is, EMV is positive and AVB is greater than one. In addition, the maximum values for EMV and AVB are comparable for the MNEs and domestic firms. Therefore both sets of firms do exercise market power. Note that the figures for market power are computed using Fruhan's suggestion for capitalizing and then expensing both advertising and R&D expenditures. If anything, such an adjustment can only produce lower values for the market power variables. We must note however that the measures of market power, EMV and AVB can only be considered as upper bounds on monopoly rents. As discussed in Lindenberg and Ross (1981) (LR), the market value of the firm represents the capitalized values of rents attributable to replacement capital, firm-specific factors, and, of course, monopoly rents.

It is also possible for AVB to be greater than unity and EMV to be positive even if the firm is a perfect competitor. This will occur if the firm earns ordinary rents on specific factors. LR also investigate the relationship between q and the Lerner index of monopoly. They find that the Lerner index contributes in explaining the cross-sectional behavior of q . This is mild evidence that q does measure market power. However some contradictory evidence also exists. As mentioned in Chapter 2, SMG investigate the SPC relationship using Shepard's data. Using Tobin's q as a measure of firm rents, SMG find that firms with high market shares earn rents not attributable to concentration. That is concentration does not generate monopoly rents. As such we can only conclude that all measures of market power can only provide us with upper bounds on capitalized monopoly rents.

The results in Table 2 are also consistent with the work of Agmon and Lessard cited earlier. For the sample firms, the average beta coefficient for MNEs is slightly smaller than the beta for domestic firms (1.166 versus 1.400). Table 3 presents the correlation results for market value of equity, AVB, EMV, beta, and FSP. These correlations represent the average over the ten year examination period. For the MNE sample, beta and the foreign sales percent are negatively correlated. This relationship also holds for the domestic sample where the FSP values vary over a much smaller range. The results in this table also confirm the findings in Errunza and Senbet (1981). Note that for the MNE sample, the foreign sales percent figure is positively related to the degree of market power, whether market power is measured as EMV or AVB. However, this result does not hold for the domestic sample. Since these firms have only a small degree of foreign involvement no positive relationship was expected. Table 3 also indicates that the measures of market power for the MNE sample are highly related ($R = 0.92$), while for the domestic firms this relationship is slightly less ($R = 0.62$).

The results pertaining to the relationship between beta and market power, however seemed mixed. For the MNE sample, beta is negatively correlated with EMV. This result, however does not hold when market power is measured by AVB. Likewise for the domestic firm sample, beta and both measures of market power are positively related. The finding that beta and market power are negatively related for the MNE sample, when market power is measured as EMV, supports the theoretical conclusion in Subrahmanyam and Thomadakis. The results of these simple

Table 3. Correlations: MNEs and Domestic Firms^a

	M	V	E	B	F
A. MNE Sample					
M	1.000	0.330	0.400	-0.231	0.112
V	0.330	1.000	0.920	0.007	0.146
E	0.400	0.920	1.000	-0.050	0.161
B	-0.230	0.007	-0.050	1.000	-0.060
F	0.110	0.140	0.160	-0.060	1.000
B. Domestic Sample					
M	1.000	0.050	0.130	-0.210	0.120
V	0.050	1.000	0.620	0.180	-0.090
E	0.130	0.620	1.000	0.050	-0.130
B	-0.210	0.180	0.050	1.000	-0.110
F	0.120	-0.090	-0.130	-0.110	1.000

^aM, V, E, B, F refer to the market value of equity, the market to book value ratio, excess market value, beta and foreign sales percent respectively.

correlations however cannot be compelling, since it may be necessary to control for other factors to uncover the beta-market power relationship. Nevertheless the negative relationship for the MNEs with EMV as the measure of market power is mild evidence for the conclusion in ST.

One additional result pertains to the relationship between beta and the size of the firm. Here size is the outstanding value of the firm's market equity. For both MNEs and domestic firms, size and beta are negatively correlated to approximately the same degree. This result may be related to larger firms having more market power. For the MNE sample this hypothesis is plausible since market power is positively correlated with the market value of equity.

Intangible Assets--Advertising and R&D Expenditures

Tables 4-7 present the year by year record of research and development (R&D) and advertising expenditures for MNEs and domestic firms. In addition these tables show the corresponding intensities. As is presented in Tables 4-7, the MNE firm sample invested larger dollar amounts in both R&D and advertising. On average, the multinational firm sample spent between \$13 and \$106 million dollars in the form of R&D during the years 1969 to 1978. On average the domestic firm sample spent between \$3 and \$70 million dollars on R&D (see Tables 4 and 5). These results are consistent with other studies on this phenomenon. While the absolute dollars spent in the form of R&D for the MNEs is due to their large size, R&D intensity for these firms indicates a similar tendency. During the years 1969-1978, the MNE sample had an R&D intensity almost

Table 4. Multinational Firm Year by Year Research and Development (R&D) Expenditures and Intensities

Year	Mean Dollar R&D ^a	SD ^b	Max.	Mean Intensity ^c	SD	Max.
1969	12.95	24.13	149.0	0.019	0.032	0.237
1970	29.11	77.93	644.0	0.024	0.028	0.120
1971	44.13	114.39	1004.0	0.030	0.028	0.119
1972	50.00	128.70	1064.3	0.031	0.032	0.233
1973	46.03	102.80	826.2	0.029	0.026	0.111
1974	58.86	123.26	889.8	0.029	0.025	0.101
1975	53.04	117.20	946.0	0.028	0.024	0.107
1976	58.45	132.90	1012.0	0.029	0.022	0.106
1977	70.95	164.80	1170.0	0.025	0.023	0.092
1978	106.00	212.61	1463.0	0.027	0.023	0.092

^aResearch and development expenditures in millions of dollars. In all cases the minimum expenditure was zero.

^bSD refers to the standard deviation.

^cIntensity is defined as the ratio of R&D to net sales.

Table 5. Domestic Firm Year by Year Research and Development
(R&D) Expenditures and Intensities

Year	Mean Dollar R&D ^a	SD ^b	Max.	Mean Intensity ^c	SD	Max.
1969	3.36	17.97	236.0	0.006	0.016	0.098
1970	6.56	24.06	257.0	0.010	0.020	0.107
1971	9.16	24.50	250.0	0.015	0.020	0.164
1972	10.81	27.95	300.0	0.016	0.019	0.118
1973	16.97	85.37	1241.6	0.014	0.019	0.180
1974	18.27	89.37	1369.6	0.013	0.016	0.102
1975	21.61	80.97	1113.9	0.013	0.017	0.095
1976	24.34	90.73	1257.3	0.013	0.016	0.090
1977	27.41	101.28	1451.4	0.015	0.018	0.102
1978	27.41	106.87	1633.1	0.014	0.018	0.101

^aResearch and development expenditures in millions of dollars. In all cases the minimum expenditure was zero.

^bSD refers to the standard deviation.

^cIntensity is defined as the ratio of R&D to net sales.

Table 6. Multinational Firm Year by Year Advertising (AD)
Expenditures and Intensities

Year	Mean Dollar AD ^a	SD ^b	Max.	Mean Intensity ^c	SD	Max.
1969	3.38	18.22	140.7	0.004	0.021	0.157
1970	3.62	20.31	176.3	0.004	0.022	0.148
1971	18.78	42.85	222.2	0.020	0.040	0.208
1972	26.74	48.66	237.9	0.026	0.040	0.198
1973	31.38	57.64	287.6	0.024	0.042	0.239
1974	35.15	62.09	323.5	0.021	0.036	0.186
1975	36.16	67.50	348.1	0.021	0.034	0.190
1976	37.87	74.63	392.6	0.024	0.038	0.202
1977	47.54	86.85	429.1	0.023	0.035	0.185
1978	69.09	109.20	492.0	0.025	0.038	0.172

^aAdvertising expenditures in millions of dollars. In all cases the minimum expenditure was zero.

^bSD refers to the standard deviation.

^cIntensity is defined as the ratio of AD to net sales.

Table 7. Domestic Firm Year by Year Advertising (AD)
Expenditures and Intensities

Year	Mean Dollar AD ^a	SD ^b	Max.	Mean Intensity ^c	SD	Max.
1969	0.69	6.32	73.4	0.0007	0.006	0.077
1970	0.96	6.90	77.4	0.0019	0.017	0.242
1971	3.37	14.66	140.2	0.0066	0.025	0.244
1972	8.96	29.21	268.7	0.0118	0.028	0.263
1973	8.35	20.78	170.5	0.0125	0.022	0.148
1974	11.19	32.23	333.4	0.0133	0.026	0.260
1975	11.84	28.20	185.8	0.0130	0.025	0.212
1976	14.82	35.94	211.3	0.0121	0.022	0.154
1977	16.31	40.54	277.1	0.0135	0.026	0.195
1978	17.47	44.76	352.4	0.0135	0.025	0.190

^aAdvertising expenditures in millions of dollars. In all cases the minimum expenditure was zero.

^bSD refers to the standard deviation.

^cIntensity is defined as the ratio of AD to net sales.

two times as large as the domestic firm sample. As expected MNEs spend relatively more dollars on the intangible assets created by investment in R&D. A similar pattern emerges when advertising expenditures are examined. Again the MNE sample had an advertising intensity almost two times larger than the domestic firm sample. Since the dollars spent on these intangible assets is not negligible, the correction suggested by Fruhan is appropriate.

The fact that MNEs are more intensive in their expenditures for advertising and R&D supports Hirschey's finding of a positive R&D intensity effect on excess valuation. Table 2 presented results which show that MNEs have larger market power than domestic firms. While we are not implying the direction of the causality, it is interesting to note that past studies have revealed a relationship between R&D intensity and multinational status. However it is plausible that after a firm becomes multinational, incentives might exist which lead to increased R&D. One possible incentive is the MNE's ability to amortize the cost of the money spent on R&D over a worldwide base. In addition, as mentioned in Chapter 2, Grubel (1967) and others find that the share of foreign-subsidary assets of U.S. corporations increases significantly with the importance of advertising and R&D expenditures. The figures in Tables 4-7 are not surprising in light of this fact.

The time series behavior of R&D expenditures and intensities shows an interesting pattern. For the MNE sample the maximum values for R&D range from \$149 million in 1969 to \$1463 million in 1978. For the domestic firm sample the range was \$18 million in 1969 to \$1633 million

in 1978. In absolute dollars, both the MNEs and the domestic firms make large investments in the form of R&D. While the MNE maximum R&D intensity in 1969 was roughly two and one-half times larger than that for domestic firms, this pattern declined so that in 1978 the maximum values were practically equal. The larger firms regardless of whether they are domestic or multinational have similar R&D expenditures and intensities. A similar pattern also holds over time for advertising expenditures and intensities.

CHAPTER 5

EMPIRICAL RESULTS OF PRICING MODELS

Factor Analysis Results: The Bilinear Paradigm

Prior to the investigation of the presence of a market power effect, factor analysis tests were performed on the groups of multinational and domestic firms. As mentioned earlier, the 138 MNE sample and the 138 domestic firm sample were broken down into six groups of 23 firms each. Following the work of Roll and Ross, as well as Brown and Weinstein, the MNE and domestic firm samples were first arranged in alphabetical order, and six groups of 23 securities were formed. The first test involves determining whether three factors are sufficient for describing security returns. This test was performed on the 46 firm group as well as both 23 firm subsets.

Before testing the equivalence in factor structure between MNEs and domestic firms, we must first test for the appropriateness of a three factor model. To do this we first solve for the maximum likelihood conditional on the covariance matrix generated by three factors (see Harman, 1976, p. 201). A second likelihood is also found without any restrictions on the number of factors. A likelihood ratio is then formed (first likelihood divided by the second). Under the null hypothesis, minus two times the natural logarithm of the likelihood ratio is distributed asymptotically as chi-square with $1/2[(n - k)^2 - (n + k)]$ degrees of freedom. Here n refers to the number of firms in each group. If the chi-square statistic is large relative to some critical value,

then more than 3 factors are needed to explain the structure of the generating process. For the 46 and 23 security groups the degrees of freedom are 900 and 187 respectively. The commonly used 50 percent level of significance yields critical chi-square values of 899.5 and 186.5 for 900 and 187 degrees of freedom respectively.

The first three columns of Table 8 present the chi-square statistics for the adequacy of the assumed three factor model for the 46 security group, as well as the 23 MNE and 23 domestic firm groups. In one half of the groups (3, 4, 5), the assumed three factor model is adequate for the 46 security group. For groups 1, 2, and 6 the three factor model is not adequate. For the subgroups, MNE and domestic groups 3, 4, 5, and 6 are in accordance with the assumed three factor model. However group six presents an interesting result. In this case the three factor model was rejected for the 46 security group; however, the three factor model was accepted for the MNE and domestic firm subgroups. In all other cases, rejection of the three factor model for the 46 security grouping led to rejection for each of the subgroups. As indicated by BW, this is no indication of model failure, since the chi-square test requires that the common factors follow a normal probability distribution.

A more interesting result, involves the test of factor constancy across groups. The fourth column in Table 8 presents these results. The F statistic for this test is described in equation (30) in Chapter 3. For groupings 3, 4, and 5, constancy of factor structure for the MNE and domestic firms is accepted. In the cases of groups 1, 2, and 6

Table 8. Test of the Hypothesis that the Same Three Factors
Generate Security Returns: Factor Analysis Results

Group	Chi-square Test for Adequacy 46 Sec. Group	Chi-square Test for Adequacy 23 Sec Group:MNE	Chi-square Test for Adequacy 23 Sec. Group:Dom.	F Text For Constancy Across Groups
1	926	240	305	115*
2	1011	206	218	18*
3	315	105	107	.192
4	685	115	118	.289
5	342	103	105	.367*
6	957	117	108	10

^aF test of constraint that the same set of factors generate returns for all 46 securities. This F statistic is defined in Chapter 3, equation (30).

* Indicates that the F statistic is significant at the 5 percent level of significance. Degrees of freedom equal (288,3840).

constancy is rejected. For the sample of MNE and domestic firms, it appears that constancy of factor structure depends on the ability of the assumed three factor model in explaining the structure of the generating process.

The tests of equality of the risk-free rate and factor prices are carried out in the same fashion as the tests for factor constancy. Under the null hypothesis that factor prices are constant across groups, the time series (1972-1979) of returns are used to estimate the loading matrix (i.e., the b_1 terms) for the 46 security group. Under the alternative hypothesis, the loading matrix is estimated separately for each 23 security group. These estimates should be the same up to rotation. Under the null hypothesis the matrix A is estimated imposing the constraints:

1. constant risk-free rate across groups.
2. constant factor prices across groups.

The estimation of the constrained and unconstrained A matrices follows the specification of equation (32) in Chapter 3. Table 9 presents the results for the restrictions imposed by the multifactor model.

The first hypothesis, that the implied risk-free rate is constant across groups is rejected for groups 1, 2, 5, and 6. This hypothesis is accepted for groups 3 and 4. Note for groups 3 and 4 the three factor model was adequate in describing the structure of security returns. In addition, constancy of the factor process was also accepted for these groups. The second hypothesis, constancy of factor prices is accepted for groups 3, 4, and 5; the same groups for which constancy of the

Table 9. Test of Three Factor APM: Factor Analysis Results^a

Group	F_1^b	F_2	F_3	Size ^c
1	2.10	4.02	5.26	4,200
2	3.52	18.16	20.46	6,609
3	0.88	0.70	0.92	5,867
4	0.52	0.20	0.35	3,589
5	1.02	0.95	0.82	6,402
6	10.03	20.36	12.35	4,120

^a F_1 : F ratio for test of constancy of implied risk-free rate across groups, where the groups are MNEs and domestic firms. d.f. equal (96,3648).

F_2 : F ratio for test of constancy of factors and factor prices across groups. d.f. equal (288,3648).

F_3 : F ratio for constancy of both risk-free rate and factor prices. ³ d.f. equal (384,3648).

^bAll F ratios marginally greater than 1.0 are significant at the 5 percent level of significance.

^cMarket value of the equity measured in millions.

factor process was accepted. The joint hypothesis is also accepted for groups 3, 4, and 5. Average firm size is reported in the fourth column of Table 9. As is evident, the alphabetical arrangement of firms produced non-discernible differences in the average size of the firm across groups. BW present more forceful results in rejecting the APM for their 21 groups. However much of their results seems to depend on the large sample sizes employed. Relative to the size of the sample used by BW, this study is much smaller. Therefore it is reasonable to assume that rejection in the cases of groups 1, 2, and 6 is not due to sample size. Rather, it is hypothesized that the factor analytic results are extremely sensitive to the size of the groups used to test the hypotheses implied by the multifactor model.

A recent criticism of the RR methodology (i.e., grouping) was raised by Dhrymes, Friend, and Gultekin (1984) (henceforth DFG). DFG essentially question the grouping technique employed by Roll and Ross. DFG state that "It is quite important to realize that factor analyzing 30 security groups is not equivalent in any way to factor analyzing a 240- or 1260-security group if we impose the condition of extracting the same number of factor . . ." (pp. 333-334). The comment by Roll and Ross (1984) however indicates that this issue is economically irrelevant since in the cross-section modern financial theory will only price those factors that are pervasive. Therefore grouping does not cause any biases.

So far, the tests employed have been general tests of the multifactor model using the statistical methodology of factor analysis.

While the results of the three factor model for MNEs and domestic firms are mixed, in half the cases the three factor model is accepted and the constraints imposed by it for MNEs and domestic firms is verified. However these results are by no means conclusive. The difficulty lies in the inability to economically interpret the results using the factor analytic framework. Therefore, the BP will be applied to the specific joint test of the APM and the market power effect.

Testing the Market Power Effect: Bilinear Paradigm

The bilinear paradigm presented in equation (24) can be used to test for the market power effect implied by the hypothesized asset pricing model in equation (10). The asset pricing model given by equation (10) stipulates that expected returns can be expressed as the product of a set of characteristics and a set of market prices attached to those characteristics. This is a bilinear representation, since given the characteristics, expected returns are assumed to be linear in the market prices. Table 10 presents the results of the bilinear model applied to equation (10). The 1972-1979 time period was divided into two subperiods. The period 1972-1974 represented a three year period when U.S capital controls were in effect. The bilinear test of the asset pricing model tested the restrictions imposed by equation (10) using only one group. This one group was comprised of 138 MNEs and 138 domestic firms. If the hypothesized pricing model is true, then we should notice equality of the implied risk-free rate across the two subgroups, as well as equality of the market prices.

Table 10. Test of Three Factor Arbitrage Pricing Model^a

Period	Model: $E(R_i) = a_0 + a_1 B_i + a_2 X_i$		
	F_1^b	F_2	F_3
Panel A: X = EMV			
1972-1979	1.02	3.63	4.25
1972-1974	1.42	2.68	3.25
1975-1979	1.59	3.67	2.58
Panel B: X = AVB			
1972-1979	2.54	2.47	3.72
1972-1974	3.26	3.68	5.26
1975-1979	1.59	2.51	6.57
Panel C: X = FSP			
1972-1979	1.68	2.07	1.92
1972-1974	2.53	3.56	2.05
1975-1979	3.01	4.28	3.68

^aThis is a test of a specific three factor APM. The F ratios are defined exactly as in Table 4, p. 72.

^bMost F ratios larger than 1.0 are significant at the 5 percent level of significance.

The results in Table 10 indicate that neither of these hypotheses is true (with the exception of the risk-free rate hypothesis in the period 72-79 when X is EMV) for the overall period, as well as either of the subperiods. This holds regardless whether we use EMV, AVB, or FSP as the additional factor X in the pricing model. As noted, however, when X is measured as the firm's excess market value, we cannot reject the null hypothesis of equality of the implied risk-free rate for the overall period. In addition, we also accept this hypothesis for the period of U.S. capital controls. During this period, however, the market prices attached to the factors were apparently different. This can be seen by examining the F statistics for the first subperiod in Panel A. During the latter period when there were no U.S. capital controls, we must reject the null hypothesis of equality of the implied risk-free rate. However for this time period, the critical F statistic is only 1.43. Therefore during the latter period we barely reject the hypothesis of equality of the implied risk-free rate.

Recall that this is a test of a joint hypothesis. Rejection of any of the hypotheses may be due to the misspecification of the characteristics that influence expected returns or the assumed linearity. However one piece of positive evidence is the equality of the implied risk-free rate when market power is measured by EMV. In the cross-section, this intercept should be the same across groups, and is not influenced by the factor identification problem (i.e., rotation). The multifactor model may be rejected in many cases with the factor analytic technique solely because of the factor identification problem. The

acceptance of the equality of the implied risk-free rate for EMV presents evidence of the possibility that this is an appropriate model describing expected returns. While the prices attached to the factors may be different, theory requires that at a minimum the implied risk free rates be the same.

The more formal tests of the pricing model given by equations (10) or (11) will now be investigated using the methodology developed in Fama and MacBeth (1973). This technique has been applied by many researchers. These include Banz (1981), Litzenberger and Ramaswamy (1979), Black and Scholes (1974), as well as Roll and Ross (1981). The portfolio grouping method as well as the maximum likelihood method will be used on MNEs and domestic firms.

Tests of the Pricing Model: OLS, GLS, and MLE

Multinational Results

The results of the cross-sectional regressions using OLS, GLS, and MLE methods are presented in Tables 11-16. The first three tables present the results for the MNE group, while the latter three tables present similar results for the domestic group. As indicated in Chapter 3, the portfolio grouping technique employed twelve portfolios in the cross-section with a minimum of twelve securities in each portfolio. Since the cross-sectional regressions used all available data in month t , intermediate portfolios could have more than twelve securities. Table 11 presents the OLS results for the MNE sample. The additional factor used in pricing could be either EMV, AVB, or the foreign sales

Table 11. Cross-Sectional Regressions: Tests of Pricing Model
OLS Procedure: MNEs

Model: $R_{pt} = a_0t + a_1tB_{pt} + a_2tX_{pt} + e_{pt}$						
Period	a_0	$t(a_0)$	a_1	$t(a_1)$	a_2	$t(a_2)$
Panel A: X = EMV						
1970-1979	0.0132	3.20	0.00300	0.60	0.00091	0.48
1970-1974	0.0008	1.40	0.00250	0.54	0.00120	1.71
1975-1979	0.0184	3.01	0.00350	0.46	0.00062	0.54
Panel B: X = AVB						
1970-1979	0.0145	3.00	0.02833	0.85	0.00123	0.74
1970-1974	0.0093	1.78	0.00982	1.00	0.00137	1.80
1975-1979	0.0197	2.59	0.04678	0.76	0.00109	0.73
Panel C: X = FSP						
1970-1979	0.0080	1.96	0.00200	0.40	0.00400	1.58
1970-1974	0.0065	1.85	0.00190	0.38	0.00370	1.64
1975-1979	0.0095	2.01	0.00210	0.27	0.00430	1.38

Table 12. Cross-Sectional Regressions: Tests of Pricing Model
GLS Procedure: MNEs

Model: $R_{pt} = a_{0t} + a_{1t} B_{pt} + a_{2t} X_{pt} + e_{pt}$						
Period	a_0	$t(a_0)$	a_1	$t(a_1)$	a_2	$t(a_2)$
Panel A: $X = EMV$						
1970-1979	0.0145	3.30	0.00245	0.65	0.00742	1.32
1970-1974	0.0063	1.69	0.00189	0.79	0.00159	1.99
1975-1979	0.0227	3.07	0.00301	0.82	0.01325	1.40
Panel B: $X = AVB$						
1970-1979	0.0139	2.98	0.00291	0.96	0.00237	1.20
1970-1974	0.0101	1.89	0.00182	1.52	0.00159	1.92
1975-1979	0.0177	2.36	0.00400	0.89	0.00301	1.37
Panel C: $X = FSP$						
1970-1979	0.0060	2.10	0.00250	0.78	0.00520	1.60
1970-1974	0.0042	1.96	0.00181	0.54	0.00450	1.72
1975-1979	0.0078	2.02	0.00319	0.42	0.00590	1.50

Table 13. Cross-Sectional Regressions: Tests of Pricing Model
MLE Procedure: MNEs

Model: $R_{it} = a_0 + a_1 B_{it} + a_2 X_{it} + e_{it}$						
Period	a_0	$t(a_0)$	a_1	$t(a_1)$	a_2	$t(a_2)$
Panel A: X = EMV						
1970-1979	0.0143	3.41	0.00187	0.70	0.00692	1.50
1970-1974	0.0058	1.72	0.00142	0.83	0.00430	2.01
1975-1979	0.0228	3.11	0.00232	0.95	0.00954	1.63
Panel B: X = AVB						
1970-1979	0.0146	2.99	0.00284	1.00	0.00259	1.25
1970-1974	0.0110	1.89	0.00201	1.68	0.00192	1.96
1975-1979	0.0182	2.40	0.00367	0.90	0.00326	1.40
Panel C: X = FSP						
1970-1979	0.0052	2.11	0.00184	0.80	0.00490	1.69
1970-1974	0.0039	1.99	0.00165	0.62	0.00280	1.75
1975-1979	0.0065	2.05	0.00203	0.54	0.00700	1.51

Table 14. Cross-Sectional Regressions: Tests of Pricing Model
OLS Procedure: Domestic

Model: $R_{pt} = a_0 + a_1 B_{pt} + a_2 X_{pt} + e_{pt}$						
Period	a_0	$t(a_0)$	a_1	$t(a_1)$	a_2	$t(a_2)$
Panel A: $X = EMV$						
1970-1979	0.0140	3.38	0.00180	0.84	0.00075	0.50
1970-1974	0.0009	1.69	0.00200	0.63	0.00105	1.42
1975-1979	0.0271	3.32	0.00160	0.74	0.00045	0.40
Panel B: $X = AVB$						
1970-1979	0.0139	2.96	0.01960	0.70	0.00189	0.61
1970-1974	0.0087	1.85	0.01320	1.05	0.00154	1.50
1975-1979	0.0191	2.42	0.02600	0.81	0.00224	0.95
Panel C: $X = FSP$						
1970-1979	0.0055	1.89	0.00130	0.52	-0.00013	-1.00
1970-1974	0.0028	1.90	0.00095	0.20	-0.00009	-0.96
1975-1979	0.0082	2.01	0.00365	0.30	-0.00017	-0.54

Table 15. Cross-Sectional Regressions: Tests of Pricing Model
GLS Procedure: Domestic

Model: $R_{pt} = a_0t + a_1t_{pt}^B + a_2t_{pt}^X + e_{pt}$						
Period	a_0	$t(a_0)$	a_1	$t(a_1)$	a_2	$t(a_2)$
Panel A: X = EMV						
1970-1979	0.0125	3.42	0.00090	0.72	0.00063	0.51
1970-1974	0.0010	1.81	0.00082	0.68	0.00092	1.30
1975-1979	0.0004	3.30	0.00098	0.79	0.00034	0.21
Panel B: X = AVB						
1970-1979	0.0125	2.79	0.00087	0.69	0.00132	0.68
1970-1974	0.0092	1.86	0.00130	1.15	0.00009	1.42
1975-1979	0.0158	2.40	0.00044	0.90	0.00174	0.80
Panel C: X = FSP						
1970-1979	0.0043	1.90	0.00095	0.40	-0.00020	-1.10
1970-1974	0.0040	1.96	0.00084	0.52	-0.00025	-1.20
1975-1979	0.0046	2.01	0.00106	0.63	-0.00015	-0.68

Table 16. Cross-Sectional Regressions: Tests of Pricing Model
MLE Procedure: Domestic

Model: $R_{it} = a_{0t} + a_{1t}B_{it} + a_{2t}X_{it} + e_{it}$						
Period	a_0	$t(a_0)$	a_1	$t(a_1)$	a_2	$t(a_2)$
Panel A: $X = EMV$						
1970-1979	0.0132	3.40	0.00070	0.86	0.00068	0.52
1970-1974	0.0019	1.76	0.00091	0.79	0.00054	1.41
1975-1979	0.0245	3.42	0.00049	0.89	0.00082	0.21
Panel B: $X = AVB$						
1970-1979	0.0183	2.84	0.00063	0.70	0.00099	0.75
1970-1974	0.0154	1.90	0.00058	1.20	0.00102	1.68
1975-1979	0.0212	2.50	0.00068	1.00	0.00096	0.90
Panel C: $X = FSP$						
1970-1979	0.0039	1.90	0.00084	0.60	-0.00102	-1.01
1970-1974	0.0028	1.87	0.00632	0.40	-0.00021	-1.05
1975-1979	0.0050	2.00	-0.00464	-0.52	-0.00183	-0.79

percent (FSP). This latter variable was included for comparative purposes with Errunza and Senbet (1984). The testing equation (11) is repeated here for convenience.

$$R_{jt} = a_0 + a_1 b_{jt} + a_2 X_{jt} + e_{jt} , \quad (37)$$

$$j = 1, \dots, N_t , \quad t = 1, \dots, T .$$

Here X_{jt} can refer to EMV, AVB, or FSP. In all cases the most significant variable was the term a_0 . This result holds regardless of the X variable employed, the time period or type of firm. Most of the results are comparable with ES (ES, Table 4, p. 741). Most notably, in almost every instance, the coefficient a_1 was statistically insignificant regardless of the factor X and the time period studied. This result is consistent with Banz as well as ES. The beta factor does a poor job in describing expected returns. Whether this is due to misspecification or disequilibrium is not clear. Another possibility is the instability of beta. Recall that the beta coefficient used in the cross-sectional regressions is estimated from the data for the prior 60 month period. If this beta does a poor job of estimating the actual beta over the test period we may observe such a phenomenon. While we can make the same claim for market power, it is highly unlikely that a firm's market power changes dramatically over such a short time period.

As mentioned earlier, on average the beta coefficient is, in all cases, only mildly correlated with any of the additional factors used in equation (37). We may therefore rule out insignificance due to the problem of multicollinearity. The more interesting results in Table 11

pertain to the estimated coefficient of the market power variable. For the MNE sample, whether X is EMV, AVB, or FSP we see mildly significant positive results. The strongest results are obtained during the period of U.S capital controls. If a market power effect is priced, then it is clearly in the period of capital controls. Both the overall period, as well as the latter period show no priced effect.

More interesting results are obtained when GLS and MLE procedures are used. For the MNE sample these results are presented in Tables 12 and 13. Table 12 presents evidence that the market power effect was priced during the period of U.S. capital controls when market power is measured by EMV. The contribution of the market power effect is 0.00159 for the period 1970-1974. The t-statistic of 1.99 is significant at the 5 percent level. Table 13 presents the MLE results which are comparable to the GLS procedure. Both tables present positive results for the coefficient of the foreign sales percent which is consistent with the findings of ES. Note that while the GLS and MLE procedures generate statistically significant results for the market power effect, they do produce different values for the contribution of this effect. While the GLS method yields a coefficient of 0.00159, the MLE method gives 0.00430. This is a pricing effect almost two and one-half times larger. This type of effect is also documented in Errunza and Senbet.

While ES propose that the foreign sales percent should be negatively related to expected returns, all regressions with the FSP variable yielded a positive relationship. Comparing ES's OLS results with our Table 11, we see that the magnitude and significance of the FSP

variable are roughly equivalent. A positive sign for FSP was not expected by ES since the role of the MNE is purely financial. However we have seen that the role of the MNE may not be purely financial. Economists have reasoned that the rationale for foreign involvement may be related to market failure. One area in which market failure does exist is the market for technology. The statistics presented in Chapter 4 indicate that the MNEs spend a nontrivial amount in the form of R&D. It appears that the MNE serves more than a purely financial role as assumed by ES. As indicated by ES, what is required is the theoretical link between excess valuation and excess returns. The present research has empirically demonstrated that such a link may exist.

The market power effect, as we have seen, is more pronounced during the period of U.S. capital controls. Most notable is the fact that the standard error of the coefficient a_2 is much smaller than the standard error during the latter subperiod as well as the overall period. As we would expect, during a period of capital controls the price system usually does not allow much variation in key economic variables. In addition, as documented by ES (1981) a positive valuation effect associated with foreign involvement was most pronounced during the period of capital controls. The tests of the pricing model more than likely reflect this phenomenon.¹

¹Visual inspection of the pattern of the a_2 coefficients indicate this effect. During the period of U.S. capital controls, the coefficients fluctuate around a rather narrow band. During the latter period the coefficients of a_2 fluctuate much more. As a result the market power effect during the latter and overall period is not significant.

From a practical standpoint, it is unfortunate that the MLE method yielded a larger coefficient than the GLS grouping method. This result however might be due to the data limitations which impose only a minimum of twelve securities per portfolio. Note that it is not surprising to see significant results for the market power effect. The results of the BP indicate that when market power is measured by EMV the null hypothesis of equality of the risk-free rate could not be rejected. This result indicates that the model described in equations (10) or (11) may be an adequate description for the characteristics that affect expected returns.

In spite of this methodological problem, evidence of a priced market power effect has been uncovered. Again the logical question is why is this effect priced in the cross-section? Earlier we argued that foreign operations must be marginally more profitable than domestic operations. This is due primarily to the increased costs of the foreign operations. Fatemi (1984) suggests that these costs may be related to the agency problem studied by Jensen and Meckling (1976) (henceforth JM). As indicated by JM the monitoring function within an organization is probably more expensive in large corporations. The costs associated

None of this is particularly surprising nor, in itself, contrary to the assumed generalized asset pricing model. The model is concerned with the relationship between expected returns and the two factors not about the relationship between return and the factors. Therefore we may expect the coefficients a_1 and a_2 to be quite variable through time. The initial hypothesis is nevertheless upheld as long as $E(a_2)$ is greater than zero. However this may certainly raise questions concerning whether the coefficient a_2 is stationary over time. This issue is of crucial importance when evaluating the statistical significance of a_2 over the entire time period 1970-1979.

with foreign operations then probably come in the form of higher monitoring and bonding costs. Since MNEs tend to be the larger firms traded on the NYSE, it is probably safe to assume that the MNE faces higher costs in the form of monitoring and bonding. Therefore we should expect foreign operations to be more profitable.

The possibility of a positively priced market power effect is related to the value creation presented by foreign involvement. The data in Table 2, p. 67, presented evidence that on average MNEs do exercise market power. For instance, the MNE market to book value ratio is 1.55. A simple t test indicates that both AVB and EMV are significantly different from their theoretical values of 1.00 and 0.00 respectively. In order for this deviation from the perfect market paradigm to exist, the firm must have valuable growth options. Recall that Thomadakis (1977) demonstrated that the firm's expected growth rate conveys information to investors about the firm's ability to generate excess profits in the future. In addition, Subrahmanyam and Thomadakis (1980) have shown that beta is a decreasing function of market power. Table 3, p. 70, presented evidence of this proposition when market power is measured by excess market value. ST also propose that portfolio experiments based on beta rankings (i.e., Fama and MacBeth type tests) may tend to reflect stratification of firms according to the criterion of monopoly power.

The fact that market power is priced in the cross-section has important implications for the Banz "small" firm effect. Recall that most studies of the CAPM show the following situation:

$$E(R_s) = R_f + \beta_s [E(R_m) - R_f] > E(R_l) = R_f + \beta_l [E(R_m) - R_f] .$$

Here β_s and β_l refer to the equivalent betas of small and large firms respectively. One reason that this result appears so often is (1) most large firms have higher degrees of market power which results in a lower beta, and (2) most large firms are multinational--which is the proposed source of the higher market power. One rationale is that the inclusion of the market power effect in a multifactor model framework will reflect these differences. In addition, the price attached to the market power effect must be positive to correct the inequality above. The value creation associated with foreign involvement causes the betas of large powerful firms to be influenced downward, regardless of the source of the uncertainty. This lower beta is accompanied by higher market power; rather than demand lower expected returns as implied by the two factor CAPM, investors will most likely require higher expected returns from these large powerful firms. The next section investigates the market power effect for a group of smaller firms. This set will include domestic firms. While this group of firms is not truly a "control" group (due to differences in firm size), we hope to test for the persistence of this effect for firms of differing size.

Domestic Firm Results

The results for the tests of the pricing model for the domestic firm sample are presented in Tables 14-16, pp. 91, 92, and 93, respectively. In all cases the only significant variable in the pricing model is the intercept term a_0 . This result holds regardless of the X

factor used, the time period studied, or the methodology employed. However, for this sample the estimated coefficient of the market power factor is positive, but not significantly different from zero. One positive result is the higher significance for the effect in the period of U.S. capital controls. Another interesting result is the negative sign attached to the foreign sales percent. This result is consistent with the theoretical arguments presented by Errunza and Senbet. However, since these sample firms, on average have a FSP of only 3 percent it is unlikely that the results are meaningful. The finding of an unpriced market power effect is consistent with the results of the BP. The bilinear results for most cases indicated that the factor prices applied to each set of firms were different. Therefore it is not surprising to find a priced market power effect for MNEs only.

Further examination of Table 2, p. 67, may help explain this result. Recall that the market power measures for MNEs were larger than those for domestic firms. A simple t test for differences in the means indicates that the mean AVB and EMV for MNEs are statistically different (i.e., larger) than the AVB and EMV for domestic firms. This statistical result points to the fact that MNEs do have significantly more market power than their domestic counterparts. In addition this finding confirms Hirschey's results. Hirschey states that a firm's foreign income stream seems to be more valuable than the domestic income stream. In the cross-section, then it is not unreasonable to see the market power effect priced for MNEs only, since these firms more than likely derive a large part of their market power from foreign operations. In

addition the market power coefficient for the domestic firm sample is much less than that for the MNE. For example, for the MLE method the price is 0.00430 versus 0.00054 for the domestic firm sample.

As was the case for the MNE firm sample, the estimated coefficient for a_2 was most significant during the period of U.S. capital controls. Since there has been no documented positive valuation effect for domestic firms during this period it is not clear what this effect demonstrates. Part of this effect may be due to our definition of domestic. Since this group of firms may have up to 20 percent of their sales derived from foreign sources, this effect may be a result of definition inaccuracy. However since there exists only a small number of truly domestic firms, statistically meaningful tests could not be conducted.

These results, as expected, indicate that MNEs and domestic firms have different characteristics which give rise to differences in observed market power. This additional factor is priced for MNEs only. As such it seems that domestic firm shares are not priced in accordance with the market power model in equation (37). This effect may be due to the small size of the domestic firms in the sample relative to the MNE sample. In addition since the MNE measure of market power reflects both domestic as well as foreign market power, it is possible that the pricing relates only to the foreign component contained in EMV. Therefore the domestic market power in both the MNE and domestic firm sample may not be priced. What are probably priced are the incremental benefits associated with foreign involvement. However it is not clear that the foreign market power in no way feeds back into the domestic market.

As indicated earlier foreign involvement could produce advantages applicable to the home market. One such advantage is the MNE's ability to spread the costs associated with R&D over a much larger base allowing it to lower costs at home. In this respect foreign status may feed back into the home market. For the multinational firm, domestic market power may be influenced by the degree of foreign involvement. This clouds our ability to separate unambiguously the effects of market power into purely domestic and foreign sources.²

While the results of the pricing model do not apply to all firms, this research has uncovered a possible link between excess valuation (monopoly power) and expected returns. ES find that there does exist a positive valuation effect associated with the degree of international involvement. We now know that MNEs have the following characteristics derived from the current and prior studies.

1. MNEs have lower beta coefficients than domestic firms. Evidence for this is contained in Fatemi (1984). In addition the higher the degree of foreign involvement as measured by the foreign sales percent the lower the beta coefficient. However

²One additional test was also conducted for the group of MNEs and domestic firms. First all firms were pooled together and a model similar to (37) was run. However an interaction variable was included. This variable was the interaction of an MNE dummy variable with the market power variable. Tests with this additional explanatory variable examined whether only market power for multinational firms is relevant. Unfortunately the results of this test, when compared with the earlier tests, yielded ambiguous results. Not only was the new explanatory variable not statistically significant, but the coefficient of the market power variable dropped below conventional significance levels.

this effect could partially be due to an incorrect specification for the return generating process for MNEs.

2. A MNE's excess valuation is related to its degree of international involvement. This effect is more pronounced during periods of U.S. capital controls.
3. MNEs spend more on R&D and advertising than domestic firms. This effect even holds on a relative basis when we examine R&D and advertising intensity. There is considerable market failure present, especially in the market for R&D.
4. Foreign market power contributes more heavily to the MNE's excess valuation than does domestic market power. In addition, R&D intensity also positively affects an MNE's excess valuation.
5. Lastly, this study finds that an MNE's returns are influenced by the level of market power. As in the case of excess valuation tests, this market power effect is most pronounced during the period of U.S. capital controls.

Current and past research has revealed that MNEs are rewarded with higher excess valuation, and this excess valuation becomes a significant determinant of expected returns. From the standpoint of current shareholders, the higher excess valuation leads to capital gains and are reflected in increased returns. While we cannot be certain of the source of the MNEs market power, a further investigation of R&D as well as advertising intensity seems warranted.

CHAPTER 6

CONCLUSIONS

This study investigates the possibility of a priced market power effect for multinational firms. In addition this effect was also examined for a "control" sample of domestic firms. To uncover this effect, a multifactor asset pricing model was employed. Within this framework, the finding of another priced factor may be consistent with the Ross APT. However we must note that the propositions are tests of the joint hypothesis of the appropriateness of a linear model as well as those firm characteristics that are assumed to affect expected returns. To capture this effect, we employ a factor that measures the firm's market power and growth potential rather than the variable employed in studies of the firm size effect. Size as it has been defined by previous researchers in terms of equity capitalization is at variance with the standard economic definition. Usually firm-size in the product market is specified in terms of sales while firm-size in the capital market is measured in terms of assets. (See Stigler, 1968, p. 3).

The inclusion of another factor is motivated by the mounting empirical anomalies present in the CAPM framework. On an a priori basis, we may expect that market power and growth affects profitability, or equivalently there may exist a large firm effect. Since the larger firms traded on the NYSE are multinational in nature, the search for a priced market power effect is more appropriately investigated among large firms.

Searching for a priced market power effect among large MNEs is consistent with the appropriability and internalization hypotheses raised earlier. It was argued that firms become multinational to (1) appropriate rents abroad, and (2) to internalize the market for knowledge. This knowledge may come in the form of R&D expenditures. Recall that Severn and Laurence (1974) documented that intangible assets discovered and developed in a firm's domestic market yield rents when used abroad. Therefore higher market power derived from foreign involvement is an observable outcome derived from the appropriability and internalization hypotheses.

The current study uncovers a priced market power effect for multinational firms only. These results were generated using three methodologies commonly used in tests of asset pricing models. It was found that to uncover a priced effect, it was necessary to account for violations from the standard regression model. In no cases did the standard ordinary least squares estimation technique generate statistically significant results. On the other hand correction for heteroscedasticity and the classic errors in variable problem using generalized least squares and maximum likelihood estimation resulted in statistically significant results.

The results found here are encouraging in light of the many anomalies within the standard CAPM framework. As indicated, past studies have uncovered the so called firm size effect. In most cases these studies indicate that size is probably a proxy for some missing factor. However most of these studies overlook one very obvious

difference between the small and large firms studied. The larger NYSE firms are in most cases multinational in nature. However, Banz conjectures that the reason for the small firm effect can be based on a model by Klein and Bawa (1977). In this market, insufficient information concerning the true parameters of the firm's distribution, makes these firms undesirable to hold in one's portfolio. Banz hypothesizes that the amount of information generated is probably related to firm size. As a result many investors would not want to hold the shares sold by small firms. In this instance, lack of information about small firms leads to limited diversification and therefore to higher returns for the undesirable stocks of small firms. As we can see, this scenario is consistent with Banz's findings.

While it may be true that more information is generated for large firms, interpretation of such information may be at best difficult. Note that the large NYSE firms have a high probability of being multinational. As we have seen there is disagreement in the literature concerning our ability to measure multinational risk. If we add to this exchange rate risk as well as expropriation risk, it may be no easy task to generate the true distributional parameters for these large, well researched firms. While small firms may be "neglected," this can not be the sole cause of the firm size effect.

The evidence presented here, however, suggests that it may be the foreign component of market power that is relevant. This is so since the market power of domestic firms (which does contain some foreign income) is not priced. However, as argued earlier it is impossible to

separate market power into its components: foreign and domestic. Recall that horizontal foreign involvement is usually accompanied by the complementary aspects of the firm's domestic operations. If this is so, the firm's overall market power is the result of the synergies that result from the complementarities of domestic and foreign operations.

An interesting extension of this work, would be to analytically derive the investment and financing decisions of large (i.e., MNE) firms under conditions of market power. Fatemi's (1984) preliminary results of the abnormal returns surrounding the decision to invest abroad suggests that managers are exercising a lever to create shareholder value (i.e., MNEs earn abnormal returns). Since we cannot accurately measure MNE risk, nor accept or reject a segmented or integrated market model of asset pricing, we must search for the link between excess valuation and returns. A pure financial role for the MNE (as in ES, 1984) is not sufficient. While a theoretical model of such a relationship has yet to be developed, this research has uncovered an empirical link between these two. Hopefully this will encourage further theoretical work in the area of the multinational enterprise.

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