Stock Return Characteristics In A Thin Incipient Stock Market

O. Felix Ayadi, (E-mail: fayadi@earthlink.net), Fayetteville State University
Lloyd P. Blenman, (E-mail: blenman@bus.olemiss.edu), University Of Mississippi
C. Pat Obi, (E-mail: obi@calumet.purdue.edu), Purdue University- Calumet

Abstract

This paper examines the distributional properties of stock returns in the Nigerian stock market. Because emerging stock markets present several institutional, political and economic barriers, we hypothesize that the structural adjustment program begun in 1986 resulted in a sustained increase in the variability of stock returns. Conventional variance homogeneity tests could not reject the hypothesis of changing volatility in the security returns process. However, the Lagrange multiplier test reveals the presence of autoregressive conditional heteroscedasticity (ARCH) effect in the stock returns.

1. Introduction

Traditional finance theory predicts a positive relationship between expected returns and risk, where risk is measured by the volatility associated with investment returns. This postulation is based on the investor's risk aversion function and assumes that investment returns are at least lognormal. More importantly, the empirical formulation of the return-generating process, in the sense of Fama (1965), assumes that the residual term in the market model is identically and independently distributed about the mean of zero. Recently, however, the impact of changes in the level of risk on expected returns has become the focus of extensive research. Virtually all of these studies employ financial data from the U.S. stock market with most of them presenting compelling evidence about the impact of heteroscedasticity on the wealth of investors. Some of the studies that emplyed U.S. data are Pindyck (1984), French et al (1987), Bollerslev (1987) and Chou (1988).

Readers with comments or questions are encouraged to contact the authors via e-mail.

In this paper, we test for the presence of autoregressive conditional heteroscedasticity (ARCH) or changing volatility in stock return process in the Nigerian stock market. Initial inquiry will explore the returns characteristics spanning all periods of political and economic regimes. The objective is to verify the effect of structural economic changes on this emerging capital market. Stock markets in all economies play an important role in capital formation. However, in most developing economies, there exist environmental as well as regulatory barriers to capital flows. The extent to which capital formation is hindered by such changing policies may indicate the degree of investor wealth constraint. This inquiry is pursued in our linkage of changing volatility to differences in the levels of investment returns.

The ARCH model and its extensions are employed in financial institutions to estimate changes in conditional variance in the distribution of asset returns. While this model has found extensive use in studies involving financial data in the United States, few inroads have been made in evaluating its utility with data it in other fi-

nancial markets. Kearns and Pagan (1990) applied the ARCH model to the Australian market while Poon and Taylor (1992) test the relationship between returns and volatility in the United Kingdom. Emerging economies and budding capital markets are fraught with several regulatory restrictions that further cause thinness in trading. Consequently, imposition of structural adjustments often present a more than disproportionate shock in the overall market structure. The Nigerian stock market possesses several of these constraints.

The Nigerian stock market has no official market markers. Commission rates are strictly regulated, and banks are not allowed to take positions in stocks. Transactions are settled only in cash further constricting the volume of transactions. The Nigerian Securities and Exchange Commission prohibits the short selling of securities or explicit margin trading by investors. In addition, it rigidly controls "undesired" volatility in prices. As a result, the Nigerian stock market possesses all of the frictions that would cause a market to depart from the standards of a perfect price-setting situation. It therefore presents all the elements of a thin capital market, a condition that is characteristic of several developing economies. Cohen *et al* (1986) argue that thinness manifests itself in drift share prices which cause transaction returns variance to be systematically larger than quotation returns variance. In addition, Amihud and Mendelson (1987, 1989), and Bollerslev *et al* (1992) have all suggested that trading mechanism, which may be a result of government policies as outlined above, potentially affects the behavior of stock prices. Ayadi (1991) confirms this observation in an empirical study of market efficiency using Nigerian stock market data.

The preceding background provides the impetus to formally explore the relation between the level of market risk and required return in the Nigerian stock market using the ARCH models. The rest of the paper is organized as follows: Section II presents an overview of literature on volatility changes and returns distribution. Section III provides a brief description of the Nigerian stock market structure. Section IV presents the sample data and methodology, including an expository survey of the ARCH models. Empirical results are presented in Section V, while Section VI provides concluding remarks.

2. A Review of Literature on Risk Shifting and Returns Distribution

Existing asset pricing models, such as the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT), predict a positive relationship between asset returns and risk. For a long time, however, researchers discounted the impact of changes in the level of risk on expected returns. Merton (1980) noted the presence of heteroscendasticity in security returns but ignored the influence investment performance. Pindyck (1984) observes that much of the decline in stock prices in the United States during the 1970s was attributable to rising risk premiums brought about by increases in volatility. However, Poterba and Summers (1986) explain that the time series properties of volatility make it impossible for Pindyck's empirical results to hold.

Mandelbrot (1963), Fama (1965), and French, Schwert and Stambaugh (1987), all find that serial correlation in asset prices causes return distribution to have fat tails. These studies also conclude that large (small) changes in asset prices tend to be followed by large (small) changes of either sign. Other factors identified as pertinent to volatility changes are nonsynchronous trading patterns (Scholes and Williams, 1977), and financial crises and recessions (Fama, 1965; French and Roll, 1986; Schwert, 1989). The widely documented day-of-the-week effect has also revealed that stock market volatility tends to be higher on Mondays than on other days of the week, apparently due of the quantity of information arriving over a 72-hour weekend period compared to 24 hours for other trading days. The literature also presents evidence showing that high levels of nominal interest rates and inflation are associated with high market volatility (Christie, 1982; and Glosten *et al.*,

1993). Earlier, Black (1976) discovers that the volatility of security returns rises (falls) as stock price drops (rises). This leverage effect in asset return volatility would suggest that a decline in stock prices relative to bond prices increases leverage and the variance of stock returns in the current period.

Recent studies by Chambliss, Madura, and Wright (1994) examine the changing risk profile of American multinational corporations doing business in Europe. Their results suggest that firms moving into increasingly integrated regional blocs may experience a significant shift in their systematic risk. Of a greater interest is the thesis of Hsu (1984) which reveal that general investment climate and political events can cause shifts in market return variability. Hsu presented empirical evidence to support the hypothesis that the market environment plays a role in the non-stationarity of the variance of stock returns.

Uppal and Han (1994) base their studies on the Karachi Stock Exchange and they contend that emerging stock markets show evidence of a strong relationship between stock returns variance and the changes in the market environment. They explain that emerging stock markets are characterized by several institutional, political and economic changes of a magnitude not seen in the developed markets. Evidence in all of this literature lead us to hypothesize that the time series behavior of stock returns can be significantly influenced by shifts in both systematic and absolute risk characteristics of firms. Our study explicitly tests this hypothesis from the standpoint of an emerging capital market, specifically, the Nigerian stock market.

3. The Nigerian Stock Market Architecture

The Nigerian stock market operates a call-over system in which all securities are listed on a big board in the main hall of the exchange. Ayadi (1991) documents that registered brokers and dealers converge every business day between 2:30 PM and 4:00 PM to "call over" the names of securities. When a stock is called, each trader on the floor indicates his or her interest in the issue and a deal is struck. Each call-over session is presided over by the Director General of the Stock Exchange or an appointed representative. Once deals have been consummated, bargain slips are exchanged between brokers. These bargain slips are later used to write out contract notes. Apart from presiding at call-over meetings, the Director General also ensures that bargain slips represent authentic transactions on the floor of the exchange.

Government policy allows a direct manipulation of prices by the Council of the Stock Exchange. The Nigerian Securities and Exchange Commission and the Stock Exchange Council are of the opinion that Nigerian investors are not sophisticated enough to leave the determination of fair prices at the discretion of issuing houses and brokers. Their position is reinforced by the Nigerian Enterprises Promotion Decree of 1977 which provides that shares should trade at prices that are considered fair and reasonable regardless market circumstances. Agreeably, the objective of price stabilization remains the same in all stock markets. In Nigeria, however, the objective goes one step further. Government also tries to use the stock market as a medium for redistributing wealth among the populace. In essence, it appears to signify that the stock market is as much a socialist as is a capitalist institution.

In well established stock markets, the formation of investor expectations is often based not on the quality of information in the market, but also on the speed with which it arrives. Once expectation is formed, a trading behavior is established. However, the trading pattern in Nigeria is almost the reverse. The stock exchange publishes a "Daily Official List" that provides only scanty information on price and volume for each trading day. There are no professionals who provide any information beyond that in the annual reports of corporations. Brokerage firms provide little or no investment advice, constraining investors to often trade on noise. Further, investors do not have access to a certain securities simply because the market lacks breadth.

There are also differences in transactionary rules between the Nigerian stock market and the advanced stock markets. For instance, trading outside the floor of the stock exchange is prohibited. Moreover, virtually all transactions are on a cash-and-carry basis because the settlement system is designed for prompt payment for purchases.

The Nigerian Stock Exchange (NSE) is the only stock market in the country. Although it has six branches and a second tier that services smaller corporations, it has become a monopolist in the provision of trading facilities. In fact before 1990, when Ghana established a stock exchange, the NSE was the only stock market in the entire West Coast of Africa. During the early years of the market, some British corporations were listed on the board, but were delisted a few years later as a result of government interference. Since then, the NSE has not been successfully associated with outside stock markets.

Similar to most emerging economies, the Nigerian government exercises a significant control in the operation of the country's stock market. Through the Central Bank's "monetary circulars", the federal government determines all interest rates in the economy. This practice was eventually abolished in 1987 after the military government of President Babangida decided to pursue a deregulation policy as a part of its structural adjustment program (SAP).

4. Data and Methodology

This study employs both daily and weekly holding period returns of the Nigerian Stock Exchange index from January 1984 through December 1992. The literature documents that the distribution of financial time series, such as security returns, may not be normal (Mandelbrot, 1963; and Fama, 1965). The modeling process consequently requires the use of the generalized central limit theorem. This theorem states that if the distribution of the sum of independent identically distributed random variables exists, it must be a member of the stable Paretian class of distribution (Ghose and Kroner, 1991). For example, monthly returns are the sum of daily returns and therefore, are approximated by a member of the Paretian class of distributions.

The ARCH model was introduced by Engle (1982) to explicitly recognize the sub-Gaussian nature of financial time series. More importantly, it acknowledges that rates of return changes are approximately uncorrelated over time and that they are described by a unimodal symmetric distribution with fatter tails than the normal. Therefore, uncertainty of speculative asset prices, as measured by variances and covariances, changes through time. The ARCH model and its various extensions admit that non-stationarity of variances causes the distribution of security returns to have fat tails.

a. The ARCH Model

The general form of the autoregressive conditional heteroscedasticity (ARCH) model is available from the authors.

b. Variance Homogeneity Tests

Conventional variance homogeneity tests are employed to assess the impact of the various government economic policies on return variability. Statistical tests will determine whether a change in volatility of stock returns occurred before and after the implementation of the Structural Adjustment Program (SAP). The Bartlett test used in an empirical analysis is a powerful variant of the log-likelihood ratio test described in the preceding section. The only weakness of this test is its sensitivity to departures from normality. We also used the Layard test, a large sample test statistic, that is relatively robust to departures from normality.

5. Empirical Results

Empirical results are summarized in Tables 1 to 4. Tables 1 and 2 present statistical results of the time series properties of returns for all sub-periods from 1984 to 1992. Results of the variance homogeneity tests using Bartlett and

Table 1
Descriptive Statistics of NSE Stock Index Returns

Estimation Period	Mean	Standard Dev.	Maximum	Minimum
1984-1992†	0.120%	1.188%	33.623%	(24.787%)
1984-1986†	0.078	0.742	5.782	(4.772)
1986-1992†	0.134	1.301	33.623	(24.787)
1984-1992‡	0.553	1.950	27.438	(8.928)
1984-1986‡	0.351	1.397	6.452	(4.502)
1986-1992‡	0.620	2.095	27.438	(8.928)

Notes: † Daily data; ‡ Weekly data;

Layard test statistics are presented in Tables 3 and 4.

a. Time Series Properties of Stock Returns

The Nigerian government instituted a structural adjustment program (SAP) beginning in July of 1986 in order to boost the level of economic activity in the country. Among other measures, the program included liberalization of trade and exchange rates, privatization of public sector enterprises, deregulation of interest rates and the initiation of greater investment opportunities to foreign investors. As a result of the various economic and political changes that took place in Nigeria after July 1986, our analysis is expected to show whether these policies had any sustained impact on the time series of security returns.

Table 1 presents the sample properties of stock return series. The mean daily return for the period, 1984 - 1992 was 0.12%, with a standard deviation of 1.188%. Prior to the implementation of the SAP program, the daily index produced returns that ranged from -4.772% to 5.782%. However, after the SAP was initiated, the average daily return went from a low of almost -25% to a peak of about 34%. The highest daily return was recorded on November 1, 1989 when the NSE index rose to 399.8 from a previous day's level of 300.7. Incidentally, the index return reached a trough some five days later following the sale of eighteen government enterprises to the general public. Initial public reaction had driven the market index into a high gyration mood. The standard deviations of daily and weekly return series were consistently higher following implementation of SAP. Interestingly, the mean returns are also higher after SAP, an apparent indication of constant or rising risk premiums. In general, casual empiricism enables the inference of risk aversion on the part of the Nigerian stock market investor.

Table 2
Sample Distribution of NSE Stock Index Returns

Estimation Period	Skewness	Kurtosis	Normality §
1984-1992†	10.603*	479.642*	20136441.00*
1984-1986†	0.468*	24.097*	9680.61*
1986-1992†	10.670*	441.718*	12877987.00*
1984-1992‡	6.261*	87.559*	137005.80*
1984-1986‡	1.212*	9.260*	208.41*
1986-1992‡	6.526*	85.727*	99075.60*

Notes: * denotes that the test statistic is significantly different from zero at the 5 percent level of significance; † denotes daily data; ‡ denotes weekly data; and § The value recorded under "normality" is the Jarque-Bera statistic for normality.

Table 2 shows a more definitive description of index return series. For all sample periods studied, stock returns exhibit significant skewness and kurtosis. The Jarque-Bera normality test confirms that normality cannot be accepted for all periods and sub-periods in the study at the 5 percent level of significance.

b. Results of Variance Homogeneity Tests

Next, we tested for variance homogeneity in market index return series before and after SAP. The first set of tests are the conventional tests of variance homogeneity using the Lagrange Multiplier (LM) test for ARCH effect. To test for the presence of ARCH effect in return distribution, we regress the return on a constant and perform diagnostic checks of the model specification. The LM test of significance for the ARCH process tests the null hypothesis that the disturbance term from the least squares regression is conditionally homoscedastic. The results of these tests are presented in Tables 3 and 4.

Table 3
Homogeneity of Variance Test Results

Test Statistic	Daily Data	Weekly Data
Bartlett	199.03*	23.40*
Layard	1.03	0.62

Note: * denotes significance at the 5 percent level. The Bartlett and Layard test statistics have a chi-square distribution.

Table 3 shows the results of conventional tests of variance homogeneity. For both the daily and weekly return data, the Bartlett test rejects the null hypothesis of homogeneity of variance at the 5 percent level. On the other hand, the Layard test fails to reject the null hypothesis for both daily and weekly return series. As explained above, the Bartlett test is sensitive to departures from normality while Layard test is relatively robust to non-normality.

Table 4 contains the results of the LM test. This test fails to reject the null hypothesis that the disturbance term from daily return data is conditionally homoscedastic for lags greater than two during the period 1984 through 1992. The same result holds for daily data after SAP was instituted. Prior to the adoption of SAP in 1986, the results indicate the presence of heteroscedasticity in daily return data. All these results hold at both 0.01 and 0.05 levels of significance. The results for daily data might have been biased because of nonsynchronous trading. We find that in the early history of the market there were some days in which the index did not actually change apparently due to non-trading.

When the weekly data was analyzed, the LM test rejects the null hypothesis that the error term is conditionally homoscedastic at the 5 percent level for all sample periods and for all lags. It should be noted that the LM test was applied to lags greater than eight, however, the results are not different from those reported in table 4.

6. Concluding Remarks

The distributional property of stock returns is critical to the validity of certain equilibrium pricing models in the field of finance. For example, the Capital Asset Pricing Model uses variances and covariances of asset returns as measures of risk. The validity of these measures holds only if stock returns are normally distributed. In this study, we examined the distributional properties and risk attributes of the Nigerian stock market. Specifically, we assessed the impact of the Nigerian government's economic reform program begun in 1986, on stock return volatility. We determined that the reform program, or structural adjustment program as it is generally referred to, brought about a sustained change in the riskiness of security returns.

Empirical evidence also suggests that stock returns were highly skewed and departed from normality over the sample period. The standard deviation of daily and weekly returns were larger after the implementation of SAP. Results show that stock returns were generally more volatile after 1986. A corresponding increase in average stock returns was also achieved in the same period, an indication of rising risk premiums.

Conventional variance homogeneity tests produced mixed results. The Bartlett test results indicate the absence of variance homogeneity. This evidence can be challenged on the

Table 4
Lagrange Multiplier Test for ARCH Process

Estimation Period	LM TEST STATISTIC FOR DIFFERENT LAGS				
	q=1	q=2	q=4	q=6	q=8
1984-1992†	0.001	248.306*	281.874*	286.533*	287.153*
1984-1986†	0.237	0.585	5.239	6.325	10.619
1986-1992†	0.002	188.222*	213.922*	217.453*	217.895*
1984-1992‡	0.015	0.016	0.260	0.315	0.366
1984-1986‡	0.328	0.299	0.768	1.448	1.958
1986-1992‡	0.009	0.011	0.194	0.234	0.277

Notes: The ARCH test is based on the following equations:

The LM statistic has an asymptotic chi-squares distribution with degrees of freedom equal to the number of lagged, squared residuals. † denotes daily data; ‡ denotes weekly data; and * indicates significance at the 5 percent level.

ground that the Bartlett test is sensitive to non-normality which was shown to exist in the data. The Layard test on the other hand indicates that the return variance is homogenous at the 5 percent level. Similar to the empirical outcome in Uppal and Han (1994), our results from the Layard test do not support the hypothesis that shifts in variance are related to economic and political events.

Finally, when we applied a more formal test of ARCH effect using the Lagrange Multiplier (LM) test. Results suggest the presence of ARCH process in sample data. Studies using the ARCH model have yet to justify its presence in stock returns data even in the developed stock markets. We state that the presence of ARCH effect in emerging capital markets can be rationalized by nonsynchronous trading, government interference in security pricing, and informational inefficiency. In most emerging economies, governments have been known to take measures that open stock markets to foreign investors, making capital formation and liquidity more affordable.

Our analysis indicates that interest rate deregulation by the Nigerian government led to a situation in which debt financing became an expensive source of capital relative to equity. By the same token, privatization also contributed to increased activity in the stock market. In 1989 alone, the number of transactions on the NSE increased by 55.1 percent to 33,444 while market value increased by 118.4 percent. The resulting increase in market activity from the SAP may have caused the ARCH effect reported in this study.

7. Suggestions for Future Research

It will be interesting to model stock returns during the turbulent economic and political landscape in Nigeria especially during the structural adjustment program using a stochastic model such as the ARCH process. This study only reports the presence of ARCH effects without modeling an ARCH-based return generating process in order to study the risk-return characteristics of the market. A future effort in this direction is appropriate. Moreover, it will be worthwhile to see a test of differential ARCH effects between the pre-reform and post reform periods.

References

1. Amihud, Y. and H. Mendelson, "Trading Mechanism and Stock Returns: An Empirical Investigation. *Journal of Finance*, 533-553, 1987.
2. Ayadi, O. F., *Stock Market Rationality, Growing Bubbles, and Noise Trading: An Empirical Evaluation of the Nigerian Stock Market*, Ph.D. Dissertation, The University of Mississippi, 1991.

3. Baillie, Richard T and Ramon P. DeGennaro, "Stock Returns and Volatility, *Journal of Financial and Quantitative Analysis*, 25, 203-214, 1990.
4. Bello, Zaki, "Stock Price Behavior in an Underdeveloped Capital Market: Nigeria in Contrast to the U.S., Journal of Applied Business Research, 6, 71-87, 1990.
5. Berndt, Ernst K., Bronwyn H. Hall, Robert E. Hall and Jerry A. Hausman, "Estimation and Inference in Nonlinear Structural Models, *Annals of Economic and Social Measurement*, 4, 653-66, 1974.
6. Black, Fischer, "Studies of Stock Price Volatility Changes," Proceedings of 1976 Meetings of the Business and Economics Statistics Section, American Statistical Association, 177-181, 1976.
7. Bollerslev, Tim, "Generalized Autoregressive Conditional Heterskedasticity," *Journal of Econometrics,* 31, 307-327, 1986.
8. Bollerslev, Tim, "A Conditional Heteroskedastic Time Series Model for Speculative Prices and Rates of Return," *Review of Economics and Statistics*, 69, 542-547, 1987.
9. Bollerslev, T., R. Chou and K.F. Kroner, "ARCH Modelling in Finance: A Review of theTheory and Empirical Evidence," *Journal of Econometrics*, 52, 5-59, 1992.
10. Chambliss, K., J. Madura and F. Wright, "The Changing Risk Profile of US-Based Multinational Corporations Exposed to European Community Markets," *The Journal of Financial Research*, 17, 133-146, 1994.
11. Chou, R., "Volatility Persistence and Stock Valuations: Some Empirical Evidence Using GARCH," *Journal of Applied Econometrics*, 3, 279-294, 1988.
12. Christie, A. A., "The Stochastic Behaviour of Common Stock Variances: Value, Leverage and Interest Rate Effects," *Journal of Financial Economics*, 10, 407-432, 1982.
13. Cohen, K. J., S. F. Maier, R. A. Schwartz and D. K. Whitcomb, *The Microstructure of Securities Markets*, Prentice-Hall, 1986.
14. Engle, Robert F., "Autoregressive Conditional Heteroscedasticity With Estimates of the Variance of U.K. Inflation," *Econometrica*, 50, 987-1008, 1982.
15. Fama, Eugene F., "The Behavior of Stock Market Prices," *Journal of Business*, 38, 34-105,1965.
16. French, K. and R. Roll, " Stock Return Variances: The Arrival of Information and the Reaction of Traders," *Journal of Financial Economics*, 17, 5-26, 1986.
17. French, K. R., G. W. Schwert and R. F. Stambaugh, "Expected Stock Returns and Volatility," *Journal of Financial Economics*, 19, 3-29, 1987.
18. Glosten, L., R. Jagannathan and D. Runkle, "On the Relation Between the Expected Value and the Volatility of the Nominal Excess Return on Stocks," *Journal of Finance*, 1779-1801, 1993.
19. Greene, William H, *Econometrics Analysis*, New York: Macmillan Publishing Company,1993.
20. Ghose, Devajyoti and Kenneth F. Kroner, "Where Do the Fat Tails Come From in Financial Time Series," Working Paper, University of Arizona, 1991.
21. Hsu, D.A., "The Behavior of Stock Returns: Is It Stationary or Evolutionary?" *Journal of Financial and Quantitative Analysis*, 19, 11-29, 1984.
22. Kearns, P and A. R. Pagan, "Australian Stock Market Volatility: 1875-1987," Working Paper No. 248, University of Rochester, 1990.
23. Lastrapes, William D., "Exchange Rate Volatility and U.S. Monetary Policy: An ARCH Application," *Journal of Money, Credit, and Banking*, 21, 66-77, 1989.
24. Lee, John H. H. and Maxwell L. King, "A Locally Most Mean Powerful Based Score Test for ARCH and GARCH Regression Disturbances," *Journal of Business & Economic Statistics,* 11, 17-27, 1993.
25. Mandelbrot, B., "The Variation of Certain Speculative Prices," *Journal of Business*, 36, 394-419, 1963.

26. Merton, R. C., "On Estimating the Expected Return on the Market: An Exploratory Investigation," *Journal of Financial Economics*, 8, 323-361, 1980.
27. Nelson, Daniel B, "Conditional Heteroskedasticity in Asset Returns: A New Approach," *Econometrica*, 59, 347-370, 1991.
28. Odife, D.,"Stockbroking in Nigeria: Problems and Prospects," *Securities Market Journal*, 3-9, 1983.
29. Ojo, Ade T. and Wole Adewumi, *Banking and Finance in Nigeria*, Graham-Burn, 1983.
30. Pindyck, Robert S., "Risk, Inflation and the Stock Market," *American Economic Review*, 74, 335-51, 1984.
31. Poon, S. H. and S. J. Taylor, "Stock Returns and Volatility: An Empirical Study of the U.K. Stock Market," *Journal of Banking and Finance*, 16, 37-59, 1992.
32. Porterba, James M, and Lawrence H. Summers, "The Persistence of Volatility and Stock Market Fluctuations," *American Economic Review*, 76, 1142-1151, 1986.
33. Sareewiwatthana, P and R. Phil Malone, "Market Behavior and the Capital Asset Pricing Model in the Securities Exchange of Thailand: An Empirical Application," *Journal of Business Finance and Accounting*, 12, 439-452, 1985.
34. Scholes, M. and J. Williams, "Estimating Betas with Nonsynchronous Data," *Journal of Financial Economics*, 5, 309-327, 1977.
35. Schwert, William G., "Why Does Stock Market Volatility Change Over Time?" *Journal of Finance*, 44, 1115-1153, 1989.
36. Stenius, Marianne, "Volatility and Time-Varying Risk Premiums in the Stock Market," *Applied Economics*, 23, 41-47, 1991.
37. Uppal, Jamshed Y. and K. C. Han, "Stock Return Variability in an Emerging Market: A Case Study of the Karachi Stock Exchange," Working Paper, Catholic University of America, 1994.