THE ASSOCIATION BETWEEN GEOGRAPHIC SEGMENT EARNINGS AND SECURITY PRICES

BY

WAYNE BRIAN THOMAS

Bachelor of Science
Southwestern Oklahoma State University
Weatherford, Oklahoma
1991

Master of Science
Oklahoma State University
Stillwater, Oklahoma
1992

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF PHILOSOPHY
December, 1995

THE ASSOCIATION BETWEEN GEOGRAPHIC

SEGMENT EARNINGS AND

SECURITY PRICES

Thesis Approved:

Gary Meek

Thesis Adviser

Dennis H. Patz

Carol Baumgardner

Wade Brorsen

Thomas C. Collins

Dean of Graduate College

ACKNOWLEDGMENTS

I would first and foremost like to thank my Lord and Savior Jesus Christ for his abundant blessings and strength in helping me to complete my degree. "And whatever you do, whether in word or deed, do it all in the name of the Lord Jesus, giving thanks to God the Father through him" (Col 3:17). I would also like to thank my wife for celebrating with me during the good times and encouraging me during the bad times. Her constant support guided me throughout the doctoral program. I would like to thank my chairman Professor Gary Meek, who consistently guided me and greatly facilitated the progress of the dissertation. He is perhaps the best dissertation chairman one could hope to have. I would also like to thank Professor Wade Brorsen whose exceptional econometric and analytical skills contributed significantly to the dissertation. I would also like to thank my other two committee members, Professor Carol Johnson and Professor Dennis Patz, for their time and effort throughout the dissertation stage. Finally, I would like to thank Professor Lanny Chasteen and the OSU School of Accounting for providing generous financial support throughout the doctoral program and Deloitte & Touche for providing financial support in the dissertation stage.

TABLE OF CONTENTS

LIST OF TABLES

1. INTRODUCTION

1.1 Background on Geographic Segment Disclosures

Prior to the 1960's most business combinations involved firms acquiring other firms which operated in the same industry and geographic area. As a result, investors needed such firms to provide consolidated statements as if the firm were operating as one unit with one or more divisions. The Committee on Accounting Procedure of the American Institute of Certified Public Accountants (AICPA) stated in Accounting Research Bulletin No. 43: "There is presumption that consolidated statements are more meaningful than separate statements" (AICPA, 1953, p.111).

Business combinations began to extend to different industries and geographic areas in the early to mid 1960's (Pacter, 1993). Geographic dispersion was aided by improved transportation and communication technology. With increased diversification, however, investors now needed information about the different segments of the firm since risks and growth opportunities likely varied across segments. Consequently, investors began to pressure standard setters to require firms to disclose operations on a disaggregated basis. Manuel Cohen, former Chairman of the Securities and Exchange Commission (SEC), pointed out that:

> It is no longer enough for the investing public to know the overall results in consolidated form. If investors are to make meaningful decisions, they must also know the respective contributions of the various categories to the consolidated income figures (McKinneley, 1970, p. 204).

Segment disclosures were first required by the SEC in 1969.[1] In 1976 the

---

[1] The SEC required firms operating in more than one industry to report sales and profits by industry segment.

Financial Accounting Standards Board (FASB) issued Statement of Financial Accounting Standards No. 14 (SFAS 14), which requires, among other things, that firms disclose revenues, identifiable assets, and profits by industry and by geographic area.

The financial community has criticized current disclosures of geographic segment information because many of the characteristics which make accounting information useful for decision making are absent from such disclosures. Many complain that the general materiality guidelines of SFAS 14 concerning the definition of a geographic segment have resulted in highly aggregated segments which provide little decision relevant information. Others complain that geographic segment disclosures are not useful because of the lack of comparability and consistency in segment definition both across firms and over time for the same firm, because of the lack of timeliness in reporting (i.e., no interim reporting requirements), and because of failure to group foreign operations according to similar risk and return characteristics. Other criticisms include the lack of neutrality and reliability in reporting geographic segment earnings because of management manipulation through transfer pricing policies, common cost allocations, and intra-group transfers. As a result, geographic segment disclosures may provide little, if any, decision useful information beyond that provided by consolidated statements.[2]

The inadequacy of current segment disclosure practices for market participants

---

[2] See Pacter (1993, Ch. 4) for a thorough discussion of the alleged shortcomings of current segment reporting practices.

is commented on in a position paper on corporate financial reporting published by the Association for Investment Management Research (AIMR, 1992, p.39).[3]

> Most analysts have found the provisions of 1976's Statement of Financial Accounting Standards No. 14, *Financial Reporting for Segments of a Business Enterprise*, helpful but inadequate.

In this position paper, current segment reporting practices are listed as the most repeated shortcoming of financial reporting and disclosure by U.S. companies.

In 1991, the AICPA organized a Special Committee on Financial Reporting to investigate the information needs of investors and creditors. The findings of the Committee reveal that investors highly value segment information, however, current disclosure practices generally do not provide adequate information for assessing a firm's future cash flows (AICPA, 1994). Thus, the usefulness of segment data, as currently reported, is in question.

The remainder of the paper is organized as follows. Next, the research questions and contributions of the dissertation are discussed. Section 2 reviews the literature related to the usefulness of geographic segment disclosures. Section 3 provides a theoretical discussion of the research questions. Section 4 details the research design and states the hypotheses to be tested. Section 5 discusses the data and sample selection criteria. Section 6 describes the results. Section 7 summarizes and provides implications of the results. Section 8 addresses limitations and section 9 discusses avenues for future research.

---

[3] The AIMR represents over 23,000 professional financial analysts worldwide.

1.2 Research Questions

This dissertation examines the usefulness of geographic segment earnings disclosures by addressing two questions. The first research question is: Are current geographic segment earnings disclosures used by market participants to value securities? This question is addressed by observing whether the market differentially values firms' geographic segment earnings. Since earnings relate to cash flows and cash flows (adjusted for risk) relate to firm value, one would expect the market to value geographic segment earnings differently if risks and/or the persistence of earnings vary across geographic areas. There is ample evidence that risks vary significantly across geographic areas. Indeed, exchange rate risk, political risk (e.g., expropriation or unfavorable regulation), economic risk (e.g., inflation), monetary risk (e.g., dividend remittance restrictions), and competitive risk vary significantly around the world and affect the stability of firms' future earnings streams (Daniels and Radebaugh, 1986, Ch. 16). If the market fails to value the earnings of geographic segments differently, then disclosures of geographic segment earnings currently provided by multinational firms contain no information beyond that provided by disclosure of consolidated earnings, and current disclosures of geographic segment earnings are therefore not used in terms of security valuation.[4]

The second research question is: Do earnings disclosed by geographic segment provide relevant accounting data for assessing the beta (i.e., systematic risk or market

---

[4] Financial statement users other than market participants may find geographic segment disclosures useful (e.g., bankers assessing the probability of bankruptcy). This alternative issue is not addressed in this dissertation.

risk) and risk-adjusted stock returns of multinational firms' securities? This question is addressed by relating accounting measures of beta and risk-adjusted returns, generated using firms' geographic segment earnings as disclosed in the financial statements, to securities' betas and risk-adjusted stock returns. Geographic segment earnings disclosures are considered useful to market participants if the accounting measures of beta and risk-adjusted return are positively related to the stock return measures of beta and risk-adjusted return. Failure to find a positive relationship would suggest that geographic segment earnings disclosures, as currently provided by multinational firms, are not useful. This, however, would not imply that investors have no other means of distinguishing between the risk and risk-adjusted returns of firms' securities, only that extant disclosures of geographic segment earnings are not useful for these purposes.

For the purpose of this dissertation, the term "useful" implies a different meaning than the term "used." The first objective of the dissertation addresses whether disclosures of geographic segment earnings are *actually* used to value securities. The second objective investigates whether such disclosures are *potentially* useful to market participants for assessing the beta and risk-adjusted returns of multinational firms' securities. The methodology of this dissertation cannot verify whether market participants *actually* use such disclosures to identify beta and risk-adjusted returns. However, the aim of the two objectives is the same. Since use is a sufficient condition for usefulness, finding that disclosures of geographic segment earnings are used to value securities necessarily implies that such disclosures are useful. Similarly, usefulness is a necessary condition for use. Finding that disclosures of geographic segment earnings are useful in assessing beta and risk-adjusted returns indicates that such disclosures can be used by rational decision makers to make investment, credit, and similar decisions. Thus, while the first objective addresses actual use and the second objective addresses potential usefulness, the two objective are consistent in that both address the adequacy of financial disclosures to provide information to financial statement users for the purpose of making decisions.

1.3 Contributions

The increase in foreign operations has made information about geographic segments one of the most important sources of information for evaluating multinational firms. The AIMR describes the importance of segment information as follows:

> It (segment reporting) is more than necessary. It is vital, essential, fundamental, indispensable, and integral to the investment analysis process (AIMR, 1992, p.39).

Recently, there has been increased interest by standard setting bodies in the U.S. regarding the adequacy of segment disclosures. The FASB recently completed and published a Research Report (Pacter, 1993), which represents the first step in a FASB project to reexamine existing standards for reporting disaggregated information. The FASB also issued an Invitation to Comment, (FASB, 1993). In addition, the adequacy of current segment disclosures was one of the major topics investigated by the Special Committee on Financial Reporting of the AICPA. In line with the FASB and AICPA investigations, this dissertation seeks directly to answer whether disclosures of geographic segment earnings now provided by multinational firms are being used by the market to value securities. Failure to find empirical evidence of the use or potential usefulness of geographic segment earnings disclosures to value securities would suggest to such standard-setting bodies that either geographic segment information is inherently noninformative (and therefore geographic segment disclosure requirements are not necessary) or the current disclosure practices are inadequate. The former is highly unlikely.

For the same reasons as above, the results of this dissertation may also be of interest to many standard-setting bodies outside the U.S. that have issued segment reporting requirements and recommendations (e.g., Accounting Standards Board in Canada, International Accounting Standards Committee, European Union, Organization for Economic Co-operation and Development, United Nations, International Organization of Securities Commissions, and several others). In addition, the methods used in this dissertation may be of interest to accounting researchers. The methods aim to strengthen the statistical relationship between earnings and returns by adjusting for the noise and lack of timeliness in earnings. Such methodological improvements could be used to provide useful evidence for many empirical issues investigating the differences in the components of earnings (e.g., line of business earnings, accruals vs. cash flows data, etc.).

2. RELATED LITERATURE

The amount of previous research directly related to the use or potential usefulness of geographic segment disclosures is relatively scarce. This section outlines the findings of previous studies and illustrates how the previous studies have not clearly answered the fundamental question: Do disclosures of geographic segment earnings provide information useful for decision making? The review of the geographic segment disclosure literature below is divided into three sections: 1) prediction model studies, 2) risk assessment studies, and 3) stock market return studies.

2.1 Prediction Model Studies

Roberts (1989) compares the ability of models constructed using geographic segment sales and earnings versus models constructed using consolidated sales and earnings to predict consolidated earnings. The study includes 78 U.K.-based companies from 1981 to 1983. Roberts finds that the geographic segment sales and earnings models provide more accurate predictions of consolidated earnings than do consolidated models. However, the ability of geographic segment earnings to predict earnings is not significantly better than the ability of geographic segment sales to predict earnings. Roberts concludes, "for forecasting purposes, there is no additional benefit in having segment earnings data as well as segment sales data" (p. 147.). Roberts attributes the inability of geographic segment earnings to outperform geographic segment sales to arbitrary common cost allocations and manipulation of geographic segment earnings through transfer pricing.

Examining 89 U.S.-based multinational companies for the period 1979 to 1985, Balakrishnan, Harris, and Sen (1990) examine whether the use of geographic segment sales and earnings provide more accurate predictions of future consolidated sales and earnings, respectively, than do consolidated data. They demonstrate that geographic data provide better predictions only when exchange rate changes and growth rates are known with perfect foresight. When exchange rate changes and growth rates are forecasted, geographic segment data do not outperform consolidated data. Balakrishnan, Harris, and Sen attribute the modest results to the lack of detailed geographic segment disclosures (i.e., insufficient disaggregation) which reduces the ability to accurately predict certain country-specific macroeconomic variables.

Ahadiat (1993) employs Box-Jenkins time series models to predict a firm's earnings using consolidated versus geographic segment earnings over a 19-year period. The results indicate that geographic segment earnings provide more accurate predictions of consolidated earnings than do consolidated earnings. Ahadiat finds that the prediction of earnings only slightly improves as the level of disaggregation increases.

In summary, studies using prediction models to assess the usefulness of geographic segment data do not demonstrate convincingly the superiority of geographic segment data over consolidated data alone. In addition, geographic segment earnings provide little or no incremental predictive power over geographic segment sales for predicting consolidated earnings. This implies that the current disclosures of geographic segment earnings may be of limited use for predicting earnings.

2.2 Risk Assessment Studies

Prodhan (1986) and Prodhan and Harris (1989) using U.K. and U.S. firms, respectively, examine the relationship between systematic risk and firms' initial disclosures of geographic segment data in 1977. A control group consisting of firms that voluntarily provided geographic segment data prior to 1977 and a treatment group consisting of firms that initially disclosed geographic segment data in 1977 are compared. Both studies find significantly higher betas for the treatment group than for the control group prior to 1977, but after 1977, no significant difference in betas remains. The authors conclude that geographic segment disclosures appear to reduce uncertainty and lower firms' cost of capital.

Doupnik and Rolfe (1990) conduct an experiment to determine whether greater disaggregation of geographic segment data affects the assessment of risk. Financial analysts are given hypothetical data about a multinational firm and asked to assess its investment risk. The data differ as to 1) the degree of disaggregation, 2) the relative involvement of the firm in the various geographic areas, and 3) the degree of specificity with which each geographic area is described. Doupnik and Rolfe find (1990) that there is an association between geographic segment disclosures and risk. However, they demonstrate that greater disaggregation does not necessarily result in less risk. In the cases where disaggregation reveals relatively high involvement in a risky geographic area (e.g., the Middle East), investment risk increases.

In summary, the risk assessment studies reveal that geographic segment disclosures influence users' perceptions of risk level. In most cases, greater disaggregation can result in less perceived risk.

2.3 Stock Market Return Studies

Senteney and Bazaz (1992) evaluate whether the mandated disclosure of geographic sales and earnings data improves the market's ability to forecast consolidated earnings. The market's ability to forecast consolidated earnings is measured as the association between market model abnormal returns and the change in earnings. As the market's ability to forecast earnings improves, then the association between abnormal returns and the change in earnings should decrease since the market is not as "surprised" when earnings are announced. Senteney and Bazaz (1992) find that the association between abnormal return and the change in earnings decreases after implementation of SFAS 14. This suggests that the market is able to make more accurate predictions of future consolidated earnings by using geographic segment data.

The studies mentioned thus far investigate the potential usefulness of geographic segment disclosures. Standard setters should aim to establish standards which are not only potentially useful but which are actually used. The only study to examine the actual use of geographic segment disclosures is Boatsman, Behn, and Patz (1993). Boatsman, Behn and Patz (1993) test for differential valuing of firms' geographic segment earnings by noting the security market reaction to unexpected geographic earnings using a 16-day window surrounding the release of the annual report. Cumulative abnormal security returns are used to measure the market's reaction to unexpected foreign earnings which are based on a random walk model adjusted for exchange rate effects.

Boatsman, Behn, and Patz (1993) find that geographic segment disclosures are useful when unexpected geographic segment earnings are large. In general, however, they find that the market does not value geographic segment earnings differently, which indicates that current disclosures of geographic segment earnings may be of limited use for security valuation. Either the market does not view geographic segment information as value relevant or the current mode of disclosure limits the ability of the market to infer information that is relevant for firm valuation. As discussed previously in section 1.2, the former is not likely.

Overall, the geographic segment disclosure literature provides modest evidence supporting the potential usefulness of earnings disclosed by geographic segment. The only study (Boatsman, Behn, and Patz, 1993) to examine the actual use of geographic segment earnings finds little support that such disclosures are used. The first purpose of this dissertation is to investigate whether geographic segment earnings are used to value securities. The work of Boatsman, Behn, and Patz (1993) is extended by more precisely measuring the relationship between security prices and geographic segment earnings. These improvements will be discussed in section 4.1.

3. THEORETICAL SUPPORT

3.1 Geographic Segment Earnings and Security Valuation

The first research question addresses whether disclosures of geographic segment earnings are used to value securities. This section develops the relationship between security prices and geographic segment earnings and shows that the earnings of geographic segments which have more risk should be valued less by the market.

Under certain assumptions, the multi-period Capital Asset Pricing Model (CAPM) shows firm value to be equal to the present value of expected future cash flows (see Watts and Zimmerman, 1986, Ch. 2):

$$P_{i,0} = \sum_{t=0}^{\infty} \frac{E(C_{i,t})}{[1 + E(r_i)]^t} \qquad (1)$$

where, $P_{i,0}$ = value of firm i in the current period (i.e., period 0), $E(C_{i,t})$ = expected cash flows for firm i in period t, and $E(r_i)$ = expected return for firm i.

The value of the firm is inversely related to the expected return of its cash flows. The greater the risk associated with a firm's cash flows, the greater the return expected by security holders.

Assuming the present value of expected earnings equals the present value of expected cash flows, which requires zero expected net investment by the firm,[5] the value of the firm can be written as the present value of the firm's future expected

[5] Zero expected net investment means that the present value of future investment that is needed to achieve future operating cash flows equals the present value of future depreciation. See Fama and Miller (1972, pp. 86-97).

earnings:

$$P_{i,0} = \sum_{t=0}^{\infty} \frac{E(A_{i,t})}{[1+E(r_i)]^t} \tag{2}$$

where, $E(A_{i,t})$ = expected accounting earnings for firm i in period t.

Under the assumption that earnings follow a random walk process, the best expectation of future periods' earnings is the current period's earnings.[6] Equation (2) can be shown as follows:

$$P_{i,0} = \sum_{t=0}^{\infty} \frac{A_{i,0}}{[1+E(r_i)]^t} \quad . \tag{3}$$

Equation (3) can be rewritten as:

$$P_{i,0} = (1 + 1/E(r_i))A_{i,0} \quad . \tag{4}$$

Therefore, one dollar of earnings is capitalized by the market as one dollar plus the present value of one dollar each period for an infinite number of periods. Notice that in this valuation model all of the firm's earnings are discounted by the same amount, $E(r_i)$. In other words, the riskiness of earnings is not allowed to vary across the firm's operations. As stated previously, it is highly likely that the riskiness of earnings differs across firms' foreign operations. Extending the earnings capitalization model to allow for risk to vary across segments, firm value can be written as the sum of each geographic segment's current earnings discounted by the

---

[6] The literature commonly refers to the assumption of earnings following a random walk as earnings being permanent.

appropriate expected return (or risk level):

$$P_{i,0} = (1 + 1/E(r_{i,1}))A_{i,0,1} + (1 + 1/E(r_{i,2}))A_{i,0,2} + ... + (1 + 1/E(r_{i,n}))A_{i,0,n} \qquad (5)$$

where, $A_{i,0,n}$ = current accounting earnings for segment n and $E(r_{i,n})$ = expected return of segment n.

If the level of risk does not vary across geographic segments, then equation (5) collapses back to equation (4). That is, only consolidated earnings need be known because the market would value the earnings of all geographic segments equally. However, if risk levels differ among geographic segments, then expected earnings should be discounted by the appropriate risk factor. In this latter case, disclosure of geographic segment earnings should allow investors to more precisely value the firm than would disclosure of consolidated earnings alone. If disclosures of geographic segments are used, then the market should differentially value geographic segment earnings since the risks and returns of operating abroad vary according to geographic area.[7]

3.2 Geographic Segment Earnings, Beta, and Risk-Adjusted Stock Returns

The second objective of this dissertation is to determine whether accounting

---

[7] An additional reason that the market may value the earnings of geographic segments differently is because the persistence of earnings differs across segments. In equation (5) earnings for all geographic segments are assumed to be equally persistent (i.e., follow a random walk). It is likely that the earnings differ in persistence across segments and are therefore less (more) persistent than a random walk causing current earnings to be valued less (more) by the market. The persistence of earnings across geographic segment is not formerly incorporated into the models but is considered when discussing the results.

measures of beta and risk-adjusted return, generated using geographic segment earnings disclosures, correspond to stock return measures of beta and risk-adjusted return. Finding an association would indicate that geographic segment disclosures provide useful information for assessing securities' risks as well as returns for those given levels of risk. This section develops an 'international' version of the familiar market model to model the returns-generation process of *multinational* firms' securities. As shown below, geographic segment earnings are expected to be related to beta and risk-adjusted stock returns when the returns on the foreign and domestic operations are not perfectly related and/or when the level of systematic risk of domestic operations differs from the level of systematic risk of foreign operations.

One of the most general models of the security returns-generation process is Sharpe's (1963) market model:

$$R_{i,t} = \beta_{0,i} + \beta_i R_{M,t} + \epsilon_{i,t} \qquad (6)$$

where, $R_{i,t}$ is the return of security i in period t, $R_{M,t}$ is the return of the market portfolio in period t, $\beta_i = cov(R_i, R_M)/var(R_M)$ is the beta of security i, $\beta_{0,i}$ is a constant and $\epsilon_{i,t}$ is a normally distributed error term with zero mean.

However, as pointed out by Roll (1977), it is not possible to directly test the market model because of the infeasibility of precisely measuring the return of the market portfolio.[8] Instead, researchers have relied on imperfect measures for the

[8] Roll (1977) argues that the only way to test the theory that stock returns are a linear function of systematic risk is to know the exact composition of the true market portfolio, and it is impossible to include *all* individual assets in the portfolio.

return of the market portfolio. The traditional proxy consists of the return of a large portfolio of stocks listed on domestic stock exchanges (e.g., NYSE equally-weighted return, NYSE value-weighted return, and S&P 500). Thus, the market model has traditionally been estimated as:

$$R_{i,t} = \beta_{0,i} + \beta_i R_{D,t} + \epsilon_{i,t} \tag{7}$$

where, $R_{D,t}$ is the return of the domestic market portfolio in period t and β_i is the market risk of security i with respect to the domestic market portfolio. As shown below, this model will not accurately portray the returns-generation process of multinational firms which operate in foreign markets that are not perfectly related to the domestic market and/or which have a different level of domestic market risk than foreign market risk.

If the return of any large, domestic portfolio of stocks (e.g., NYSE) were a good proxy for the return of the entire market portfolio, then returns of securities from around the world should be priced according to their comovement with this domestic market portfolio. Empirically, this is not the case. Jacquillat and Solnik (1978) estimate the traditional (domestic) market model and a "multi-country" market model for firms from nine major countries.[9] The multi-country market model involves regressing the return of security i on the returns of the market portfolios from each of the nine countries whereas the domestic market model regresses the return of security i on the return of the respective domestic market portfolio only. Jacquillat

---

[9] The countries include the United States, the Netherlands, Belgium, Germany, Italy, Sweden, France, Switzerland, and the United Kingdom.

and Solnik (1978) find that there is very little improvement of the multi-country market model over the simpler domestic market model. The domestic market portfolio of each country best explains the returns of the firms in the respective country. That is, the U.S. market portfolio return best explains the returns for U.S. firms' securities, the French market portfolio best explains the returns for French firms' securities, and so on.[10] This indicates that no domestic market model provides a "good" substitute for the entire market model. Instead, the market risk (or beta) that domestic securities have with the domestic market portfolio approximates the market risk that domestic securities have, relative to other domestic securities, with the return of the entire market portfolio. That is, a security whose domestic beta is greater (less) than one would indicate a security which has greater (less) market risk with the entire market portfolio relative to the other domestic securities.

Since multinational firms operate in more than one domestic market, the traditional domestic market model will not portray the returns-generation process of multinational firms' securities. Augmon and Lessard (1977) show that as a firm's proportion of foreign sales increases, then its domestic beta decreases while its foreign beta increases. This indicates that the domestic portion of the return of a multinational firm's security is explained by the market risk of this domestic portion relative to the market risk of other domestic firms. Similarly, the foreign portion of the return of a multinational firm's security is explained by the market risk of this

[10] Similar findings have been reported by Solnik (1973) and Lessard (1976).

foreign portion relative to the market risk of other foreign firms.[11] However, as will be shown below, to the extent that the return of the foreign market portfolio is perfectly correlated to the return of the domestic market portfolio, the domestic market portfolio also explains the foreign portion of the security return. In contrast, if movements in the foreign and domestic stock markets are independent (i.e., uncorrelated), then the domestic market portfolio will not explain any of the foreign portion of the security return.

Empirical evidence suggests that movements in the world stock markets are relatively independent. Solnik (1991) shows that the average common variance (i.e., squared correlation) between the U.S. stock market and 16 other national stock markets is less than 20%.[12] The average common variance among the 16 other national stock markets is equally low as well.[13] Thus, domestic market portfolios will explain only a small amount of the foreign portion of a security's return. Accounting for the market risks that multinational firms encounter in both domestic and foreign markets, the multi-country market model can be written as follows:

The return of security i is a weighted average of the security's domestic beta:

---

[11] Ideally, the return of the foreign market portfolio would be the return of the domestic market portfolio of the foreign country in which the multinational firm operates.

[12] Solnik (1991) uses monthly returns over the 1971-1986 period.

[13] Similar results have been reported by others. Hunter and Coggin (1990) use quarterly returns over the 1970-1986 period and find relatively little correlation among national security markets. Their sample of countries closely resembles that of Solnik (1991). Errunza (1983) uses monthly returns over the 1976-1980 period and finds lower correlation between the securities markets of developing and emerging market countries than between the securities markets of developing countries only.

$$R_{i,t} = \beta_{0,i} + x_i \beta_{i,D} R_{D,t} + (1 - x_i) \beta_{i,F} R_{F,t} + \epsilon_{i,t} \quad . \tag{8}$$

$\beta_{i,D}$, times the return of the domestic market portfolio and the security's foreign beta, $\beta_{i,F}$, times the return of the foreign market portfolio, $R_{F,t}$. The weight, x_i, is determined by the proportion of the security's return that is attributable to domestic operations.

The return of the foreign market portfolio can be separated into two components, the portion that is perfectly correlated with the domestic market portfolio and the portion that is uncorrelated with the domestic market portfolio:

$$R_{F,t} = \beta_1 + \beta_{F,D} R_{D,t} + \omega_t$$

where, β_1 is an intercept term, ω_t is a normally distributed error term with zero mean, and $\beta_{F,D} = cov(R_F, R_D)/var(R_D)$ is the market risk of the foreign market portfolio with the domestic market portfolio. The portion of the return of the foreign market portfolio that is correlated with the return of the domestic portfolio equals $\beta_{F,D}$ times R_D. The uncorrelated portion, $UR_{F,t}$, equals β_1 plus ω_t.

After separating the return of the foreign market portfolio into its correlated and uncorrelated portions, equation (8) can be written as follows:

$$R_{i,t} = \beta_{0,i} + x_i \beta_{i,D} R_{D,t} + (1 - x_i) \beta_{i,F} (B_{F,D} R_{D,t} + UR_{F,t}) + \epsilon_{i,t} \quad . \tag{10}$$

After rearranging variables in equation (10), equation (11) shows the returns-generation process of a multinational firm's security and the estimates of the security's domestic beta and foreign beta:

$$R_{i,t} = \beta_{0,i} + [x_i\beta_{i,D} + (1-x_i)\beta_{i,F}\beta_{F,D}]R_{D,t} + (1-x_i)\beta_{i,F}UR_{F,t} + \epsilon_{i,t} \quad . \tag{11}$$

Since researchers traditionally omit the uncorrelated portion of the return of the foreign market portfolio (see equation (7)), the estimated beta, $\beta^*_{i,D}$, of security i is a weighted average of the firms' domestic market risk and its foreign market risk times the market risk of the foreign market with the domestic market:

$$\beta^*_{i,D} = x_i\beta_{i,D} + (1-x_i)\beta_{i,F}\beta_{F,D} \quad . \tag{12}$$

Note that omitting $UR_{F,t}$ from equation (11) does not bias the estimation of $\beta^*_{i,D}$ since $UR_{F,t}$ and $R_{D,t}$ are uncorrelated. However, omitting $UR_{F,t}$ does cause security i's risk-adjusted return to be measured incorrectly. Subtracting both sides of equation (11) by the domestic portion of the return, $\beta^*_{i,D}R_{D,t}$, shows that security i's risk-adjusted return is expected to equal $\beta^*_{i,F}$ times $UR_{F,t}$:

$$R_{i,t} - \beta^*_{i,D}R_{D,t} = \beta_{0,i} + \beta^*_{i,F}UR_{F,t} + \epsilon_{i,t} \tag{13}$$

where, $\beta^*_{i,F} = (1-x_i)\beta_{i,F}$.

As Sharpe's market model shows (see equation (6)), the expected return of a security equals the security's beta times the expected return of the market portfolio. Only the nondiversifiable risk (i.e., beta or market risk) of the security is valued in an efficient market since any nondiversifiable risk can, by definition, be eliminated by holding other assets. Theoretically, the return of any security, less its beta times the return of the market portfolio is expected to be zero. However, using only the domestic market portfolio as a measure of the entire market portfolio does not adequately portray a multinational firm's *total* market risk, it only portrays the multinational firm's *domestic* market risk (and the correlated portion of the foreign market risk). Therefore, since the market values the total market risk of a security, the total return of the multinational firm's security will reflect both domestic and foreign market risk, but the estimated beta, using only the domestic market portfolio, will reflect only the domestic market risk (and the correlated portion of foreign market risk). To the extent that $\beta^*_{i,F}$ times $UR_{F,t}$ is nonzero, security i's risk-adjusted return, computed using only the return of the domestic market portfolio, is not expected to be zero.

The objective of this dissertation is to determine whether earnings disclosed by geographic segment are useful measures of the returns of domestic and foreign operations. By substituting the domestic and foreign earnings per share of firm i in period t (divided by beginning of period price), $E_{i,t}$, for stock returns in equation (11), accounting measures of domestic beta, foreign beta, and risk-adjusted return can be computed. If disclosures of geographic segment earnings are useful, then accounting measures of beta and risk-adjusted return should correspond to the stock return measures of beta and risk-adjusted return. The accounting betas are calculated as follows:

$$E_{i,t} = \alpha_{0,i} + \alpha^*_{i,D}E_{D,t} + \alpha^*_{i,F}UE_{F,t} + \upsilon_{i,t} \qquad \textbf{(14)}$$

where, $\alpha_{0,i}$ is an intercept term and $\upsilon_{i,t}$ is a normally distributed error term with zero mean. $E_{D,t}$ is the sample average of the individual firms' *domestic* earnings/price ratios in period t (i.e., the return of the domestic market portfolio). $UE_{F,t}$ is the portion of the sample average of the individual firms' *foreign* earnings/price ratios that is uncorrelated with the sample average domestic earnings/price ratio (i.e., the return of the portion of the foreign market portfolio uncorrelated with the return of the domestic market portfolio). $\alpha^*_{i,D}$ and $\alpha^*_{i,F}$ are the estimated domestic and foreign accounting betas, respectively. The construction of the variables in equation (14) is discussed in more detail in section 4.2.

Geographic segment earnings are considered useful if the accounting measures of beta and risk-adjusted returns are positively related to stock return betas and risk-adjusted returns. That is, a positive relationship should exist between the estimated domestic stock return betas and domestic accounting betas (i.e., a positive relationship between $\beta^*_{i,D}$ and $\alpha^*_{i,D}$). There should also be a positive relationship between risk-adjusted stock returns and the foreign accounting betas times the uncorrelated foreign market earnings (i.e., a positive relationship between $R_{i,t}$ - $\beta^*_{i,D}$ $R_{D,t}$ and $\alpha^*_{i,F}$ $UE_{F,t}$).

4. RESEARCH DESIGN AND STATEMENT OF HYPOTHESES

4.1 Testing the Use of Geographic Segment Earnings Disclosures to Value Securities

The first research question addresses whether the market uses disclosures of geographic segment earnings to value securities. As discussed earlier, Boatsman, Behn, and Patz (1993) relate unexpected returns and unexpected geographic segment earnings over a 16-day window and find no evidence that disclosures of geographic segment earnings are being used. Their methodological approach may have biased the results towards understating the use of geographic segment earnings. The use of narrow windows may result in measurements which understate the use of geographic segment earnings if narrow windows fail to capture the induced price revision (Lev, 1989). Since consolidated earnings are known well in advance of geographic segment earnings, most of the changes in geographic segment earnings may have been anticipated and therefore incorporated into the prices of securities before the beginning of the short-window interval.

Instead of measuring the response of unexpected returns to unexpected geographic segment earnings within a short-window period, this dissertation investigates the association between geographic segment earnings and security returns using (1) long-window associations of returns and earnings (see section 4.1.1) and (2) leading-period returns (see section 4.1.2). Both of these methods have been shown to enhance the observed statistical relationship between raw returns and the level of, as opposed to the change in, consolidated earnings.

Using the level of earnings instead of the change in earnings to explain security returns has been supported both theoretically and empirically. Theoretically, Ohlson (1991a,b) and Ohlson and Shroff (1992) argue that the level of earnings is often more appropriate than is the change in earnings (both deflated by beginning of period price) as a proxy for unexpected earnings. Empirically, Easton and Harris (1991) and Ali and Zarowin (1992) use 12-month windows and find support for the earnings level variable in explaining security returns. The advantages of using raw returns and the level of earnings in long-window association studies (as in Easton, Harris, and Ohlson, 1992) and in leading-period return studies (as in Kothari and Sloan, 1992) are discussed below.

4.1.1 Long-Window Association of Returns and Earnings

Empirically, (unexpected) earnings have been able to explain very little about variations in security prices. Most earnings/returns studies find explanatory power (i.e., R^2) of less than 10%. Bernard (1989) and Lev (1989) note that these findings are robust across different estimation techniques. Thus, the problem of low explanatory power is unlikely to be econometric in nature. One reason for the low correlation between earnings and returns may be that of timing. That is, value relevant events may be captured in the current period's security return but not in the current period's earnings, or value relevant events occur prior to the return interval which are recognized in the current period's earnings. As the interval over which the returns are measured increases, these two types of errors should become less important. By definition, if the return interval matches the life of the firm, then there will be no timing differences between earnings and returns.

Easton, Harris, and Ohlson (1992) investigate the relationship between earnings and returns over long periods and find a considerable increase in the ability of earnings to explain returns.[14] Earnings appear to provide a better approximation of cash flows as the length of the measurement window increases. Easton, Harris, and Ohlson (1992) conclude that the explanatory power provided by using long-window associations of earnings and returns can facilitate the understanding of how the various

[14] Easton, Harris, and Ohlson (1992) regress 10-,5-,2-, and 1-year returns on cumulative 10-,5-,2-, and 1-year earnings, respectively, and find that earnings explain approximately 63%, 33%, 15%, and 5% of returns, respectively.

components of earnings contribute to explaining returns.[15] The components of earnings can be separated into geographic segment earnings. The appendix analytically incorporates geographic segment earnings into the long-window returns/earnings model of Easton, Harris, and Ohlson (1992). The model that will be used to estimate the long-window association of returns and geographic segment earnings (hereafter referred to as the cumulative return/earnings model) is shown below:[16]

$$R_{t,t-\tau} = \alpha + \beta_1 \frac{D_{t,t-\tau}}{P_{t-\tau}} + \sum_{n=2}^{N} \beta_n \frac{F_{n,t,t-\tau}}{P_{t-\tau}} + \epsilon_{t-\tau} \qquad (15)$$

where,

$R_{t-\tau} = (P_t + \Sigma_{\tau=1}^{T} d_{t,t-\tau} - P_{t-\tau})/P_{t-\tau}$ = total buy and hold returns for period (t, t - τ),

$d_{t,t-\tau}$ = dividends paid for period (t, t - τ),

$P_{t-\tau}$ = security price at the beginning of the return interval,

$D_{t,t-\tau}$ = cumulative domestic earnings for period (t, t - τ),

$F_{n,t,t-\tau}$ = cumulative foreign earnings of segment n for period (t, t - τ),

α = intercept term to capture omitted factors,

β_1 = domestic earnings coefficient,

β_n = earnings coefficient for foreign segment n,

---

[15] Ramesh and Thiagarajan (1993) state that the ability of earnings cumulated over several years to explain cumulative returns is due to cumulative earnings proxying for permanent earnings.

[16] Firm subscripts are omitted to simplify the notation.

$\epsilon_{t,t-\tau}$ = random disturbance term, and

τ = 1, 2, 3, 4, and 5 years.

Equation (15) regresses the firm's buy and hold return for period (t, t - τ) on cumulative geographic segment earnings (deflated by market value at the beginning of the return interval) for period (t, t - τ). Earnings are separated into domestic earnings for period (t, t - τ) and earnings for each foreign segment disclosed by firms for period (t, t - τ). The foreign segments include geographic segments that are disclosed often enough to warrant inclusion in the model.

For example, the regressors in equation (15) might be Dom (domestic earnings), As/Pc (Asia/Pacific earnings), Eur (Europe earnings), GB (Great Britain earnings), Can (Canada earnings), SA/Mx (South America/Mexico earnings), and For (other foreign geographic segment earnings). For, say, a three-year return interval, the regression model is estimated as follows:

$$R_{t,t-3} = \alpha + \beta_1 \frac{Dom_{t,t-3}}{P_{t-3}} + \beta_2 \frac{As/Pc_{t,t-3}}{P_{t-3}} + \beta_3 \frac{Eur_{t,t-3}}{P_{t-3}} + \beta_4 \frac{GB_{t,t-3}}{P_{t-3}} + \beta_5 \frac{Can_{t,t-3}}{P_{t-3}} + \beta_6 \frac{SA/Mx_{t,t-3}}{P_{t-3}} + \beta_7 \frac{For_{t,t-3}}{P_{t-3}} + \epsilon_{t-3} \quad . \tag{16}$$

A firm that discloses geographic earnings in a domestic segment, Canada segment, and South Africa segment would assign the cumulative earnings over the past three years in the domestic segment to the Dom regressor, in the Canada segment to the Can regressor, and in the South Africa segment to the For regressor.[17] Earnings of zero would be assigned to the AS/PC, EUR, GB, and SA/MX regressors. For each observation the dependent variable is the buy and hold security return over the past three years.

Preferably, equation (15) would be estimated using firm-specific time-series regressions. Returns are likely to vary more by firm than for firms over time. However, estimating equation (15) using firm-specific time-series regressions may produce unreliable estimates due to the limited number of firm-specific observations. This occurs because geographic segment disclosures have been required only since 1977 and because firms often change geographic segment definitions. Instead, equation (15) is estimated using a pooled cross-sectional time-series regression approach.

4.1.2 Leading-period Returns

A topic that has recently received a considerable amount of attention in financial accounting research is the relationship between the time-series properties of earnings and the magnitude of the earnings coefficient estimated from regressing returns on earnings.[18] Time-series properties of annual earnings suggest that firms'

---

[17] The For regressor acts as a "catch-all" variable to account for the earnings of foreign geographic segments that are not reported commonly enough to warrant an individual regressor.

[18] The estimated earnings coefficient is commonly referred to as the earning response coefficient (ERC). To make clear the purpose of the proposed study, the word "response" is excluded since the proposed study addresses the "association"

earnings are largely permanent, which indicates that the estimated earnings coefficient is predicted to be about (1 + 1/r) where r is the expected return of the firm's equity.[19] For example, a regression of the current year's security return on the current year's earnings for a firm that has an expected return equal to 10% should yield an estimated earning coefficient of 11. The estimated earnings coefficient in many studies are far below the predicted values. Using time-series models to compute expected earnings, Penman (1990) estimates the earnings coefficient to be .894, Kormendi and Lipe (1987) find a median coefficient of 2.5, and Ali and Zarowin (1992) report a median coefficient of 1.59. Kothari and Sloan (1992) show that a regression of returns on changes in earnings biases estimated earnings coefficient towards zero and that this bias can be mitigated by including leading-period returns in the estimation of earnings coefficients. Using leading-period returns, Kothari and Sloan (1992) estimate the average earnings coefficient to be 5.45, which is much closer to the theoretically-predicted value.[20]

Leading-period returns decrease the bias in the estimated earnings coefficients in the following way. If price changes contain information about future earnings changes, which are not indicated by past earnings series, then price changes lead

---

between returns and earnings rather than the "response" of unexpected returns to unexpected earnings.

[19] See section 3.1.

[20] Kothari and Sloan (1992) use the average realized annual return of 17.15% on the CRSP equal-weighted portfolio from 1926-88 as a proxy for the expected return. For r=17.15%, the average earnings coefficient is predicted to be 6.83.

earnings changes.[21] The market's earnings expectations are based on a richer set of information than the past time-series of earnings. Properties of generally accepted accounting principles such as conservatism, objectivity, and verifiability limit the ability of earnings to reflect the market's revision in expectation of future net cash flows (e.g., long-term sales contracts, research and development, gain contingencies, and so on). Therefore, regressing returns on changes in earnings biases the estimated earnings coefficient towards zero. Given that price changes lead earnings changes, the earnings forecast embedded in security prices can be exploited by regressing leading-period returns on current earnings. Therefore, regressing leading-period returns on earnings causes the estimated earnings coefficient to be closer to the magnitude suggested by the time-series properties of earnings (i.e., random walk). The leading-period returns model that will be estimated is:

$$R_{t,t-\tau} = \alpha + \beta_1 \frac{D_t}{P_{t-\tau}} + \sum_{n=2}^{N} \beta_n \frac{F_{n,t}}{P_{t-\tau}} + \epsilon_t \qquad (17)$$

where,

$R_{t,t-\tau} = P_t/P_{t-\tau}$ = one plus buy-and-hold return, with dividends, in period $(t - \tau, t)$,[22]

$P_{t-\tau}$ = security price at the beginning of the leading-period return interval,

D_t = domestic earnings for period t,

---

[21] The phenomenon of "prices leading earnings" has been recognized previously in the literature [see Ball and Brown (1968), Beaver, Lambert, and Morse (1980), Brown, Foster, and Noreen (1985), Collins Kothari, and Rayburn (1987), Freeman (1987), and Collins and Kothari (1989)].

[22] This form of raw return is used to be consistent with Kothari and Sloan (1992).

$F_{n,t}$ = foreign earnings of segment n for period t,

α = intercept term to capture omitted factors,

β_0 = domestic earnings coefficient,

β_n = earnings coefficient for foreign segment n,

ϵ_t = random disturbance term, and

τ = 1, 2, 3, 4 and 5 years.

Equation (17) regresses one plus the firm's buy-and-hold security return for period (t-τ,t) on current geographic segment earnings (deflated by market value at the beginning of the return interval) for period t. With $\tau=1$ equation (17) reduces to the usual regression of returns for period t on geographic segment earnings for period t. With $\tau=2$ equation (17) regresses one plus the buy-and-hold return, computed over the interval extending from the end of the current period t to 24 months back (i.e., t-2), on geographic segment earnings for the current period t only. The earnings variables are separated into domestic earnings for period t and earnings for each foreign segment disclosed by firms for period t. Equation (17) uses the same foreign segments and is estimated essentially in the same way as equation (15).

4.1.3 Statement of Hypothesis 1

Taking as given that risks and returns of operating abroad vary according to geographic area, the first hypothesis to be tested is whether current geographic disclosure practices are used by the market to value securities. The first hypothesis is stated below in the null and alternative forms.

$H1_0$: The estimated earnings coefficients are equal across geographic segments (i.e., the market does not value geographic segment earnings differently).

$H1_A$: The estimated earnings coefficients are not equal across geographic segments (i.e., the market values geographic segment earnings differently).

The standard F-test is used to test the equality of the earnings coefficients estimated across geographic segments in both equation (15) and equation (17). If the estimated earnings coefficients are significantly different across geographic segments, then this difference would suggest that disclosures of geographic segment earnings are being used to value securities.

4.2 Testing the Usefulness of Geographic Segment Earnings in Explaining Beta and Risk-Adjusted Stock Returns

The second research question of this dissertation addresses whether earnings disclosed by geographic segment are positively related to the betas and risk-adjusted stock returns of multinational firms' securities. Failure to find an association would indicate that such disclosures are not useful. To test for this association, each firm's beta and risk-adjusted stock return are computed over a five-year period. Next, accounting measures of beta and risk-adjusted returns are calculated using geographic segment earnings over the same five-year period. To be considered useful, the accounting measures of beta and risk-adjusted returns using geographic segment earnings should be positively related to the measures of beta and risk-adjusted returns using actual stock returns. Details of the empirical tests follow.

Securities' betas and risk-adjusted stock returns are computed using the market model and monthly stock returns over a five-year period. The NYSE equally-weighted index is used as a measure of the return of the domestic market portfolio:

$$R_{i,t} = \beta_{0,i} + \beta_i R_{D,t} + \epsilon_{i,t} \quad . \tag{18}$$

Accounting measures of beta and risk-adjusted returns are then calculated using firms' disclosures of annual geographic segment earnings over the same five-year period. To estimate the accounting betas and risk-adjusted returns, it is first necessary to generate the portion of foreign earnings that is uncorrelated with domestic earnings, $UE_{F,t}$. This is done by regressing the sample average foreign earnings/price ratio, $E_{F,t}$, in period t on the sample average domestic earnings/price ratio, $E_{D,t}$, in period t:

$$E_{F,t} = \alpha_1 + \alpha_{F,D} E_{D,t} + v_t \tag{19}$$

where, α_1 is an intercept term and v_t is a normally distributed error term with zero mean. The uncorrelated portion of foreign earnings in period t is the intercept plus the error term in period t:

$$UE_{F,t} = \alpha_1 + v_t \quad . \tag{20}$$

Next, the total earnings/price ratio, $E_{i,t}$, for firm i in period t is regressed on the sample average domestic earnings/price ratio and the portion of the sample average foreign earnings/price ratio that is not correlated with the sample average domestic earnings/price ratio in year t. This generates estimates of a firm's domestic accounting beta and foreign accounting beta, $\alpha^*_{i,D}$ and $\alpha^*_{i,F}$, respectively:

$$E_{i,t} = \alpha_{0,i} + \alpha^*_{i,D}E_{D,t} + \alpha^*_{i,F}UE_{F,t} + \upsilon_{i,t} \quad . \tag{21}$$

4.2.1 Statement of Hypotheses 2 and 3

The second hypothesis to be tested is stated below in the null and alternative forms.

$H2_0$: The domestic accounting betas are not related with the domestic stock return betas (i.e., $\alpha^*_{i,D}$ and $\beta^*_{i,D}$ are not related).

$H2_A$: The domestic accounting betas are positively related with the domestic stock return betas (i.e., $\alpha^*_{i,D}$ and $\beta^*_{i,D}$ are positively related).

The second hypothesis is tested in two ways. It is first tested by regressing the domestic stock return beta on the domestic accounting beta:

$$\beta^*_{i,D,} = a_0 + a_1\alpha^*_{i,D,} + \epsilon_{i,t} \quad . \tag{22}$$

If a_1 is significantly positive, then the null form of the second hypothesis is rejected in favor of the alternative hypothesis. This would suggest that disclosures of geographic segment earnings are useful in that they allow financial statement users to assess the market risk of the firm due to its domestic operations (and the correlated portion of the foreign market risk).

The second hypothesis is also tested by estimating the relationship between the domestic stock return beta and the domestic and foreign portions of the domestic accounting beta. Recall that equation (12) shows that the domestic beta equals the weighted average of the firm's domestic market risk and its foreign market risk times the market risk of the foreign market with the domestic market. Estimates of the domestic market risk, $\alpha_{i,D}$, and foreign market risk, $\alpha_{i,F}$, are obtained from the following equation:

$$E_{i,t} = \alpha_{0,i} + \alpha_{i,D}E_{D,t} + \alpha_{i,F}E_{F,t} + \upsilon_{i,t} \quad . \tag{23}$$

Equation (23) regresses each firm's total earnings/price ratio on the sample average domestic earnings/price ratio and the sample average foreign earnings/price ratio. Estimates of the market risk of the foreign market with the domestic market, $\alpha_{F,D}$, are obtained from equation (19). The domestic accounting beta can then be separated into its domestic and foreign portions (i.e., $\alpha^*_{i,D} = \alpha_{i,D} + \alpha_{i,F}\ \alpha_{F,D}$). The second hypothesis is tested by regressing the stock return beta on the domestic portion and the foreign portion of the domestic accounting beta:

$$\beta^*_{i,D} = a_0 + a_1\alpha_{i,D} + a_2\alpha_{i,F}\alpha_{F,D} + \epsilon_i \quad . \tag{24}$$

Since $\alpha^*_{i,D} = \alpha_{i,D} + \alpha_{i,F}\ \alpha_{F,D}$, a_1 and a_2 are expected to be positive. For comparative purposes, the relationship between beta and total accounting beta is also estimated.[23] Total accounting betas are computed by regressing each firm's total earnings/price ratio on the sample average total earnings/price ratio in year t.

The third hypothesis to be tested is stated below in the null and alternative forms.

---

[23] Others have investigated the association between market betas and total accounting betas. Beaver, Kettler, and Scholes (1970) find a significant positive correlation between total accounting betas and stock return betas. Other studies include Bildersee (1975), Eskew (1979), Elgers (1980), Comiskey, Mulford, and Porter (1986), and Ismail and Kim (1989). No previous study has used firms' disclosures of domestic and foreign earnings to estimate domestic and foreign accounting betas.

$H3_0$: Accounting measures of risk-adjusted return are <u>not</u> related to risk-adjusted stock returns.

$H3_A$: Accounting measures of risk-adjusted returns are <u>positively</u> related to risk-adjusted stock returns.

The third hypothesis is tested by regressing risk-adjusted stock returns on the accounting measure of risk-adjusted return (i.e., foreign accounting beta times the uncorrelated return of the foreign market portfolio):

$$AR_i - \beta^*_{i,D} AR_D = b_0 + b_1 \alpha^*_{i,F} AUE_{F,t} + \epsilon_{i,t} \quad . \tag{25}$$

where, AR_i is the five-year average return of security i, AR_D is the five-year average return of the domestic market portfolio, $AUE_{F,t}$ is the five-year average return on the uncorrelated foreign market portfolio, and $\beta^*_{i,D}$ and $\alpha^*_{i,F}$ are the stock return beta and foreign accounting beta, respectively. The risk-adjusted stock return and the foreign accounting return are computed over the same five year period.[24] Beta is estimated using the market model and monthly returns. Estimates of $AUE_{F,t}$ and $\alpha^*_{i,F}$ are obtained from equations (20) and (21), respectively. Equation (25) is estimated cross-sectionally for each year and by pooling observations over all years.[25] If b_1 is significantly positive, then disclosures of geographic segment earnings are deemed

---

[24] Alternative measures of risk-adjusted security returns were also used. The results obtained from using these alternative measures were not substantively different from those reported.

[25] Ideally, the variables used in the pooled cross-sectional regression model would be adjusted for the risk-free rate of return. However, due to the uncertainty in identifying the risk-free rate of return for domestic and foreign earnings this adjustment is not possible. Therefore, the results should be viewed with this limitation in mind. In the cross-sectional regression models the risk-free rate is cross-sectionally constant so no adjustment would be needed.

useful since they provide financial statement users with information concerning the return of a security for its given risk. If b_1 is not significantly positive, then such disclosures are considered not useful.

The results of the tests used to examine the second and third hypotheses are likely biased toward zero (i.e., against rejection of the null hypotheses). This occurs for at least two reasons. First, the accounting measure of the return of the foreign market portfolio consists of a wide conglomeration of geographic segment earnings across firms. While the sample average earnings per geographic area may be highly associated with the return of the market portfolio of that geographic area, this relationship will undoubtedly decline as earnings from around the world are combined into a single category. Second, domestic and foreign accounting betas are estimated with only five annual observations, whereas the stock return betas are estimated with 60 monthly observations. Using only five annual observations reduces the probability of generating an accurate estimate of the systematic covariance of firm i's geographic segment earnings with the sample average geographic segment earnings. To control for some of the measurement error, portfolio analysis is used.[26] Firms are ranked according to their estimated stock return beta and evenly divided into ten portfolios. Portfolio one contains firms with the lowest betas and portfolio ten contains firms with the highest betas. The averages of the portfolios are then used to estimate the relationships among the variables.

---

[26] Portfolio analysis is commonly used in "beta-type" research (e.g. Black, Jensen, and Scholes, 1972; Fama and Macbeth, 1973; Fama and French, 1992; Kothari, Shanken, and Sloan, 1995; and many others).

5. DATA AND SAMPLE SELECTION

To be included in this dissertation firms must meet the following criteria: 1) geographic segment earnings available on *Compustat Business Information File*, 2) dividend and security price information available from the *Center for Research in Security Prices* (CRSP), 3) incorporated in the U.S., and 4) December 31 year-ends.

Firms are not required to have complete data and consistent geographic segment definitions over the entire time period to be included in the sample. To be included as an observation, firms are required to have consistent definitions of geographic segments as well as earnings, dividends, and price data for the relevant return interval.

6. RESULTS

6.1. Association Between Geographic Segment Earnings and Security Returns

The first hypothesis addresses whether earnings of geographic segments are valued differently by the market. This is done by (1) regressing leading-period stock returns on current geographic segment earnings and (2) regressing cumulative stock returns on cumulative geographic segment earnings. Evidence of the use of geographic segment earnings is found if the earnings coefficients across geographic segments are statistically different. If the geographic segment earnings coefficients are not different, then such disclosures provide no information beyond that provided by consolidated earnings and are therefore considered not useful.

6.1.1 Model Development and Sample Size

To estimate these models, it is first necessary to identify the geographic segments that will be used as the regressors. Only geographic segments that are distinctly defined for a large number of companies can be used as regressors. Using only geographic segments that are distinctly defined helps to assign the estimated earnings coefficients to particular geographic areas. For example, if a country disclosed foreign operations in a Canada/Europe/Asia segment, then it would be difficult to determine to what extent the market values Canandian versus European versus Asian earnings. If, however, the company were to disclose the earnings of the three geographic segments separately, then a better of estimate of the extent to which the market differentially values these earnings is attainable. Also, as the number of firms disclosing a particular geographic area increases, the more precise and generalizable will be the estimated earnings coefficient for that geographic segment.

The *Compustat Business Information File* identifies firms' geographic segment disclosures with up to four two-digit area codes. Continents are identified by the tens digit and countries within the continent are identified by the ones digit (see Table 1). As an example, suppose a company discloses four geographic segments: Domestic, Canada, South America/Mexico, and Europe/Asia. The domestic segment is coded as 70, the Canada segment is coded as 62, the South America/Mexico segment is coded as 50 and 63, and the Asia/Europe segment is coded as 20 and 30. The *Compustat Business Information File* also provides an additional segment which is the total of all foreign operations. Continuing the example, the total earnings, sales, and assets of the Canada, South America/Mexico, and Asia/Europe segments would be combined into the Total Foreign segment and coded as 98.

A frequency distribution of geographic segment disclosures in 1992 for all firms on the tape is calculated. Five combinations of geographic segments are deemed to be reported commonly enough to be included as regressors: Asia/Pacific, Other Europe, Great Britain, Canada, and South America/Mexico. Table 2 shows the geographic segments included in the geographic-specific regressors. The Number column indicates the number of firms that specifically disclosed earnings for that particular geographic segment in 1992. The Asia/Pacific segment includes any geographic segment that is specific to Asia or to the Pacific or that is a combination of Asia and the Pacific. Similarly, the South America/Mexico segment includes any geographic segment that is specific to South America or to Mexico or that is a combination of South America and Mexico. The Other Europe segment includes all firms that have a geographic segment code specific to Europe but not specific to Great Britain.[27] In addition to these five, a Domestic segment and an Other Foreign segment are also included as regressors. All firms disclose a domestic segment. The Other Foreign segment serves to capture the remainder of earnings of each firm not included in one of the geographic-specific segments.

The leading-period returns model is shown below in equation (26) and the cumulative returns/earnings model is shown below in equation (27):

---

[27] A firm which disclosed foreign earnings in, for example, an Asia/Europe segment could not be included in the tests since its geographic earnings could not be matched with a specific geographic segment.

$$R_{t,t-\tau} = \alpha + \beta_1 \frac{Dom_t}{P_{t-\tau}} + \beta_2 \frac{As/Pc_t}{P_{t-\tau}} + \beta_3 \frac{Eur_t}{P_{t-\tau}} + \beta_4 \frac{GB_t}{P_{t-\tau}} + \beta_5 \frac{Can_t}{P_{t-\tau}} + \beta_6 \frac{SA/Mx_t}{P_{t-\tau}} + \beta_7 \frac{For_t}{P_{t-\tau}} + \epsilon_t \qquad (26)$$

$$R_{t,t-\tau} = \alpha + \beta_1 \frac{Dom_{t,t-\tau}}{P_{t-\tau}} + \beta_2 \frac{As/Pc_{t,t-\tau}}{P_{t-\tau}} + \beta_3 \frac{Eur_{t,t-\tau}}{P_{t-\tau}} + \beta_4 \frac{GB_{t,t-\tau}}{P_{t-\tau}} + \beta_5 \frac{Can_{t,t-\tau}}{P_{t-\tau}} + \beta_6 \frac{SA/Mx_{t,t-\tau}}{P_{t-\tau}} + \beta_7 \frac{For_{t,t-\tau}}{P_{t-\tau}} + \epsilon_{t,t-\tau} \quad . \qquad (27)$$

There are two differences between the models. First, the leading-period returns model uses one plus the buy-and-hold return and the cumulative returns/earnings model uses the buy-and-hold return. This has no effect on the estimated earnings coefficients. Second, the leading-period returns model uses *current* geographic segment earnings (divided by beginning price), whereas the cumulative returns/earnings model uses *cumulative* geographic segment earnings (divided by beginning price). Even though the leading-period returns model uses only current geographic segment earnings, firms are required to have consistent geographic segment disclosures over the entire return interval. Both models are estimated over the 1984-1992 period and adjusted for multiplicative heteroskedasticity. When the return intervals are greater than one year (i.e., $\tau > 1$), observations will have overlapping return intervals causing autocorrelated error terms. Therefore, when the return interval exceeds one year, the models are estimated by modeling the residuals from the ordinary least squares regressions as a first-order autoregressive process and then ordinary least squares parameters are reestimated using a rho transformation of the variables. Rho is the estimated coefficient of regressing ordinary least square residuals of the original model on the lag residuals. This method is similar to Cochrane and Orcutt (1949).

Before proceeding with formal tests of the first hypothesis, the data are tested for influential observations. Boatsman, Behn, and Patz (1993) find evidence that geographic segment earnings disclosures are used only when influential observations are included. When these observations are omitted, disclosures of geographic segment earnings do not appear to be used. To identify influential observations, the leading-period returns model and the cumulative returns/earnings model are estimated for return intervals ranging from one to five years. Observations that have R-studentized residuals of a magnitude greater than 2 are deemed to be outliers.[28] An examination of these observations shows that many have very low security prices causing a "denominator effect" in the independent variable. Also, many of these firms have returns and earnings yields that are over four standard deviations from their respective sample means. Elimination of influential observations resulted in approximately 4-5% of the usable observations for each model being omitted. Table 3 shows the sample sizes for each model for each return interval. Due to the method of detecting outliers,

---

[28] Similar methods of detecting outliers have been employed in this type of research (Kothari and Sloan, 1992; Boatsman, Behn, and Patz, 1993). Ruppert and Carroll (1980) warn that this method of omitting influential observations may result in inefficient estimates when heavy-tailed distributions are present. The distributions of the error terms from the regression models are tested and generally found not to be heavy-tailed.

the samples used to estimate the leading-period returns models and the cumulative returns/earnings models are not identical but are very similar.

6.1.2 Descriptive Statistics

The averages and standard deviations of the variables used to estimate the leading-period returns models and the cumulative returns/earnings models are shown in Tables 4 and 5, respectively. The averages and standard deviations of both stock returns and geographic segment earnings increase monotonically as the return interval increases. The correlation matrix for the independent variables used in the one-year return interval models is shown in Table 6. Nearly all of the correlations are less than .10. Only two correlations are above .20 (South America/Mexico and Other Europe (.225), and Domestic and Other Foreign (.296)). The correlation matrices for the independent variables used in the five-year leading-period return model and the five-year cumulative returns/earnings model are shown in Table 7 and Table 8, respectively. Once again, nearly all of the correlations among geographic segment earnings have magnitudes of less than .10. No correlation for the five-year leading-period return model has a correlation above .20 and only one correlation is above .20 for the five-year cumulative returns/earnings model (Asia/Pacific and Great Britain (.307)). Thus, while a few of the correlation coefficients are somewhat different than zero, there appears to be sufficient variation among the independent variables to estimate discrete effects. The correlation matrices for the other return intervals are similar to those reported.

6.1.3 Comparison of Estimated Earnings Coefficients with Previous Research

To determine whether the data are comparable to previous studies, the earnings of all geographic segments are combined and the traditional returns/(total) earnings model is estimated. Table 9 shows the estimated total earnings coefficients of the leading-period returns models for one- to five-year return intervals. Kothari and Sloan (1992) estimated the earnings coefficient to be 1.25 for the one-year return interval and 4.89 for the four year return interval.[29] The estimated earnings coefficients in Table 9 follow a similar increasing pattern but are consistently lower than those reported by Kothari and Sloan (1992). One explanation for the slightly lower coefficients may be that Kothari and Sloan (1992) use firms' total earnings whereas the results reported in Table 9 are based on total geographic segment earnings, which is generally firms' total *operating* earnings.

Easton, Harris, and Ohlson (1992) regress cumulative stock returns on cumulative earnings and report R^2s ranging from 5% for the one-year interval to 33% for the five-year interval. As shown in Table 10, regressing cumulative stock returns on cumulative total geographic segment earnings results in a R^2 of 1.7% for the one-year return interval and a R^2 of 27.2% for the five-year return interval. As the return window increases the estimated coefficients and explanatory power of the model increase monotonically. Thus, the results reported here are similar to those reported by Easton, Harris, and Ohlson (1992) with slightly lower R^2s, likely because of the

[29] The estimates are from cross-sectional time-series regressions (Kothari and Sloan, 1992, p. 160).

reason mentioned above.

Next, earnings coefficients are estimated for domestic earnings and total foreign earnings. For the leading-period returns model, the domestic and foreign earnings coefficients are significantly different for the two-, three-, and four-year return intervals (Table 11). For the cumulative returns/earnings model, the domestic and foreign earnings coefficients are significantly different for all return intervals of two or more years (Table 12). There is no difference in the domestic and foreign earnings coefficient for the one-year return interval. It is also interesting to note that for all return intervals, except the one-year interval, the foreign earnings coefficient is larger than the domestic earnings coefficient. This indicates that one dollar of foreign earnings is valued more by the market than one dollar of domestic earnings.[30]

6.1.4 Test of Hypothesis 1 - Differences in Geographic Segment Earnings Coefficients

Earnings coefficients are estimated based on firms' disclosures of geographic segment earnings. Table 13 shows the estimated coefficients of the leading-period returns models. The null hypothesis that geographic segment earnings are valued equally by the market can be rejected only for the four- and five-year return intervals. Table 14 shows the estimated coefficients of the cumulative returns/earnings model for the one- to five-year return interval. The null hypothesis is rejected for the three-, four-, and five-year return intervals. These results suggest that the market does not

[30] Bodnar and Weintrop (1995) using a different database find that foreign earnings are valued more by the market than are domestic earnings. They conclude that this difference is attributable to the greater growth opportunities abroad.

use one-year, or even two-year, geographic segment earnings to value the firm. Only when geographic segment earnings are disclosed for three consecutive years or more are they used by the market to value the firm.

An interesting result is the magnitude of the geographic segment earnings coefficients for cases when the null hypothesis is rejected. The Asian/Pacific, Europe, and Great Britain segments generally have coefficients greater than the Domestic coefficient. This may be attributable to the greater growth opportunities or lower risk that existed in these markets compared to the U.S. market during the 1984-1992 period. The Canada and Domestic coefficients are similar which reflects the similarity in the risks, growth opportunities, and general business conditions of the U.S. and Canadian markets. Furthermore, the South America/Mexico segment generally has the lowest earnings coefficient indicating that the market values the earnings from these markets lowest because of the high risk environment. The South America/Mexico coefficient is negative for the leading-period returns model for the four- and five-year return intervals indicating that investor may actually penalize companies for operating in such volatile environments.

6.1.5 Sensitivity Analysis

To examine the stability of the results, cross-sectional regressions are estimated for both leading-period return models and cumulative returns/earnings models. As the return interval increases, there is a tradeoff between sample size and the explanatory power of the model. Therefore, the three-year return interval models are chosen as the cross-sectional models to estimate. Table 15 shows the cross-sectional estimates of the three-year leading-period returns model. Geographic segment earnings appear to be valued differently in all years except 1989. Table 16 shows the cross-sectional estimates of the three-year cumulative returns/earnings model. For this model, geographic segment earnings appear to be valued differently for all years except 1990. Based on the F-tests, one would conclude that geographic segment earnings are valued differently by the market and are therefore used. However, closer examination of these results shows that this conclusion should be made with caution. The size and sign of the estimated earnings coefficients are unstable. For example, Table 15 shows that the earnings of the Canada segment are valued negatively by the market in 1986, 1990, and 1991, whereas the Canada segment has the second largest earnings coefficient in 1989 and 1992. The South America/Mexico segment has the lowest earnings coefficient in 1986, 1987, 1988, and 1990 but the highest earnings coefficient in 1991 and 1992. Similar inconsistencies are found for the cumulative returns/earnings model in Table 16.

As shown in Table 3, the sample composition changes with each return interval. To determine whether the results are sensitive to sample composition, the leading-period returns and cumulative returns/earnings models are estimated for the one-,two-, and three-year return intervals using the firms that have three years of consistent geographic segment disclosures. This allows the sample composition to remain constant across return intervals. Table 17 shows the estimates of the leading-period returns models. The geographic segment earnings coefficients are statistically different across geographic segments for the two-year return interval but not for the one- or three-year return interval. Table 18 shows the estimates of the cumulative returns/earnings models. The geographic segment earnings coefficients are significant for all three return intervals. This indicates that the market may only be able to use geographic segment disclosures that are disclosed on a consistent basis from year to year. However, the same caution mentioned for the cross-sectional regression estimates should be applied to the interpretation of these results. Many of the coefficients have signs and magnitudes different than what might be expected. For example, the domestic earnings coefficients of the leading-period returns model for the one- and two-year return intervals are both lower than the respective South America/Mexico earnings coefficients. The opposite is true for the three-year return interval. The Other Europe earnings coefficient is the third lowest for the one-year return interval and it is the second highest for the two- and three-year return intervals. These findings make it difficult to conclude that geographic segment earnings are used in a consistent manner by market participants to value the firm.

6.2 Ability of Geographic Segment Earnings to Explain Beta and Risk-Adjusted Returns

The second and third hypotheses address whether disclosures of geographic segment earnings are related to beta and risk-adjusted stock returns, respectively. Disclosures of geographic segment earnings are considered useful for assessing beta if domestic accounting betas, calculated using firms' disclosures of domestic earnings, are positively related to stock return betas (Hypothesis 2). Failure to find a positive association would indicate that disclosures of geographic segment earnings are not useful. Disclosures of geographic segment earnings are deemed useful for assessing risk-adjusted returns if foreign accounting betas times the uncorrelated return of the foreign market portfolio, calculated using firms' disclosures of domestic and foreign earnings, are positively related to risk-adjusted stock returns (Hypothesis 3). Failure to find a positive association would indicate that disclosures of geographic segment earnings are not useful.

6.2.1 Validating the Returns-Generation Model

Before proceeding with formal tests of the hypotheses, the validity of the multinational firm's returns-generation model developed in section 3.2 is examined. The returns-generation model shows that, in general, as the portion of foreign activity increases, then the security's domestic beta will decrease. Similarly, as the portion of foreign activity increases, then the security's risk-adjusted return will increase, at least when the risk is defined as domestic beta. To examine the validity of the returns-generation model, firms' percentage of foreign sales is related to beta and risk-adjusted stock returns. Foreign sales should be a reasonable proxy for the extent to which firm value is generated from foreign activities. These relationships are examined using with regressions of individual firm variables and portfolio variables. Portfolios are constructed as described in section 4.2.1. The Spearman rank correlation is also shown.

As Table 19 shows and as expected, a strong negative relationship exists between the percentage of foreign sales and beta for all periods. As firms expand internationally, the returns of their securities tend to have less comovement with the return of the domestic market portfolio (i.e., with the returns of other domestic securities). As Table 20 shows and as expected, a strong positive relationship exists between the percentage of foreign sales and risk-adjusted returns. The positive relationship occurs because securities' returns are based on their total (foreign and domestic) market risk while their risk-adjusted returns are adjusted based only on their domestic market risk, which causes returns per level of risk to appear greater. Thus, there appears to be some validity to the returns-generation model.[31]

6.2.2 Test of Hypothesis 2 - Relationship between Beta and Accounting Beta

The second hypothesis addresses whether disclosures of geographic segment earnings are useful in explaining beta. Firms' accounting betas, based on disclosures of geographic segment earnings, are related to their securities' betas. This relationship is tested by (1) regressing stock return betas on domestic accounting betas and (2) regressing stock return betas on the domestic portion and the foreign portion of the domestic accounting betas. For comparative purposes, a regression of stock return betas on total accounting betas is estimated. Results of portfolio analysis and

---

[31] To control for the size effect, the log of total sales was added as a second explanatory variable to the regression models used to test the validity of the returns-generation model. The results, not reported, show that after controlling for size, the percentage of foreign sales continues to significantly explain beta and risk-adjusted returns.

Spearman rank correlations are also provided. Table 21 shows the relationship between beta and domestic accounting beta (Panel A), beta and the domestic portion and foreign portion of the domestic accounting beta (Panel B), and beta and the total accounting beta (Panel C).

Panel A shows that, based on the estimated coefficient or rank correlation, the estimated relationship between beta and domestic accounting beta is positive for all years and significant for all years except 1988 and 1990. When all years are pooled, the estimated coefficient is positive and significant at the .01 level. Panel B shows that the estimated relationship between beta and the domestic and foreign portions of the domestic accounting betas is positive in each year. The domestic portion is significant for all years. The foreign portion is significant at the .10 level or better for two of the five years. Although not shown in Table 21, the foreign portion is significant at the .15 level or better for all years. From these results one may be able to conclude that disclosures of geographic segment earnings are useful. However, Panel C shows the estimated relationship between beta and total accounting beta. Note that the estimated relationship between beta and total accounting beta is quite similar to the estimated relationship between beta and the domestic accounting beta, which suggests that disclosure of geographic segment earnings are not more useful than disclosures of consolidated earnings, at least for explaining beta.

The examination of the relationship between beta and accounting betas is repeated using portfolio analysis. As shown in Table 22, the portfolio analysis appears to correct for much of the measurement error in beta estimation. The estimated coefficients and t statistics are greatly increased. Also, the rank correlation between beta and the domestic accounting beta is .988 when all years are pooled. However, the basic conclusions remain unchanged. The relationship between beta and domestic accounting beta is positive and significant for all years except 1988. However, the relationship between beta and domestic accounting beta is not more significant than the relationship between beta and total accounting beta. As stated above, disclosure of domestic and foreign earnings provides no incremental information beyond disclosure of consolidated earnings for assessing beta, which suggests that geographic segment earnings disclosures are not useful.

To formally test whether the domestic accounting beta provides any incremental information beyond that provided by the total accounting beta for explaining the domestic stock return beta, a multivariate regression model is estimated with the stock return beta as the dependent variable and the domestic accounting beta and the total accounting beta as the independent variables. If the estimated coefficient of the domestic accounting beta is significantly positive once controlling for the total accounting beta, then this would indicate that disclosures of geographic segment earnings are useful. The regression model is estimated for each year and for all years pooled. The results, not reported, show that the estimated coefficient of the domestic accounting beta is significantly positive at the .10 level in 1990 only. The coefficient is not significant in any other year or for the pooled regression model. This evidence suggests that disclosures of geographic segment earnings provide no incremental information beyond that provided by consolidated earnings.

6.2.2 Test of Hypothesis 3 - Relationship between Risk-Adjusted Returns and Foreign Accounting Returns

The third hypothesis addresses whether geographic segment disclosures are useful in explaining risk-adjusted stock returns. Firms' foreign accounting betas times the uncorrelated return of the foreign market portfolio are related to their securities' risk-adjusted returns. As explained above, since returns reflect the total market risk of a security but the (domestic) beta does not, securities whose foreign beta times the uncorrelated foreign market return is positive should have positive risk-adjusted returns. The higher the foreign beta times the uncorrelated foreign market return, the higher the risk-adjusted return. As show in Table 23, there appears to be almost no relationship between risk-adjusted returns and foreign accounting returns. The firm-specific regressions show that the relationship is significantly positive only in 1991 and 1992. The portfolio analysis shows that the relationship is significantly positive only in 1991. Furthermore, the pooled regression models and the rank correlations are not significantly positive for either the individual firm analysis or portfolio analysis. Therefore, disclosures of geographic segment earnings do not appear to be useful in explaining firms' risk-adjusted stock returns.

7. SUMMARY AND CONCLUSION

This dissertation investigates the use of geographic segment earnings, as disclosed by multinational firms, in valuing securities as well as the usefulness of geographic segment earnings disclosures in explaining beta and risk-adjusted stock returns. The use of geographic segment earnings disclosures to value securities is tested by regressing leading-period stock returns on current geographic segment earnings and by regressing cumulative stock returns on cumulative geographic segment earnings. Both types of models are tested using one- to five-year return intervals. Evidence of use is found if the market values the earnings of the various geographic segments differently. The results provide some support that geographic segment earnings are used by the market to value securities. However, the estimated earnings coefficients are cross-sectionally unstable. An additional finding is that disclosures of geographic segment earnings are used only when geographic segments are consistently defined for at least three years.

The usefulness of geographic segment earnings in explaining beta and risk-adjusted returns is tested by relating firms' stock return betas and risk-adjusted stock returns to their accounting measures of beta and risk-adjusted returns, calculated using disclosures of geographic segment earnings. Evidence of usefulness is found if domestic accounting betas are positively related to stock return betas and if foreign accounting betas times the uncorrelated foreign market portfolio are positively related to risk-adjusted stock returns. An international version of the familiar market model is developed to model the returns-generation process of multinational firms' securities. The results suggest that firms' domestic accounting betas are positively related to their stock return betas. However, the strength of this relationship is not more significant than the strength of the relationship between firms' total accounting betas and stock return betas. Thus, geographic segment earnings provide no incremental information beyond total earnings in explaining beta. No relationship between firms' risk-adjusted stock returns and accounting measures of risk-adjusted returns is found.

The results of this dissertation are largely consistent with prior research and the complaints by the financial community. Prior research provides very modest, if any, evidence of the usefulness of disclosures of geographic segment earnings. In addition, the financial community lists current segment disclosures as the most repeated shortcoming of financial reporting and disclosures, stating that such disclosures are inadequate.[32] The results of this dissertation support those views and suggest that current disclosures practices are inadequate and that standard setters should revise current geographic segment disclosure standards.

8. LIMITATIONS

This dissertation does not compare the costs of providing geographic segment disclosures against their benefits (e.g., decision usefulness). Many firms argue that the costs of compiling, processing, and disseminating geographic segment information exceed the benefits, and disclosing proprietary information can lead to competitive disadvantages. Standard setters must consider not only the benefits of geographic segment disclosures but also their costs.

Another limitation is the inconsistencies in the level of profits disclosed across firms. Boatsman, Behn, and Patz (1993) find that 70% of the firms in their sample define profits as operating profit, 14% as net income before taxes, and 9% as net income. Thus, the relationship between earnings and returns is evaluated at different

[32] See section 1.1.

levels across firms. The effects of other revenues and expenses, taxes, discontinued operations, extraordinary items, and accounting changes will be included in the earnings variable of some firms and not others. However, disclosing profits at the operating profit level may decrease the noise in earnings by reducing the effects of common cost allocations and management manipulation.

The conclusions of this dissertation are also limited by the traditional joint hypothesis problem. Testing the use of geographic segment earnings to value securities is a joint hypothesis of the usefulness of geographic segment earnings disclosures and the validity of the earnings capitalization model. Similarly, testing the usefulness of the geographic segment earnings in explaining beta and risk-adjusted returns is a joint hypothesis of the usefulness of geographic segment earnings disclosures and the validity of the international market model.

9. FUTURE RESEARCH

Because of the scarce amount of empirical research in the area of geographic segment disclosures, especially in the area of stock market studies, several possible avenues for future research exist. One avenue for future research would be to split firms according to industry membership. Biddle and Seow (1991) show that the estimated earnings coefficient of regressing returns on earnings is dependent upon industry membership. In this dissertation, the estimated earnings coefficients represent the average coefficient across all firms. The estimated earnings coefficient on, say, the Canadian segment may be greater than that of the domestic segment for firms in certain industries but not for firms in other industries. In this case, the average earnings coefficient on the Canadian segment may equal the average earnings coefficient on the domestic segment. Failure to control for the industry effect would mistakenly indicate that market participants do not differently value domestic and Canadian earnings. However, controlling for the effect of industry membership would provide a different conclusion. Also, showing that the estimated earnings coefficient of the Canadian segment differs across industry would provide evidence in favor of requiring firms to disclose industry and geographic information in a matrix format rather than separately (Radebaugh, 1987).

Another possibility for future research would be to investigate the amount of incremental information that disclosures of earnings by geographic segment provide in addition to disclosures of earnings by line of business segment. If certain countries concentrate on different mixes of industries, then the diversification gains of expanding internationally may be more attributable to industry diversification than to geographic diversification.

Two major criticisms of current geographic segment disclosure practices are (1) failure to disclose geographic segment data by country instead of by continent or globally and (2) failure to consistently define geographic segments over time. Firms that provide highly aggregated geographic data and/or firms that often change their definitions of geographic segments may make it more difficult for the market to determine the risks and returns of foreign operations. One way to investigate this would be to stratify the sample of multinational firms based on the "quality" of the geographic segment disclosures, where quality is defined in terms of the level of disaggregation and the consistency in defining segments over time. The geographic segment earnings of firms that provide higher quality disclosures should have a higher association with security returns and beta.

Another major criticism of current geographic segment disclosure practices is the lack of interim reporting. Only a small number of firms provide geographic segment information in quarterly reports. As discussed in section 4.2, estimating accounting betas with only five annual observations does not provide a precise measure of the covariability of the firm's earnings with the other firms' earnings. However, if firms were to disclose quarterly geographic segment earnings, then the number of observations in a five-year period would increase to twenty. Thus, a more precise measure of the firm's domestic and foreign accounting betas would be obtainable with disclosures of quarterly information. Firms that disclose quarterly geographic segment earnings should have accounting betas that are more highly associated with stock return betas than would firms that disclose only annual geographic segment earnings. This test would provide evidence as to whether firms should be required to disclose geographic segment information on a quarterly basis.

BIBLIOGRAPHY

Augmon, T. and D. Lessard. "Investor Recognition of Corporate International Diversification." *The Journal of Finance* (September 1970): 1049-1055.

Ahadiat, N. "Geographic Segment Disclosure and the Predictive Ability of the Earnings Data." *Journal of International Business Studies* (Second Quarter, 1993): 357-371.

Ali, A. and P. Zarowin. "Permanent Versus Transitory Components of Annual Earnings and Estimation Error in Earnings Response Coefficients." *Journal of Accounting and Economics* (June/September 1992): 249-264.

American Institute of Certified Pubic Accountants. *Accounting Research Bulletin No. 43: Restatement and Revision of Accounting Research Bulletins*. New York: AICPA, 1953.

American Institute of Certified Public Accountants. *The Information Needs of Investors and Creditors*. New York: AICPA, 1994.

Association for Investment Management and Research, Financial Accounting Policy Committee. *Financial Reporting in the 1990's and Beyond: A Position Paper of the Association for Investment Management and Research*, prepared by Peter H. Knutson, Charlottesville, Va., October, 1992.

Balakrishnan, R.; T. Harris; and P. Sen. "The Predictive Ability of Geographic Segment Disclosures." *Journal of Accounting Research* (Autumn 1990): 305-325.

Ball, R. and P. Brown. "An Empirical Evaluation of accounting Income Numbers." *Journal of Accounting Research* (Autumn 1968): 159-178.

Beaver, W.; P. Kettler; and M. Scholes. "The Association Between Market Determined and Accounting Determined Risk Measures." *The Accounting Review* (October 1970): 654-682.

Beaver, W.; R. Lambert; and D. Morse. "The Information Content of Security Prices." *Journal of Accounting and Economics* (July 1980): 3-28.

Bernard, V. "Capital Market Research in Accounting During the 1980s: A Critical Review." In *The State of Accounting Research as We Enter the 1990's*, edited by T.J. Frecka, pp. 72-120. Urbana-Champaign, IL.: University of Illinois.

Biddle, G. and G. Seow. "The Estimation and Determinants of Associations Between Returns and Earnings: Evidence from Cross-industry Comparisons." *Journal of Accounting, Auditing and Finance* (Spring 1991): 183-232.

Bildersee, J. S. "The Association Between Market-Determined Measures of Risk and Alternative Measures of Risk." *The Accounting Review* (January 1975): 81-98.

Black, F.; M. Jensen; and M. Scholes. "The Capital Asset Pricing Model: Some Empirical Tests." In *Studies in the Theory of Capital Markets*, edited by Michael C. Jensen. New York, NY: Praeger. 1972.

Boatsman, J.; B. Behn; and D. Patz. "A Test of the Use of Geographical Segment Disclosures." *Journal of Accounting Research* (Supplement 1993): 46-64.

Bodnar, G. and J. Weintrop. "The Valuation of Foreign Income: A Growth Opportunities Perspective." Working Paper, University of Pennsylvania (1995).

Brown, P.; G. Foster; and E. Noreen. "Security Analyst Multi-Year Earnings Forecasts and the Capital Market." *Studies in Accounting Research No. 21*, Sarasota, FL.: American Accounting Association, 1985.

Cochrane, D. and G. Orcutt. "Application of Least Squares Regressions to Relationships ContaininG Autocorrelated Error Terms." *Journal of the American Statistical Association* (1949): 32-61.

Collins, D. and S. Kothari. "An Analysis of the Intertemporal and Cross-Sectional Determinants of the Earnings Response Coefficients." *Journal of Accounting and Economics* (July 1989): 143-181.

Collins, D.; S. Kothari; and J. Rayburn. "Firm Size and the Information Content of Prices with Respect to Earnings." *Journal of Accounting and Economics* (July 1987): 111-138.

Comiskey, E.; C. Mulford; T. Porter. "Forecast Error, Earnings Variability and Systematic Risk: Additional Evidence." *Journal of Business Finance and Accounting* (Summer 1986): 257-265.

Daniels, J. and L. Radebaugh. *International Business*, Fourth Edition. Reading, MA: Addison-Wesley Publishing Company, 1986.

Doupnik, T. and R. Rolfe. "Geographic Area Disclosures and the Assessment of Foreign Investment Risk for Disclosure in Accounting Statement Notes." *International Journal of Accounting* (Fall 1990): 252-267.

Easton, P. and T. Harris. "Earnings as an Explanatory Variable for Returns." *Journal of Accounting Research* (Spring 1991): 19-36.

Easton, P.; T. Harris; and J. Ohlson. "Aggregate Accounting Earnings Can Explain Most of Security Returns." *Journal of Accounting and Economics* (June/September 1992): 119-142.

Elgers, P. "Accounting Based Risk Predictors: A Reexamination" *The Accounting Review* (July 1980): 389-408.

Errunza, V. "Emerging Markets: A New Opportunity for Improving Global Portfolio Performance." *Financial Analysts Journal* (September-October 1983): 51-58.

Eskew, R. "The Forecasting Ability of Accounting Risk Measures: Some Additional Evidence." *The Accounting Review* (January 1979): 107-118.

Fama, E. and K. French. "The Cross-Section of Expected Stock Returns." *Journal of Finance* (June 1992): 427-465.

Fama, E. and J. MacBeth. "Risk, Return, and Equilibrium: Empirical Tests." *Journal of Political Economy* (1973): 607-636.

Fama, E. and M. Miller. *The Theory of Finance*. Hinsdale, IL: Dryden Press, 1972.

Financial Accounting Standards Board. *Statement of Financial Accounting Standards No. 14: Financial Reporting for Segments of a Business Enterprise*. Stamford, CT: FASB, 1976.

Financial Accounting Standards Board. *Invitation to Comment. Reporting Disaggregated Information*. Norwalk, CT: FASB, 1993

Hunter, J. and T. Coggin. "An Analysis of the Diversification Benefit from International Equity Investment." *The Journal of Portfolio Management* (Fall 1990): 33-36.

Ismail, B. and M. Kim. "On the Association of Cash Flow Variables with Market Risk: Further Evidence." *The Accounting Review* (January 1989): 125-136.

Jacquillat, B. and B. Solnik. "Multinationals are Poor Tools for Diversification." *The Journal of Portfolio Management* (Winter 1978): 8-12.

Kormendi, R. and R. Lipe. "Earnings Innovations, Earnings Persistence, and Stock Returns." *Journal of Business* (July 1987): 323-346.

Kothari, S.; J. Shanken; and R. Sloan. "Another Look at the Cross-Section of Expected Stock Returns." *Journal of Finance* (March 1995): 185-224.

Kothari, S. and R. Sloan. "Information in Prices about Future Earnings." *Journal of Accounting and Economics* (June/September 1992): 143-171.

Lev, B. "On the Usefulness of Earnings: Lessons and Directions from Two Decades of Empirical Research." *Journal of Accounting Research* (Supplement 1989): 153-192.

Lessard, D. "World, Country, and Industry, Relationships in Equity Returns." *Financial Analysts Journal* (January-February 1976): 32-38.

McKinneley, I. "International Financial Reporting." *Accountant* (August 13, 1970): 202-204.

Ohlson, J. "The Theory of Value and Earnings and an Introduction to the Ball-Brown Analysis." *Contemporary Accounting Research* (Fall 1991a): 1-19.

Ohlson, J. "Earnings, Book Values, and Dividends in Security Valuation." Working Paper, Columbia University (1991b).

Ohlson, J. and P. Shroff. "Changes Versus Levels in Earnings as Explanatory Variables for Returns: Some Theoretical Considerations." *Journal of Accounting Research* (Autumn 1992): 210-226.

Pacter, P. *Reporting Disaggregated Information*. Norwalk, CT: FASB, 1993.

Penman, S. "Financial Statement Information and the Pricing of Earnings." Working Paper, University of California, Berkeley (1990).

Prodhan, B. "Geographic Segment Disclosure and Multinational Risk Profile." *Journal of Business Finance and Accounting* (Spring 1986): 15-37.

Prodhan, B. and M. Harris. "Systematic Risk and the Discretionary Disclosure of Geographical Segments: An Empirical Investigation of U.S. Multinationals." *Journal of Business Finance and Accounting* (Autumn 1989): 467-492.

Radebaugh, L. *International Aspects of Segment Disclosures: A Conceptual Approach*. Research Monograph No. 2. Glasgow, Scotland: University of Glasgow, 1987.

Ramesh, K. and S. Thiagarajan. "Estimating the Permanent Component of Accounting Earnings Using the Unobservable Components Model: Implications for Price-Earnings Research." *Journal of Accounting, Auditing, and Finance* (Fall 1993): 399-425.

Roberts, C. "Forecasting Earnings Using Geographical Segment Data: Some U.K. Evidence." *Journal of International Financial Management and Accounting* (Summer 1989): 130-151.

Roll, R. "A Critique of the Asset Pricing Theory's Tests." *Journal of Financial Economics* 4 (1977): 129-176.

Ruppert, D. and R. Carroll. "Trimmed Least Squares Estimation in the Linear Model." *Journal of the American Statistical Association* 75 (1980): 828-838.

Senteney, D. and M. Bazaz. "The Impact of SFAS 14 Geographic Segment Disclosures on the Information Content of U.S.-Based MNEs' Earnings Releases." *International Journal of Accounting* (Fall 1992): 267-279.

Sharpe, W. "A Simplified Model for Portfolio Management." *Management Science* (January 1963): 277-296.

Solnik, B. *European Capital Markets*. Lexington, Mass.: Heath Lexington Books, 1973.

Solnik, B. "Why Not diversify Internationally Rather Than Domestically?" *Financial Analysts Journal* (July-August 1974); 48-54.

Solnik, B. *International Investments* Second Edition. Reading, MA: Addison-Wesley Publishing Company, 1991.

Watts, R. and J. Zimmerman. *Positive Accounting Theory*. Englewood Cliffs, NJ: Prentice-Hall, Inc, 1986.

APPENDIX

The appendix incorporates geographic segment earnings into the Easton, Harris, and Ohlson (1992) model which outlines the intuition behind aggregate earnings explaining aggregate market returns.

The following notation is used to relate a firm's earnings to its market performance for a general return interval, (0, T):

P_t = the firm's market value at date t,
d_t = dividends paid at date t,
$R_t = (P_t + d_t - P_{t-1})/P_{t-1}$ = market return for the (t-1,t) period,
x_t = earnings for the (t-1,t) period,
BV_t = book value of equity at date t,
g_t = goodwill at date t,
R_F = one plus the risk-free rate of return.

Additionally, firm *j* subscripts are deleted to simplify the notation, firm-specific variables are on an adjusted per-share basis, and the term structure of interest rates is assume to be flat and nonstochastic.

Assuming that dividends are invested in the risk-free asset, the market return for the period (0, T) is

$$RET_T \equiv [P_T + FVS(d_1,\ldots,d_T) - P_0]/P_0$$

where

$$FVS(d_1,\ldots,d_T) \equiv d_1(R_F^{T-1}) + d_2(R_F^{T-2}) + \ldots + d_{T-1}(R_F) + d_T \equiv FVS_T$$

FVS_T is the total amount an investor can withdraw at date T due to the payment and subsequent investment of dividends in the risk-free asset.

$$x_T \equiv [AX_T + FVF(d_1,\ldots,d_T)]/P_0$$

where

$$AX_T \equiv \Sigma_{t=1}^{T} x_t$$

and

$$FVF(d_1,\ldots,d_T) \equiv d_1(R_F^{T-1} - 1) + d_2(R_F^{T-2} - 1) + \ldots + d_{T-1}(R_F - 1) \equiv FVF_T$$

FVF_T represents the earnings due to investment of dividends. $(AX_T + FVF_T)$ is the earnings that would have been earned by the firm had it not paid any dividends and instead retained this cash to invest in the risk-free asset.

Now let the difference between the market value of equity at date t and the book value of equity at date t be defined as 'goodwill'. Thus,

$$P_T - P_0 = \{BV_T - BV_0\} + \{g_T - g_0\}$$

But in general,

$$BV_t - BV_{t-1} = x_t - d_t$$

This implies

$$\{BV_T - BV_0\} = \Sigma_{t=1}^{T} x_t - \Sigma_{t=1}^{T} d_t = AX_T - \{FVS_T - FVF_T\}$$

Combining the relations and dividing by market value at time 0 yields

$$\{P_T - P_0\}/P_0 + FVS_T/P_0 = \{AX_T + FVF_T\}/P_0 + \Delta g_T/P_0$$

Therefore, changes in goodwill capture the measurement error in aggregate earnings. In long return intervals the variation in the earnings variable should overwhelm the variation in the goodwill variable.

Total earnings can easily be decomposed into n segment earnings

$$x_t = \Sigma_{n=1}^{N} x_n$$

Aggregate earnings can then be written as the aggregate earnings of n segments

$$AX_T = \Sigma_{t=1}^{T} \Sigma_{n=1}^{N} x_{t,n} = AX_{T,1} + AX_{T,2} + \ldots + AX_{T,n}$$

Substituting aggregate segment earnings into the above relations yields

$$\{P_T - P_0\}/P_0 + FVS_T/P_0 = \{AX_{T,1} + AX_{T,2} + \ldots + AX_{T,n} + FVF_T\}/P_0 + \Delta g_T/P_0$$

Easton, Harris, and Ohlson (1992) show empirically that the effect of different interest rates is insignificant even for $R_F = 1$. Therefore, the model to be used is

$$\{P_T + \Sigma_{t=1}^{T} d_t - P_0\}/P_0 = \{AX_{T,1} + AX_{T,2} + \ldots + AX_{T,n}\}/P_0$$

TABLES

Table 1
Geographic area codes and their designations as listed on the *Compustat Business Information File*

Designation	Geographic Area Code
Africa	10
South Africa	11
Asia	20
Japan	21
Phillipines	22
Middle East	23
Europe	30
Great Britain	31
France	32
Germany	33
Pacific	40
Australia	41
South America	50
Brazil	51
North America	60
United States[a]	61
Canada	62
Mexico	63
Domestic	70
Total Foreign	98
Foreign	99

[a] The "United States" designation only applies to foreign companies that disclose the U.S. as one of their geographic segments. It is the "Domestic" segment that is used to classify U.S. firms' U.S. operations.

Table 2
Geographic composition of the regressors used to estimate the leading-period returns and cumulative returns/earnings models and the cross-sectional frequency of disclosure in 1992.

Regressor	Reported Geographic Segment	code(s)	Number
Asia/Pacific	Asia	20	13
	Japan	21	2
	Middle East	23	4
	Asia/Japan/Phillipines	20/21/22	1
	Pacific	40	3
	Australia	41	9
	Pacific/Australia	40/41	1
	Asia/Pacific	20/40	12
	Asia/Australia	20/41	2
			47
Other Europe	Europe	30	71
	France	32	1
	Germany	33	4
	Europe/France	30/32	1
	Europe/Germany	30/33	2
	France/Germany	32/33	1
	Europe/France/Germany	30/32/33	3
	Europe/GB/France/Ger	30/31/32/33	40
			123
Great Britain	Great Britain	31	26
	Europe/Great Britain	30/31	20
			46
Canada	Canada	62	72
South America/Mexico	South America	50	7
	Brazil	51	6
	Mexico	63	4
	South America/Mexico	50/63	5
	S. America/Brazil/Mexico	50/51/63	5
			27

Table 3
Sample size for each model for each return interval.

Return Interval	Total Sample[a]	Model[b]	Outliers[c]	Final Sample[d]
1-year	1877	Leading	80	1797
		Cumulative	80	1797
2-year	1316	Leading	53	1263
		Cumulative	52	1264
3-year	917	Leading	35	882
		Cumulative	36	881
4-year	640	Leading	19	621
		Cumulative	23	617
5-year	428	Leading	23	405
		Cumulative	24	404

[a] The total sample is all firm-year observations that have all necessary price and earnings data available.
[b] "Leading" is the leading-period returns model and "Cumulative" is the cumulative earnings/returns model.
[c] Outliers were identified as observations that had R-studentized residuals of a magnitude greater than two.
[d] The final sample equals the total sample less the omitted outliers.

Table 4
Averages (standard deviations) for leading-period stock returns and current geographic segment earnings divided by beginning price.

	Return Interval				
Variables	$\tau=1$[a]	$\tau=2$	$\tau=3$	$\tau=4$	$\tau=5$
N	1797	1263	882	621	405
Returns	1.1327	1.2967	1.4492	1.6254	1.8214
	(.2626)	(.4663)	(.6111)	(.7495)	(.9100)
Domestic	.0896	.0932	.0969	.1070	.1118
	(.1813)	(.1220)	(.1148)	(.1166)	(.1088)
Asia/Pacific	.0026	.0029	.0031	.0032	.0025
	(.0175)	(.0188)	(.0206)	(.0202)	(.0161)
Other Europe	.0118	.0142	.0162	.0212	.0240
	(.0304)	(.0384)	(.0354)	(.0463)	(.0527)
Great Britain	.0021	.0027	.0032	.0028	.0031
	(.0167)	(.0142)	(.0185)	(.0142)	(.0163)
Canada	.0040	.0046	.0053	.0062	.0075
	(.0165)	(.0197)	(.0250)	(.0304)	(.0361)
S Amer/Mexico	.0017	.0017	.0019	.0022	.0023
	(.0097)	(.0083)	(.0093)	(.0104)	(.0106)
Other Foreign	.0205	.0232	.0252	.0291	.0322
	(.0371)	(.0403)	(.0372)	(.0419)	(.0448)

[a] $\tau=1$ indicates that the return interval is one year, $\tau=2$ indicates that the return interval is two years, and so on.

Table 5

Averages (standard deviations) for cumulative stock returns and cumulative geographic segment earnings divided by beginning price.

	Return Interval				
Variables	$\tau=1$[a]	$\tau=2$	$\tau=3$	$\tau=4$	$\tau=5$
N	1797	1264	881	617	404
Stock Returns	.1327 (.2626)	.2952 (.4583)	.4559 (.6094)	.6182 (.7267)	.8166 (.8844)
Domestic	.0896 (.1813)	.1895 (.2330)	.2858 (.3143)	.4059 (.3831)	.5131 (.4413)
Asia/Pacific	.0026 (.0175)	.0056 (.0341)	.0085 (.0509)	.0112 (.0658)	.0113 (.0674)
Other Europe	.0118 (.0304)	.0274 (.0617)	.0482 (.0974)	.0729 (.1392)	.1011 (.1967)
Great Britain	.0021 (.0167)	.0052 (.0263)	.0084 (.0391)	.0100 (.0468)	.0123 (.0581)
Canada	.0040 (.0165)	.0095 (.0360)	.0167 (.0629)	.0260 (.0983)	.0380 (.1453)
S Amer/Mexico	.0017 (.0097)	.0034 (.0160)	.0053 (.0237)	.0076 (.0323)	.0098 (.0407)
Other Foreign	.0205 (.0371)	.0447 (.0670)	.0721 (.1000)	.1032 (.1382)	.1381 (.1698)

[a] $\tau=1$ indicates that the return interval is one year, $\tau=2$ indicates that the return interval is two years, and so on.

Table 6
Correlation matrix of current geographic segment earnings divided by beginning price (i.e., earnings at time t divided by price at t-1).

	Asia/ Pacific	Other Europe	Great Britain	Canada	S Amer/ Mexico	Other Foreign
Domestic	-.04286	.04982	.19106	.08842	.05423	.29626
Asia/ Pacific		-.02875	.12450	-.02783	-.03984	-.03955
Other Europe			-.00107	.00287	.22494	-.04118
Great Britain				.10962	-.00719	.02934
Canada					.02851	-.09720
S Amer/ Mexico						-.00458

Table 7
Correlation matrix of current geographic segment earnings divided by five-year leading price (i.e., earnings at time t divided by price at t-5).

	Asia/ Pacific	Other Europe	Great Britain	Canada	S Amer/ Mexico	Other Foreign
Domestic	-.08749	.15444	.03234	.14555	.08580	.16888
Asia/ Pacific		.02034	.05804	-.02689	-.03469	-.08794
Other Europe			-.07012	.04488	.12474	.03939
Great Britain				-.01155	-.04236	-.06270
Canada					.06146	-.00220
S Amer/ Mexico						-.09362

Table 8
Correlation matrix of five-year cumulative geographic segment earnings divided by five-year leading price (i.e., cumulative earnings of period (t, t-5) divided by price at t-5).

	Asia/ Pacific	Other Europe	Great Britain	Canada	S Amer/ Mexico	Other Foreign
Domestic	-.09610	.06462	-.03016	.08365	.14960	-.05829
Asia/ Pacific		-.01055	.30722	-.03847	-.04110	-.10569
Other Europe			-.07984	-.01018	.11034	-.03224
Great Britain				-.03304	-.04863	-.07677
Canada					.03113	-.09195
S Amer/ Mexico						-.08587

Table 9
Estimated earnings coefficients (t statistics) of regressions of leading-period stock returns on current total earnings deflated by beginning price.

	Return Interval				
	$\tau=1$	$\tau=2$	$\tau=3$	$\tau=4$	$\tau=5$
Total Earnings	.275 (7.174)	1.502 (15.717)	2.440 (16.932)	3.509 (20.306)	4.721 (21.667)
Constant	1.0969 (133.171)	.757 (52.628)	.649 (34.144)	.562 (24.844)	.522 (19.324)
Adjusted R-Square	.017	.171	.275	.433	.559
Firm-years	1797	1265	882	621	405

Table 10
Estimated earnings coefficients (t statistics) of regressions of cumulative stock returns on cumulative total earnings deflated by beginning price.

	Return Interval				
	$\tau=1$	$\tau=2$	$\tau=3$	$\tau=4$	$\tau=5$
Total Earnings	.275	.672	.822	.757	.990
	(7.174)	(12.250)	(13.408)	(11.508)	(13.368)
Constant	.096	.067	.049	.075	.006
	(11.658)	(4.729)	(2.524)	(2.642)	(.184)
Adjusted R-Square	.017	.097	.139	.182	.272
Firm-years	1797	1265	881	617	405

Table 11

Estimated earnings coefficients (t statistics) of regressions of leading-period stock returns on current domestic and foreign earnings deflated by beginning price.

	Return Interval				
	$\tau=1$	$\tau=2$	$\tau=3$	$\tau=4$	$\tau=5$
Domestic	.282	1.369	1.921	2.9676	4.403
	(6.315)	(11.860)	(11.005)	(13.129)	(13.919)
Foreign	.276	1.997	4.019	5.2927	5.294
	(2.517)	(7.680)	(10.037)	(11.360)	(11.172)
Constant	1.095	.749	.623	.52918	.520
	(128.201)	(50.804)	(32.803)	(24.180)	(19.219)
Adjusted R-Square	.015	.171	.291	.4423	.558
F-Test[a]	.002	4.216	19.498	16.397	1.864
(p-value)	(.963)	(.040)	(.001)	(.001)	(.172)
Firm-years	1797	1263	882	621	405

[a] The F-Test is a test of the null hypothesis that the domestic earnings coefficient equals the foreign earnings coefficient.

Table 12
Estimated earnings coefficients (t statistics) of regressions of cumulative stock returns on cumulative domestic and foreign earnings deflated by beginning price.

	Return Interval				
	τ=1	τ=2	τ=3	τ=4	τ=5
Domestic	.282	.601	.655	.540	.672
	(6.315)	(9.656)	(9.181)	(6.800)	(7.201)
Foreign	.276	.981	1.443	1.374	1.675
	(2.517)	(6.072)	(8.720)	(10.306)	(11.431)
Constant	.095	.057	.020	.045	-.017
	(11.139)	(3.793)	(.978)	(1.587)	(-.508)
Adjusted R-Square	.015	.101	.167	.204	.331
F-Test[a]	.002	4.357	16.990	25.649	27.870
(p-value)	(.963)	(.037)	(.001)	(.001)	(.001)
Firm-years	1274	1264	881	617	404

[a] The F-Test is a test of the null hypothesis that the domestic earnings coefficient equals the foreign earnings coefficient.

Table 13
Test of Hypothesis 1 - Estimated earnings coefficients (t statistics) of regressions of leading-period stock returns on current geographic segment earnings deflated by beginning price.

	Return Interval				
Geographic Segment	$\tau=1$	$\tau=2$	$\tau=3$	$\tau=4$	$\tau=5$
Domestic	.273 (6.022)	1.430 (11.783)	2.039 (12.209)	2.945 (13.564)	4.024 (15.863)
Asia/Pacific	.225 (.614)	2.039 (2.813)	2.423 (2.406)	4.065 (3.207)	7.701 (56.199)
Other Europe	.019 (.096)	1.659 (3.519)	3.734 (5.047)	6.296 (6.953)	6.557 (11.457)
Great Britain	1.042 (2.736)	1.876 (1.892)	2.821 (1.959)	2.697 (1.381)	7.854 (21.697)
Canada	.738 (1.843)	2.293 (2.447)	2.890 (4.063)	3.261 (3.737)	3.903 (5.228)
South America/ Mexico	.160 (.216)	1.665 (.755)	.102 (.031)	-2.478 (-.842)	-7.469 (-2.604)
Other Foreign	.320 (1.916)	2.537 (6.840)	3.486 (6.277)	6.505 (9.720)	6.981 (9.348)
Constant	1.095 (127.921)	.681 (48.442)	.625 (33.073)	.576 (25.295)	.452 (20.736)
Adjusted R-Square	.012	.166	.272	.449	.623
F-Test[a] (p-value)	7.823 (.251)	8.131 (.229)	9.953 (.127)	36.481 (.001)	1029.973 (.001)
Firm-years	1797	1263	882	621	405

[a] The F-Test is a test of the null hypothesis that the earnings coefficients are equal across all seven geographic segments.

Table 14
Test of Hypothesis 1 - Estimated earnings coefficients (t statistics) of regressions of cumulative stock returns on cumulative geographic segment earnings deflated by beginning price.

	Return Interval				
Geographic Segment	$\tau=1$	$\tau=2$	$\tau=3$	$\tau=4$	$\tau=5$
Domestic	.273 (6.022)	.588 (9.468)	.837 (11.330)	.829 (10.576)	.873 (10.478)
Asia/Pacific	.225 (.614)	.517 (1.490)	1.238 (2.435)	1.609 (2.584)	1.272 (3.637)
Other Europe	.019 (.096)	1.053 (3.626)	1.776 (5.780)	1.716 (7.111)	1.162 (6.788)
Great Britain	1.042 (2.736)	1.035 (3.074)	.948 (1.430)	1.099 (1.580)	1.104 (1.502)
Canada	.738 (1.843)	.817 (1.607)	1.065 (2.544)	.978 (4.358)	1.241 (9.231)
South America/ Mexico	.160 (.216)	.851 (.818)	.176 (.128)	1.351 (1.174)	.808 (.536)
Other Foreign	.320 (1.916)	.823 (3.970)	1.957 (8.024)	1.824 (8.681)	2.104 (8.138)
Constant	.095 (11.097)	.057 (4.137)	-.043 (-2.304)	-.053 (-2.097)	-.053 (-2.005)
Adjusted R-square	.012	.102	.250	.304	.433
F-Test[a] (p-value)	7.823 (.251)	4.016 (.675)	23.382 (.001)	28.049 (.001)	20.422 (.002)
Firm-years	1797	1264	881	617	404

[a] The F-Test is a test of the null hypothesis that the earnings coefficients are equal across all seven geographic segments.

Table 15
Estimated earnings coefficients (t statistics) of cross-sectional regressions of leading-period stock returns on current geographic segment earnings deflated by beginning price for the subsample of firms having three years of consistent geographic segment disclosures.

	Ending year of three-year return interval			
Geographic Segment	1986	1987	1988	1989
Domestic	3.46	2.05	2.21	2.10
	(17.14)	(6.47)	(19.47)	(3.95)
Asia/Pacific	.41	-.41	-.77	.12
	(.11)	(-.24)	(-.24)	(.08)
Other Europe	8.41	4.20	4.26	1.92
	(7.96)	(4.20)	(34.82)	(1.44)
Great Britain	20.00	-1.21	2.75	-.96
	(6.22)	(-.70)	(9.80)	(-.03)
Canada	-.69	2.79	1.52	2.30
	(-2.43)	(11.07)	(10.20)	(1.59)
S Amer/Mexico	-8.53	-2.19	-10.74	.68
	(-2.47)	(-.99)	(-10.73)	(.12)
Other Foreign	5.97	4.64	3.88	4.30
	(5.43)	(4.32)	(18.02)	(3.25)
Constant	1.24	1.13	.96	.85
	(27.08)	(17.07)	(22.36)	(10.48)
Adjusted R-Square	.42	.34	.33	.19
F-Test[a]	4543.77	24.81	1327.80	4.62
(p-value)	(.01)	(.01)	(.01)	(.59)
No. of Firms	95	113	106	110

[a] The F-Test is a test of the null hypothesis that the earnings coefficients are equal across all seven geographic segments.

Table 15 (continued)

Estimated earnings coefficients (t statistics) of cross-sectional regressions of leading-period stock returns on current geographic segment earnings deflated by beginning price for the subsample of firms having three years of consistent geographic segment disclosures.

	Ending Year of Three Year Return Interval			
Geographic Segment	1990	1991	1992	All
Domestic	1.49	2.44	2.20	2.04
	(5.29)	(6.73)	(5.31)	(12.21)
Asia/Pacific	1.11	.10	5.27	2.42
	(6.15)	(.06)	(5.57)	(2.41)
Other Europe	4.26	7.12	3.18	3.73
	(3.95)	(6.60)	(2.13)	(5.05)
Great Britain	.85	6.34	3.99	2.82
	(1.21)	(30.63)	(1.36)	(1.96)
Canada	-1.33	-0.10	10.96	2.89
	(-3.24)	(-.03)	(3.02)	(4.06)
S Amer/Mexico	-9.22	8.86	17.59	.10
	(-3.37)	(1.89)	(3.05)	(0.03)
Other Foreign	2.44	4.66	1.96	3.49
	(4.10)	(4.73)	(1.76)	(6.28)
Constant	1.11	.97	1.09	.63
	(.06)	(19.36)	(19.80)	(33.07)
Adjusted R-Square	.03	.31	.18	.27
F-Test[a]	143.57	73.12	24.64	9.95
(p-value)	(.01)	(.01)	(.01)	(.13)
No. of Firms	142	155	161	882

[a] The F-Test is a test of the null hypothesis that the earnings coefficients are equal across all seven geographic segments.

Table 16
Estimated earnings coefficients (t statistics) of cross-sectional regressions of cumulative stock returns on cumulative geographic segment earnings deflated by beginning price for the subsample of firms having three years of consistent geographic segment disclosures.

	Ending year of three-year return interval			
Geographic Segment	1986	1987	1988	1989
Domestic	.90	.88	-.03	.02
	(10.28)	(8.90)	(-.40)	(.23)
Asia/Pacific	1.98	1.27	-1.04	.05
	(.59)	(.79)	(-1.57)	(.25)
Other Europe	4.49	1.97	1.30	.38
	(4.77)	(8.52)	(11.49)	(1.33)
Great Britain	3.29	-.49	3.07	-1.01
	(1.15)	(-.74)	(4.66)	(-.49)
Canada	-.63	1.30	.60	.67
	(-1.18)	(6.32)	(1.93)	(1.47)
S Amer/Mexico	.40	.66	1.31	2.82
	(.23)	(.21)	(1.96)	(2.00)
Other Foreign	2.41	1.73	1.71	2.45
	(4.11)	(4.45)	(4.78)	(5.65)
Constant	.26	.11	.14	.01
	(3.25)	(1.84)	(2.45)	(.01)
Adjusted R-Square	.10	.30	.06	.04
F-Test[a]	46.45	46.00	268.55	40.87
(p-value)	(.01)	(.01)	(.01)	(.01)
No. of Firms	99	115	105	108

[a] The F-Test is a test of the null hypothesis that the earnings coefficients are equal across all seven geographic segments.

Table 16 (continued)
Estimated earnings coefficients (t statistics) of cross-sectional regressions of cumulative stock returns on cumulative geographic segment earnings deflated by beginning price for the subsample of firms having three years of consistent geographic segment disclosures.

	Ending Year of Three-Year Return Interval			
Geographic Segment	1990	1991	1992	all
Domestic	.41	.74	1.15	.84
	(1.96)	(4.72)	(7.66)	(11.33)
Asia/Pacific	.07	.40	2.07	1.24
	(.10)	(1.04)	(4.61)	(2.44)
Other Europe	.64	3.18	1.88	1.78
	(1.29)	(5.40)	(5.50)	(5.78)
Great Britain	.19	.59	.85	.95
	(.17)	(.99)	(.75)	(1.43)
Canada	-.54	.12	-.44	1.07
	(-.66)	(.43)	(-.55)	(2.54)
S Amer/Mexico	-2.41	-1.35	1.88	.18
	(-1.53)	(-.97)	(1.01)	(.13)
Other Foreign	1.14	1.17	.71	1.96
	(2.63)	(2.98)	(2.83)	(8.02)
Constant	.16	-.03	-.01	-.04
	(1.63)	(-.47)	(-.05)	(-2.30)
Adjusted R-Square	.05	.07	.05	.25
F-Test[a]	9.43	28.67	31.84	23.38
(p-value)	(.15)	(.01)	(.01)	(.01)
No. of Firms	143	152	159	881

[a] The F-Test is a test of the null hypothesis that the earnings coefficients are equal across all seven geographic segments.

Table 17
Estimated earnings coefficients (t statistics) of regressions of leading-period stock returns on current geographic segment earnings deflated by beginning price for the subsample of firms having three years of consistent geographic segment disclosures.

	Return Interval		
Geographic Segment	$\tau=1$	$\tau=2$	$\tau=3$
Domestic	.259 (4.268)	.997 (7.444)	2.039 (12.209)
Asia/Pacific	.842 (1.339)	1.974 (3.368)	2.423 (2.406)
Other Europe	-.045 (-.156)	3.184 (5.611)	3.734 (5.047)
Great Britain	1.493 (1.765)	4.222 (5.819)	2.821 (1.959)
Canada	.314 (.805)	4.311 (3.233)	2.890 (4.063)
South America/ Mexico	.768 (.566)	1.372 (.458)	.102 (.034)
Other Foreign	.113 (.448)	2.140 (4.647)	3.485 (6.278)
Constant	1.088 (85.631)	.762 (41.905)	.625 (33.073)
Adjusted R-Square	.003	.143	.272
F-Test[a] (p-value)	4.891 (.558)	36.592 (.001)	9.953 (.127)
Firm-years	882	882	882

[a] The F-Test is a test of the null hypothesis that the earnings coefficients are equal across all seven geographic segments.

Table 18
Estimated earnings coefficients (t statistics) of regressions of cumulative stock returns on cumulative geographic segment earnings deflated by beginning price for the subsample of firms having three years of consistent geographic segment disclosures.

	Return Interval		
Geographic Segment	$\tau=1$	$\tau=2$	$\tau=3$
Domestic	-.005 (-.132)	.269 (5.198)	.837 (11.330)
Asia/Pacific	.669 (1.028)	0.604 (1.531)	1.238 (2.435)
Other Europe	.148 (.599)	1.048 (3.601)	1.776 (5.780)
Great Britain	2.404 (3.083)	.973 (1.679)	.948 (1.430)
Canada	.376 (1.026)	1.128 (1.971)	1.065 (2.545)
South America/ Mexico	-.191 (-.193)	.559 (.430)	.176 (.128)
Other Foreign	.429 (1.633)	.855 (3.204)	1.957 (8.024)
Constant	.100 (8.770)	.109 (5.834)	-.0437 (-2.304)
Adjusted R-Square	.022	.003	.250
F-Test[a] (p-value)	13.654 (.034)	13.270 (.001)	23.382 (.001)
Firm-years	881	881	881

[a] The F-Test is a test of the null hypothesis that the earnings coefficients are equal across all seven geographic segments.

Table 19
Estimated coefficients (t statistics) of regressing stock return beta on the percentage of foreign sales.[a]

	Year					
Individual Firms	88	89	90	91	92	All
Number of Firms	153	158	159	173	193	836
% Foreign Sales	-.370 (-2.868)**	-.240 (-1.924)*	-.286 (-2.094)*	-.196 (-1.245)*	-.162 (-.768)	-.265 (-3.514)**
Rank Correlation	-.193**	-.131*	-.167*	-.131*	-.106*	-.151**
Portfolios						
% Foreign Sales	-6.831 (-9.331)**	-4.783 (-2.916)**	-3.987 -2.703)**	-2.806 -1.491)*	-4.290 (-1.449)*	-7.086 (-3.373)**
Rank Correlation	-.709**	-.491*	-.624*	-.612*	-.455*	-.855**

* Significant at the .10 level.
** Significant at the .01 level.
[a] The level of significance is based on the one-tailed t-test that the estimated coefficient is less than zero.

Table 20
Estimated coefficients (t statistics) of regressing risk-adjusted stock return on percentage of foreign sales.[a]

	Year					
Individual Firms	88	89	90	91	92	All
Number of Firms	153	158	159	173	193	836
% Foreign Sales	.013 (3.017)**	.016 (4.477)**	.016 (3.871)**	.012 (2.956)**	.003 (.719)	.011 (5.168)**
Rank Correlation	.170*	.261**	.250**	.264**	.105*	.202**
Portfolios						
% Foreign Sales	.062 (2.442)*	.055 (2.048)*	.085 (4.278)**	.021 (1.138)	.060 (1.565)*	.080 (3.700)**
Rank Correlation	.491*	.624*	.697*	.588*	.370	.855**

* Significant at the .10 level.
** Significant at the .01 level.
[a] The level of significance is based on the one-tailed t-test that the estimated coefficient is greater than zero.

Table 21
Test of Hypothesis 2 - Estimated coefficients (t statistics) of regressing stock return betas on accounting betas using individual firm variables.[a]

	Year					
	88	89	90	91	92	All
Number of Firms	153	158	159	173	193	836
Panel A.						
Domestic Beta	.012 (1.264)	.014 (1.427)*	.006 (.821)	.008 (1.296)*	.025 (2.471)**	.015 (3.403)**
Rank Correlation	.026	.113*	.091	.174**	.192**	.116**
Panel B.						
Domestic Portion[b]	.013 (1.294)*	.014 (1.428)*	.019 (2.013)*	.010 1.323)*	.023 (2.902)**	.014 (3.811)**
Foreign Portion[c]	.020 (1.111)	.015 (1.072)	.015 (1.880)*	.009 1.057)	.029 (3.076)**	.013 (3.449)**
Panel C.						
Total Beta	.015 (1.261)	.018 (1.397)*	.009 (.801)	.012 (1.293)*	.041 (2.556)**	.022 (3.610)**
Rank Correlation	.053	.140*	.082	.176**	.191**	.127**

* Significant at the .10 level.
** Significant at the .01 level.
[a] The level of significance is based on the one-tailed t-test that the estimated coefficient is greater than zero.

Table 22

Test of Hypothesis 2 - Estimated coefficients (t statistics) of regressing stock return betas on accounting betas using portfolio variables.[a]

	Year					
	88	89	90	91	92	All
Panel A.						
Domestic Beta	.099 (.673)	.210 (1.602)*	.306 (5.998)**	.291 (2.461)*	.524 (4.831)**	1.255 (8.665)**
Rank Correlation	.297	.661*	.248	.673*	.842**	.988**
Panel B.						
Domestic Portion[b]	.040 (.184)	.090 (1.917)*	.141 (1.025)	.221 (1.449)*	.481 (4.503)**	.779 (7.425)**
Foreign Portion[c]	.439 (1.118)	.539 (4.584)**	.105 (.751)	.188 (1.015)	.494 (4.591)**	.726 (6.639)**
Panel C.						
Total Beta	.092 (.568)	.331 (1.744)*	.452 (5.909)**	.407 (2.434)*	.770 (4.844)**	1.849 (8.583)**
Rank Correlation	.576*	.576*	.261	.672*	.842**	.903**

* Significant at the .10 level.

** Significant at the .01 level.

[a] The level of significance is based on the one-tailed t-test that the estimated coefficient is greater than zero.

[b] The domestic portion of the domestic accounting beta.

[c] The foreign portion of the domestic accounting beta (foreign portion plus domestic portion equals the domestic beta).

Table 23
Test of Hypothesis 3 - Estimated coefficients (t statistics) of regressing risk-adjusted stock returns on foreign accounting return (foreign accounting beta times the return of the uncorrelated foreign market portfolio):[a]

	Year					
Individual Firms	88	89	90	91	92	All
Number of Firms	153	158	159	173	193	836
Foreign Return	-.005 (-1.831)	-.002 (-.545)	-.001 (-.038)	.003 (3.102)**	.023 (15.532)**	.001 (.026)
Rank Correlation	-.296	-.195	-.070	.072	-.023	-.080
Portfolios						
Foreign Return	-.002 (-.367)	.004 (.171)	.011 (.471)	.017 (2.890)**	-.044 (-.594)	.007 (.293)
Rank Correlation	-.333	.006	.164	.394	-.152	.261

* Significant at the .10 level.
** Significant at the .01 level.
[a] The level of significance is based on the one-tailed t-test that the estimated coefficient is greater than zero.

2

VITA

Wayne Brian Thomas

Candidate for the Degree of

Doctor of Philosophy

Thesis: THE ASSOCIATION BETWEEN GEOGRAPHIC SEGMENT EARNINGS AND SECURITY PRICES

Major Field: Business Administration

Biographical:

Education: Graduated from Western Heights High School, Oklahoma City, Oklahoma, May 1987; received Bachelor of Science degree majoring in both Accounting and Business Administration from Southwestern Oklahoma State University, Weatherford, Oklahoma, May 1991; received Master of Science degree in Accounting from Oklahoma State University, Stillwater, Oklahoma, May 1992. Completed the requirements for the Doctor of Philosophy degree with a major in Business Administration at Oklahoma State University, December 1995.

Memberships and Certifications: Certified Public Accountant (Oklahoma), American Accounting Association - International Accounting Section, Beta Alpha Psi, Beta Gamma Sigma, and Phi Kappa Phi.

Fellowships, Scholarships, and Grants: Deloitte & Touche Doctoral Fellowship, Wilton T. Anderson Distinguished Graduate Fellowship, Wilton T. Anderson School of Accounting Scholarship, Robert Glenn Rapp Foundation Distinguished Graduate Fellowship, Summer (1992, 1993, 1994) Research Grant, William Haskell Cudd Scholarship, OG&E Scholarship, Lions Club Outstanding Student Scholarship, Raven Company Outstanding Student Scholarship, SWOSU Athletic Scholarship, and SWOSU Academic Scholarship.

Honors and Awards: AAA National Doctoral Consortium, AAA Southwest Doctoral Consortium, CBA Faculty of the Month, BAP National Research Scholar, NAIA Academic All-American, Who's Who Among College Students, and Love's Country Stores Outstanding Intern.

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 06-15-95 **IRB#:** BU-95-031

Proposal Title: THE ASSOCIATION BETWEEN GEOGRAPHIC SEGMENT EARNINGS AND SECURITY PRICES

Principal Investigator(s): Gary Meek, Wayne Thomas

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING.
APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Reasons for Deferral or Disapproval are as follows:

Signature: John H. Whyte [signature]
Chair of Institutional Review Board

Date: June 20, 1995