Stock Market Integration in CARICOM Member States: A look at the Barbados, Jamaica and Trinidad and Tobago Stock Exchanges

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A Thesis

In

The John Molson School of Business

Presented in Partial Fulfillment of the Requirements
For the Degree of Master of Science in Administration (Management) at
Concordia University
Montreal, Quebec, Canada

August 2005

Your file Votre référence
ISBN: 978-0-494-34586-3
Our file Notre référence
ISBN: 978-0-494-34586-3

Abstract

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Portfolio selection, as proposed by Markowitz, suggests that investors' needs are best satisfied by selecting an efficient portfolio that minimizes risk and maximizes returns. In search of these efficient portfolios, international investors are now looking more towards emerging markets due to the high level of financial integration among the world's developed capital markets. Regional cooperation by bodies such as NAFTA, EU and ASEAN, have lead to an increase in the interdependency of the capital markets in these areas. The regional body in the Caribbean, CARICOM, has also undertaken many of the same policies as NAFTA, EU and ASEAN to aid in the development of the Caribbean. In this paper, we investigate the emerging capital markets of the Caribbean as a potential investment region to aid international investors in attaining an optimal portfolio allocation and to see if regional investors can still adequately diversify their portfolios through local markets. The results show that international investors can effectively diversify their portfolio by allocating capital to all three markets in the Caribbean. Furthermore, there is no evidence of cointegration among the markets of the Caricom region implying that the liberalization measures undertaken in the region have yet to take effect.

Acknowledgements

I would like to acknowledge and thank the Heavenly Father for his grace and mercies, which endureth forever.

I would also like to thank my committee members, Dr. Boutchkova and Dr. Paeglis for their assistance. I would also like to express gratitude to my supervisor, Dr. Ian Rakita for his patience, assistance and guidance in not only writing this thesis, but also in developing a career path.

Last but not least, I would like to thank my family for their continuous encouragement and support. To my father, Edmund, my mother, Costilda and my two sisters Naomi and Malisa, your moral support is my foundation.

Employ your time in improving yourself by other men's writings, so that you can gain easily what others have labored hard for. - Socrates

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1. Introduction

As international investors become more astute, the search for viable market opportunities must be pursued with greater intensity. The search for value has become more challenging with the formation of common trading blocks (e.g. ASEAN, EU, and NAFTA) and the development of integrated economic systems. This emergence of cooperative markets has promoted closer linkages between stock markets within the constituent countries. According to Koutoulas & Kryzanowski (1994) national economies are becoming more internationalized through increased trade and the mutual cooperation of national governments. As a consequence, the hindrance to the free flow of goods, services, and financial, physical, and human capital has been minimized. Jeon and Chiang (1991) cite deregulation and market liberalization measures, rapid developments in communication technology and computerized trading systems, and increasing activities by multinational corporations as factors contributing to such integration. Bekaert and Harvey (1997) also found that capital market liberalization contributed to an increase in the correlation between local market returns and the world market.

Research on developed markets indicates that the potential gains from diversification through international investing may have been overstated for investors with long holding periods. Chou et al. (1994), Gerrits & Yuce (1999), Kasa (1992), Leachman & Francis (1995), Leachman & Francis (1998) all find evidence that developed markets are indeed cointegrated and although unique events may occur, these markets exhibit a common stochastic trend over the long term. This implies that

international investors cannot effectively diversify their portfolios over long investment horizons by simply allocating capital to these markets.

There are several reasons why different countries' stock prices may have a significant long term relationship. The presence of strong economic ties and policy coordination between the relevant countries can indirectly link their stock prices over time. As a result, the interdependence of regional stock markets has become the subject of extensive research. With increasing global integration, vigilant international investors are seeking new markets to aid in the diversification of the portfolios that they manage.

Ajayi and Mehdian (1995) conclude that adding stocks from emerging markets to a portfolio of stocks from developed economies will benefit the efficient diversification of the portfolio. In addition to these studies, Chan et al. (1992), Darrat et al. (2000), DeFusco et al. (1996), Ghosh et al. (1999), Gilmore and MacManus (2002), and Yang et al. (2004) have all found evidence that emerging markets in Asia, the Middle East, Latin America and Central Europe lack a significant long term stochastic relationship with developed economies.

As a result, the question arises as to whether or not the stock markets of the Caribbean may also offer a viable diversification tool for international investors bent on portfolio optimization. The markets of the Caribbean have also been subjected to much of the same regional integration policies implemented by other regional bodies such as NAFTA, EU and ASEAN. The creation of CARICOM[1] in the Caribbean region has created wide spread measures to aid in integrating the region. Darrat and Zhong (2005) clearly demonstrate that the creation of NAFTA in the North American market has lead

[1] Please see section 2.8 for an in-depth outline of the development of CARICOM.

to interdependence among the exchanges of Canada, Mexico and the U.S. Therefore, not only is the question of regional integration in CARICOM pertinent, but its relationship with its largest trading partner, the U.S. must also be considered.

The purpose of this study is to investigate the interdependence of CARICOM markets (Barbados, Jamaica, and Trinidad) and to also determine whether a long term relationship with the U.S. market exists. The recent emergence of the Caribbean Single Market Economy and a regional CARICOM stock market is evidence of the numerous efforts by the regional body to integrate the area. Regional investors as well as international investors must assess if any long term stochastic trend binds the markets together. This is needed to determine whether they must seek new investment opportunities or whether the current policies that have been implemented have yet to make a significant impact in integrating the economies of the region.

Our study differs from previous research in the Caribbean region in several ways. Previous research by Hamilton (1998) and Leon (1996) on Caribbean markets has mainly investigated the volatility of the Jamaica Stock Exchange (JSE) market. Although these studies prove useful, they do not offer any insight to international investors as to the possible benefits of investing in the region. Conversely, there has been little work done on the linkages between Caribbean economies. Kim and Langrin (1998) investigate volatility spillover under foreign exchange liberalization whereas Seerattan and Birchwood (2003) perform a study that investigated economic linkage between the regions via an uncovered interest rate parity model. These are the main studies that attempt to address the question of stock market interdependence in the region and also with the developed markets in the U.S.

The methodology implemented to study the potential common stochastic trend between the markets of CARICOM and the U.S. market is based on the Johansen and Juselius (1990) cointegration test. A monthly time series that spans a period from January 1990 through December 2003 is used in the study. Robustness checks are also implemented in the investigation to verify the local currency results and to provide insight for international investors. The first robustness check involved breaking down the time series into two sub-periods; from January 1990 to December 1996 and from January 1997 to December 2003. The second robustness check implemented was to convert local currencies index prices to a common U.S. dollar denominated index prices. The final check that was utilized involved investigating a weekly time series for the same period, with the relevant sub-periods and conversion to a common U.S. dollar denominated index price.

Evidence presented in this study suggests three key findings. First, markets in the CARICOM region do not display any bivariate or trivariate long-term relationship. Although many economic policies have been implemented by CARICOM to aid in the liberalization of the region, no significant regional integration is evident through the exchanges in the region. Second, in regards to the integration of the region with the U.S., only the Trinidadian market displays any bivariate relationship. Third, an interesting finding is that the system of the Jamaican, Trinidadian and U.S. market shows a significant long term stochastic trend that binds the markets together from January 1997 through December 2003. The implications of these findings are two-fold: regional investors can still adequately diversify their portfolios throughout regional markets and international investors with long-term investing horizons can diversify their portfolios by

investing in either the Jamaican or Barbadian markets or the entire CARICOM region since these tests do not yield any long-term relationship with the U.S. market.

The remainder of the study is organized as follows. The next section undertakes a review of the international diversification question as it relates to the cointegration literature. Section 2 also contains a background of the CARICOM region with a brief overview of the stock markets in the region. Section 3 presents a description of the data and the reasoning behind the markets chosen for the investigation. In section 4 the methodology used in the study to investigate and analyze the long term stochastic trend in the study is discussed. Section 5 outlines the results of the unit root and the Johansen and Juselius (1990) cointegration tests. In addition, section 5 considers robustness checks for monthly time series results. The final section of the study presents conclusions and offers ideas for future research.

2.0 Literature Review

2.1 Changing Face of International Diversification

The task of allocating capital efficiently has been investigated extensively throughout the era of modern Finance. Markowitz (1952), Sharpe (1964) and Lintner (1965) suggest that investors have a tendency to select portfolios that have the highest return for a given level of risk and the lowest risk for a given return. Michaud et al. (1996), whose work supports Markowitz's theory, indicate that broadening the universe of potential stocks to the international window provides the opportunity for investors to add stocks that have superior returns than the stocks currently held in the portfolio. Depending on the correlation between international stocks and stocks included in the domestic portfolio, the prospect exists for a decline on the entire portfolio risk. Wide

empirical results provided by the literature to date, have had the tendency to support the notion of adding international securities into a portfolio consisting of only domestic stocks. In fact, most studies have provided evidence that such a strategy tends to produce higher returns for a given level of risk and lower risk for a given return. French and Poterba (1991) investigate the cost of incomplete diversification by analyzing the expected returns in each domestic market to justify the observed home bias. Their results indicate that domestic investors in U.K., U.S., and Japanese markets expect annual returns in their domestic market to be greater than foreign market returns by anywhere between 250 and 500 basis points. Such gains are not realized.

Shapiro (1998) among others, provide evidence that international portfolio diversification provides investors with better risk return trade offs. Investors can get greater returns for the same amount of risk. According to Shapiro's results, the broader the diversification the more stable the returns. Therefore, greater risk reduction can be obtained by adopting an international diversification strategy rather than a simple domestic diversification policy. His findings indicate that a fully diversified U.S portfolio is about 27% as risky as an individual stock, meaning that 73% of individual stock risk can be diversified away. With regards to a strategy including international stocks, greater risk reduction can be achieved. In fact, an international diversified portfolio is only 11.7% as risky as the typical investment stock (88.3% of the portfolio's risk can be diversified away). As we notice, the benefits of a global diversification strategy are drastically enhanced relative to a domestic diversification strategy. However, according to Michaud et al (1996), improvements in the Markowitz efficient frontier depend on a number of crucial factors that include the domestic country, the

investment strategy and the time period under study.

At its inception, Markowitz's theory assumed that all assets should be held to observe the efficient portfolio. Although Markowitz proposed this, problems such as home bias and government legislation did not allow investors to allocate their portfolio efficiently (Lewis, 1999). With these factors in mind, coupled with the inherent lack of integration in the markets, global asset managers focused primarily on country factors to build their portfolios. With the recent structural changes taking place in the international setting in past few years, as cited by Cavaglia et al. (2000) and Yang et al. (2004), the debate has been accentuated regarding the best way to undertake international investments and if in fact the potential benefits still exist. As a matter of fact, following the decline in trade barriers (GATT), the emergence of large trading blocks (EU, NAFTA, ASEAN) and the increasing economic integration between developed countries, several researchers have questioned the relative importance that country factors may now have in this setting.

Notwithstanding the changing dynamics in portfolio selection, investors are becoming more knowledgeable and are considering alternative markets to secure optimal returns and achieve Markowitz's efficient frontier. Although, most investors still hold a majority of their investments in domestic assets, emerging markets are now being considered as a means of realizing an optimal portfolio allocation.

Errunza et al. (1999), propose that diversification benefits of investing directly in international securities are quickly disappearing because of the availability of multinational corporation stocks, closed-end country funds and American Depository Receipts available in the U.S. market. The results from his study indicate that there is no

statistical or economic difference between investing directly in foreign markets or in domestically traded securities for 11 of the 16 countries under investigation. Despite this fact, many emerging markets still do not have a presence in international markets.

Studies by Bekaert and Urias (1996 and 1999), Bekaert and Harvey (2002), Divecha et al. (1992) and Li et al. (2003) support the benefits of portfolio diversification through emerging markets. Bekaert and Urias concluded that open-end instruments provide superior diversification benefits when compared to close-end funds that are traded in domestic markets. They propose that because the net asset value of closed-end funds can deviate from the market value (i.e., either trade at a premium or discount), investors lose a substantial part of the benefits of diversification. Li et al. (2003), on the other hand, address the issue of portfolio constraints in emerging markets. Li et al. (2003) demonstrate that although a short sale constraint is imposed on securities in emerging markets, the diversification benefits are reduced but are not eliminated.

2.2 Emerging Markets

The term emerging market used here implies an exchange or market in a developing economy as defined by the World Bank International Finance Corporation. There are many definitions used to describe emerging markets, however the definition that was found to be most common is, *"an exchange or market in a developing economy"*. The World Bank defines developing economies by the Gross National Income (GNI) per capita. Economies with a minimum GNI per capita of $9,266 are described as developed countries. The very nature of classifying an equity market as an emerging market implies that market quality and efficiency are expected to increase with time. The importance of these markets is unmistakable with six markets ranking among

the top 20 markets in the world in terms of capitalization (Jun, Marathe and Shawky. 2002)[2].

In recent years, investments have increased sharply in the markets of developing economies. According to the Emerging Markets Factbook (1997), the aggregate net capital flows to emerging markets increased from USD $71.1 billion to USD $284.6 billion in a 12-year period. The rapid increase in capital flows in emerging markets can be credited to the potential for rapid economic growth, financial deregulation and the benefits of diversification (Bosner-Neal, Neal. 1999).

The role of emerging markets is not only important to international investors seeking potentially high returns in a relatively short period of time, but it is also important to the general economy in which the market is located. There has been a strong link documented in economic development literature between the development of financial markets and the growth of the economy. According to Atje and Jovanovic (1993), Levine and Zervos (1998) and Levine (1997), well-functioning stock markets enhance the liquidity of capital investment and thus promote long run economic growth. The need for funding lucrative long-term investments suggests that the orderly functioning of equity markets is more vital in developing economies compared to developed markets (Jun, Marathe and Shawky (2002)).

2.3 Market Integration

International equity market integration has been fueled by the rapid expansion of international trade and by the diverse economic policies that have been undertaken to assist in the integration of these markets (Kearney and Lucey 2004). After the Asian

[2] These countries are Malaysia, South Africa, Mexico, Korea, Singapore and Thailand.

crisis in 1997, the investigation of equity market integration between the world's financial exchanges surged. The increase in studies after the Asian crisis mainly investigated the relationships between emerging markets and developed markets, whereas the question of cointegration before the Asian crisis mainly focused on long-term relationships among developed markets.

2.4 Integration Among Developed Economies

Kasa (1992) produced one of the pioneering studies in the investigation of common stochastic trends in developed equity markets. The study employed both monthly and quarterly data from January 1974 through August 1990 to compute Johansen (1990) tests for common trends. Kasa (1992) concluded that equity markets in the U.S., Japan, England, Germany, and Canada, have a single common stochastic trend that ties these markets together in the long-run. The implication of this study questioned the proposed gains achieved from international diversification in that previous research probably overstated the potential benefits of international diversification in developed markets.

Many studies followed to support Kasa's (1992) conclusions. Chou et al. (1994), Leachman & Francis (1995), Leachman & Francis (1998) implemented a multivariate cointegration test and found evidence that the G7 (U.K., U.S., Japan, France, Germany, Canada and Italy) are cointegrated. In addition, Chou et al. (1994) and Leachman & Francis (1995) both conclude that the cointegration relationships over the specified time periods under investigation have become stronger. Corhay et al. (1993) investigated the bivariate relationships of five European markets, France, Germany, Italy, Netherlands and United Kingdom to determine if a common long-run component governs the

interaction. The results of the study indicate that only the Italian market is not cointegrated with any of the remaining markets in the study. Gerrits & Yuce (1999) also provide evidence of the interdependence between stock prices in Germany, the U.K., the Netherlands and the U.S.

Notwithstanding all the evidence in favor of integrated markets, Kanas (1998), using data spanning January 3, 1983 through November 29, 1996, finds that the U.S. market is not pairwise cointegrated with the U.K., Germany, France, Switzerland, Italy or the Netherlands.

Koutoulas & Kryzanowski (1994) investigate the level of integration between the Canadian and U.S. stock market. Using modified forms of the APT model and a data set from March 1969 through March 1988, they conclude that the Canadian equity market is only partly integrated with the American equity market. However, contrasting results can be found in Ammer & Mei (1996) who found evidence that there is a high degree of financial integration between Canada and the United States.

There has been a great deal of support for the integration of developed markets which calls into question the benefits of long-term diversification throughout these markets. With a better understanding of the relationship that exist between the world's developed equity markets, many researchers began to focus on the relationship of developed economies with emerging markets. They propose that the level of integration observed between developed economies will not be observed between developed markets and emerging markets.

2.5 Integration among Asian Markets

The initial research on emerging markets investigated developing economies in Asia. Corhay et al. (1995) indicate that this region's world market capitalization, specifically the markets of the Pacific-Basin, has grown from 14% in 1972 to 47% of world market capitalization in 1988. Chan et al. (1992) conducted an influential study that investigated the relationship between Hong Kong, South Korea, Singapore, Taiwan, Japan and the United States. They used a data set that spanned the period February 1, 1983 to May 18, 1987. Not only did Chan et al. (1992) investigate bivariate relationships, but also tested for trivariate and quadrivariate relationships for this time series[3]. Cointegration test in the study revealed that none of the markets demonstrated a common stochastic trend. They concluded that international diversification is still effective among these markets. DeFusco et al. (1996), whose investigated geographical regional cointegration for the period January 1989 to May 1993, support the conclusions presented by Chan et al. DeFusco et al.'s investigation focused primarily on bivariate relationships between Korea, the Philippines, Taiwan, Malaysia, Thailand and the United States and supports significant diversification benefits from investing in these markets.

Ghosh et al. (1999) investigate markets in the Asian-Pacific region using a daily time series for their study. The daily time series chosen for their cointegration analysis spans March 26, 1997 to December 21, 1997. Ghosh et al. (1999) determine that the markets of Hong Kong, India, Korea and Malaysia are cointegrated with the United States, whereas the markets of Indonesia, Philippines, and Singapore are cointegrated

[3] The term bivariate relationship indicates a cointegration test that investigates the relationship between two variables, whereas a trivariate relationship investigates the relationship between three variables. On the other hand the term quadrivariate relationship refers to an investigation of the relationship between four variables.

with Japan. Darrat and Zhong's (2002) study yields a different conclusion. Their study investigates the markets in the same region using a longer time series extending from November 1987 to May 1999. The results of this study suggest that the main driving force in regional markets in the Asian Pacific region is only the United States market and that none of the markets share a bivariate cointegration relationship with Japan. Darrat and Zhong (2002) imply that the effect of the Japanese market on these markets is only transitory.

Yang et al. (2004) address the issue of conflicting results observed in cointegration research of emerging markets[4] and the United States stock market during different time periods. Using a recursive cointegration analysis, Yang et al. determine that there is no long-run cointegration relationship between emerging markets and the United States stock markets before 1997. However, cointegration between emerging markets and the United States is more pronounced from 1997 as a result of the global emerging market crisis. Sheng and Tu (2000) also raise the issue of the stability of the cointegration relationship between emerging markets and the United States market by investigating 12 Asian-Pacific markets. Their results support the conclusion of Yang et al., in that no cointegration relationship existed before the Asian financial crisis of 1997. These findings support the conclusion of Longin and Solnik (1994). Longin and Solnik studied the correlation of monthly excess returns for the G7 from 1960 to 1990. They found that correlation matrices are unstable over time implying that there are structural breaks in the cointegration relationship similar to the findings of Sheng and Tu (2000).

[4] Yang et al. (2004) investigated the following markets: Argentina, Brazil, Chile, Colombia, Greece, India, Korea, Malaysia, Mexico, Taiwan, Thailand, Venezuela, and Zimbabwe.

2.6 Integration in European and Middle Eastern Markets

Central European markets have received more attention in recent studies because of their geographic proximity to the major European markets. DeFusco et al. (1996) and Yang et al. (2004) investigate the emerging markets of Greece, Portugal and Turkey and conclude that these European markets are not cointegrated with the United States. Gilmore and MacManus (2002) also find results that are consistent with the lack of a common long-run stochastic trend between emerging markets of Central Europe and the U.S. market. Notwithstanding, Voronkova (2004) using a modified version of the cointegration test that allows for structural breaks in the cointegration relationship, concludes that the emerging markets of the Central European region share a common stochastic trend with the UK, French, German and U.S. market.

Darrat et al. (2000) examine regional markets in the Middle East and determine that a common stochastic trend ties the markets of Egypt, Morocco and Jordan together over the long-run. Despite the presence of integration in the region, none of the markets are interdependent with the U.S. market, therefore the potential for diversification gains are significant for international investors.

2.7 Integration in Latin American Markets

There has been conflicting evidence of a long-run relationship between the Latin American markets and the U.S. market. Defusco et al. (1996) concluded that the emerging markets of Latin American displayed no long-run stochastic trend with the U.S. market. Conversely, using the same time period, Choudhry (1997) proposes that there is evidence of a common stochastic trend between Latin American markets and the U.S. More recently, Yang et al. (2004) investigated the stability of long-run relationships

between Latin American and U.S. stock markets and determined that no common stochastic trend is evident prior to 1997. However Yang's results indicate that a long-run relationship exists after 1997 which is consistent with the findings of Chen et al. (2002).

Despite the conflicting results of a common stochastic trend between emerging and U.S. stock markets, its importance to international portfolio diversification is not diminished. Investors are constantly looking for new alternatives to increase the efficient frontier and achieve better risk adjusted returns. Although the results seem to be contradictory, a consistent theme is observed in the results of cointegration analysis in emerging markets. Most time series, regardless of region, share a common stochastic trend with the U.S. market after 1997. Therefore the potential for portfolio diversification is becoming increasingly difficult for investors through emerging markets. Although the emerging markets of Asia, Central Europe, the Middle East and Latin America have been studied as a source of international portfolio diversification, no studies have been conducted on the developing markets of the Caribbean which may increase the efficiency of investors' portfolios by offering securities in an independent market.

2.8 History of CARICOM Community

The British West Indies have long known the importance of economic unity and integration as a means of survival and prosperity for the region in a changing world. The establishment of the British West Indies Federation in 1958 was the precursor to the vision of regional economic integration. The Federation opened the pathway to the Caribbean Free Trade Association (CARIFTA) in 1965 which was created to further assimilate the region. The final stage of the complex process to unify over thirteen

countries in the region came in 1973 with the establishment of the Caribbean Community and Common Market (CARICOM).

CARICOM is a regional body in the Caribbean created to develop the economies of countries in the region and Central and South America. Through CARICOM's economic policies not only has CARICOM aimed to develop the economies of member states, but also to integrate their economies. Gerrits & Yuce (1999) conclude that the increase in global capital market liberalization is consistent with the integration in the world equity markets.

One of CARICOM's major initiatives to integrate the region was the creation of a regional stock exchange. In 1991, the regional stock market was implemented with an agreement by the Barbados (BSE), Jamaica (JSE) and Trinidad and Tobago (TTSE) stock exchanges for cross border trading in equity. CARICOM proposed that by creating a regional market, the integration process between the states would be enhanced. Since that time five securities have been introduced on the regional market and four of these companies are based in Trinidad while the other is a Jamaican organization.

The latest measure undertaken by CARICOM is the introduction of the CARICOM Single Market and Economy (CSME), which was proposed in 1987. The CSME was adopted in 2001. From a movement that began with only four English speaking Caribbean islands, CARICOM is now also comprised of Dutch and French-speaking islands and represents fifteen member states and five associate states (http://www.caricom.org/archives/caricom-history.htm).

2.9 Stock Markets of the Caribbean

Roll (1992) investigates the effects of index construction and industrial structure on the behavior of international equity markets. He concludes that three main factors affect the interdependence of international equity exchanges. The first relevant dynamic that he notes is a diversification factor, in that some indices are more diversified than others. Two factors govern this diversification dynamic, one being the pure number of listings on an exchange and the other being the industrial concentration of a market. Exchange rates are the next relevant factor that Roll discusses in his findings. He investigates the effects of investigating indices that express returns in a local currency compared to expressing returns in a common U.S. dollar return. Results for this study indicate that exchange rates play a role to some varying degree on international markets. With this in mind, a description of the relevant market characteristics is presented below for the markets of CARICOM.

2.10 Overview of the Barbados Stock Exchange

The BSE began operations in 1989, with a single initial index the BSE 1000. With the inception of the regional stock exchange in 1991, the BSE introduced two new indices, the BSE 1000 Cross List Index and the BSE 1000 Junior Market Index. The BSE 1000 became the BSE 1000 Local Index. Since January 1990 market capitalization on the BSE grew from BDS $594 million to BDS $7,125 million in December 2003. This represents an increase of over 1000 percent. Trading volume on the exchange has also increased from 3.7 million to 56.7 million shares. This translates into a total value of shares trading increasing by BDS $46 million.

The BSE market is composed of mainly financial securities and currently lists 19

securities. This market is the only exchange that has decreased in the number of listed companies from the end of the time series until May 31, 2005. The market comprises a total of eight industries that range from banking to tourism.[5] The market was fully automated in July 2001 which improved efficiency and prepared the market for greater capital inflows (http://www.jse.com.jm/controller.php?action=about_exchange).

2.11 Overview of the Jamaica Stock Exchange

The JSE is the oldest and largest stock market in the region and dates back to 1969. Jamaica's exchange experienced a rapid influx of capital into the market from 1990 to 2003 with an 8000 percent increase in market capitalization from JA $6,228 million to JA $512,884 million. This represents a substantial increase in dollar terms, regardless of the volatile and depreciating nature of the Jamaican currency. The exchange was completely automated in 2001 and began trading daily, making it the most liquid exchange in the region. The volume of transactions on the market rose from 58 million to 4,290 million shares traded. This share volume translates into a total value of JA $230 million to JA $24,237 million respectively.

The greatest sector weighting on the JSE is in financial services securities and the exchange currently lists 46 shares. This is the most diverse market in the CARICOM region but surprisingly the JSE is comprised of only eight sectors (http://www.jse.com.jm/controller.php?action=listed_companies).

2.12 Overview of the Trinidad and Tobago Stock Exchange

The TTSE was the final market considered in this study to convert to a fully

[5] The industry composition of the BSE is as follows: 2 companies -Banking sector, 3 securities - Conglomerates, 3 securities – Insurance compnaies, 4 companies – Manufacturing, 3 securities – Trading, 2 companies – Utility, 1 company – Tourism and 1 security listed as Other.

automated trading system. Although the exchange, as of March 18, 2005, implemented an automated trading platform, trading on the exchange still occurs only on Tuesdays, Wednesdays and Fridays; however, the market maintains a significant level of volume[6]. With the recent automation of the TTSE, it is proposed that daily trading will be put into operation on the exchange in the near future.

The TTSE market is only slightly smaller than the JSE with 41 securities listed on the exchange. This exchange has experienced the largest increase in the number of listed securities since the end of December 2003. Notwithstanding, the TTSE is comprised of ten separate sectors making it the most diverse market in the CARICOM region (http://www.stockex.co.tt/stockex/listings/securities.aspx).

2.13 Caribbean Studies

The stock markets of the Caribbean have generally been neglected and as such very little research has been conducted on these emerging markets. The empirical investigations that have been undertaken focused mainly on volatility studies of the JSE (see Hamilton (1998), Leon (1996) and Morris (2001)). In addition to these studies, Kim and Langrin (1998) investigate the volatility spillover effect under foreign exchange liberalization. They report that foreign exchange liberalization has a positive effect on the Jamaican market in that after the liberalization policies are adopted, volatility spillover is evident in the JSE returns. Conversely, their results indicate that there was no significant effect on the Trinidadian market. This implies that the change in policy did not have an effect on the barriers to entry for the TTSE market and that there were

[6] The TTSE did not use an automated platform for the time series under investigation, rather all orders were manually filled. The automation of the TTSE is a recent event and is only noted to demonstrate the development of the markets in the region.

probably no binding barriers present in the market before the change in policy. Following these studies Seerattan and Birchwood (2003) conducted a study on the financial market integration in the Caribbean. The two main factors that were investigated were the long run uncovered interest rate parity between Guyana, Jamaica and Trinidad and Tobago and the convergence of the risk premia in the regional money markets. The results of the study indicate that there is no evidence of interest rate parity between any of the Caribbean countries and that no interest parity is apparent between the U.S. and any of the Caribbean countries studied. Seerattan and Birchwood propose that since no interest parity is observed between the Caribbean countries, a significant risk premium should be associated with each market.

The purpose of this study is to extend the current body of research on market integration by investigating the developing markets of CARICOM as a potential solution to increasingly integrated world capital markets.

3.0 Data

The data for this study covers the three largest exchanges in the CARICOM community. These are markets located in Barbados, Jamaica and Trinidad and Tobago. Although the Bahamas, the Eastern Caribbean and Guyana have stock exchanges and are members in the CARICOM community they have been excluded from the study[7]. Notwithstanding the fact that Bermuda boasts the world largest offshore securities market, they have not been included in the study for two reasons. First, Bermuda only holds associate membership status in CARICOM and is not part of the common market.

[7] Although The Bahamas is a member of the CARICOM community they were omitted from the study because they are not part of the common market. On the other hand, the Eastern Caribbean and Guyana were omitted from the investigation because the exchanges have only recently commenced operations (October 19, 2001 and June 30, 2003 respectively) and only limited data were available.

Second, the composition of the Bermuda market is unlike that of the other markets in the study in that it is composed mostly of offshore funds (62% of securities listed are offshore funds). Finally, most of the economic reforms implemented by CARICOM focus on the integration of the markets in Barbados, Jamaica and Trinidad and Tobago, hence we only consider these markets in our study.

The study employs monthly and weekly closing index values obtained from the respective CARICOM member state exchanges. The Barbados (BSE) index is a price-weighted index of 24 stocks. Whereas the Jamaica (JSE) index and the Trinidad and Tobago (TTSE) index are market value-weighted indices with 41 and 32 stocks, respectively[8]. There are two major differences between the way in which the BSE and the JSE and TTSE represent their indexes. First, the BSE is the only index to calculate its value using a price-weighted methodology. Second, the BSE is the only exchange to include cross-listed securities in a separate index. Both the JSE and TTSE are market value-weighted indexes and include cross-listed securities that have ordinary shares in the calculation for the exchange's index value.

The Standards & Poor's (S&P) 500 index is a value-weighted index of 500 of the leading companies in the U.S. economy. The S&P is considered to be a key proxy of the U.S. market. Monthly and weekly closing index values for the S&P were taken from yahoo.com (http://finance.yahoo.com).

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[8] The data for the BSE were obtained from the Barbados Stock Exchange Inc.'s website http://www.bse.com.bb/; the data for the JSE were obtained from the Jamaica Stock Exchange Financial Network's website http://www.jamstockex.com/; the data for the TTSE were obtained from two sources, the data from 1998 thru 2003 were obtained from the Trinidad and Tobago Stock Exchange Limited's website http://www.stockex.co.tt/ and the data from 1990 thru 1997 were obtained directly from the stock exchange in response to an email request sent to ttstockx@tstt.net.tt. The number of listed companies, as quoted in the paper, is based on listings at the end of the December 2003 investigation period.

For the investigation, the cointegration tests were performed with two index values. The first set of tests investigates the cointegration relationship with index values of respective countries in local currency and the second group of tests investigates the relationship with index values converted to a common currency. The local index values were converted to a common USD currency base using exchange rates obtained from the respective countries' national bank. For the period of the study the Barbadian dollar was pegged to the U.S. currency, therefore we do not expect any variation in the cointegration analysis between the two sets of tests for these interactions. Conversely, the Jamaica dollar is at the other end of the spectrum and has experienced a great deal of volatility that is expected to play an important role in the interaction of the cointegration relationship. The Trinidadian currency has experienced a mixed monetary policy for the period. From January 1990 to April 1993 the Trinidadian currency was pegged to the U.S. dollar and for the remainder of the study the Trinidadian dollar adopted a floating rate regime against the U.S. currency.

The sample period for the study covers a 14-year time frame from January 1990 to December 2003. The data is divided into two sub-periods including, January 1990 to December 1996 and January 1997 to December 2003. This allows estimation of changes of the relationship in markets between the two periods. The monthly analysis is conducted with 168 observations, whereas the weekly analysis contains 728 observations for the full sample period. For the monthly investigation, the last trading date of the

month is used as the month's ending index value. For the weekly analysis, the closing index value for every final day of trading on the index for each week is used[9].

There were data collection problems with regards to the weekly data set. Although the data sample was complete for our monthly investigation, the data for the weekly investigation was incomplete. The weekly data for the BSE was only available from January 1999. Therefore the investigation of the cointegration relationship with the BSE was not possible for the weekly sample.

3.1 Descriptive Statistics

The relevant descriptive statistics for the data sets are presented in Tables 1 and 2, while plots for each time series used in the study are presented in Figures 1 through 4. For the sample period, the TTSE market seems to have outperformed both the BSE and JSE markets on a risk return basis. The JSE market is clearly the most volatile market with a standard deviation of more than double that of the other markets in the study. The S&P has the lowest standard deviation, as expected, since it is the only developed market in the study. The distributions of all three Caribbean markets indicate that each time series is not normally distributed. The Caribbean markets display excess skewness with all time series distributions being skewed to the right and a distinctive peaked appearance confirming excess kurtosis[10]. The Jarque-Bera (JB) statistic is also calculated to determine the normality of the time series and large JB values are obtained for each emerging market time series, which is indicative of non-normality.

[9] Whenever a statutory holiday falls on the final day of trading, the previous trading day's close is used for the week's ending index value.
[10] For the standard normal distribution skewness = 0 and kurtosis = 3.

4.0 Methodology

Three prominent methodologies: the international CAPM, time-varying estimation, and a correlations/cointegration test can be employed to assess the interdependence between the regional equity markets of CARICOM and the United States. With this in mind, the most appropriate methodology from among the three alternatives will be utilized for this study. The first type of these methodologies tests the segmentation of stock markets using an international CAPM model. The international CAPM test generally assumes one of the following three scenarios:

1. the world's equity markets are perfectly integrated
2. a country's stock market is perfectly segmented from the world market
3. equity markets are partially segmented

Recent international CAPM studies have employed more sophisticated tests that allow the segmentation to vary between both of the extremes as noted above in scenario three. Harvey's (2001) study investigates the conditional risk of 17 countries and discusses some of the issues with the international CAPM test[11]. The international CAPM was not employed in this study due to the difficulty associated with specifying exactly what is expected of the model and due to the number of assumptions that must be made with respect to these models.

Conversely, time-varying estimates have gained popularity in the investigation of the integration of equity markets due to the time varying nature of equity risk premia. Notwithstanding, this study did not use a time-varying methodology, because the

[11] The model discussed is the Sharpe-Lintner model implemented by Stulz (1981).

methodology does not provide results that are as easily interpreted as other available methodologies. Baillie and Bollerslev (1989) also conclude that using index prices instead of index returns provides a more realistic assessment of the integration relationship because return data removes the trend that binds the cointegration. Engle and Granger (1987) support this conclusion and demonstrate, that if a vector of a time series contains a common trend, then models which ignore this trend by only incorporating first differences are likely to suffer a loss of efficiency, and may in fact be subject to more serious specification biases as well. Furthermore, Bekaert and Harvey (1995) acknowledge that time varying methodologies may omit important factors that may cause the integration relationship to deviate from its true value. These issues support the use of a simpler, yet very effective methodology to characterize the integration relationship.

Correlation studies examine the question of international integration of stock markets by investigating the correlations of returns over time. These studies lead to the methodology of cointegration, which was chosen for this investigation. While an extensive body of literature exists dealing with the integration of stock market indices using different cointegration methodologies, this study implements the Johansen and Juselius (1990) method to determine if the indices share a long run component that binds them over long investment horizons. The initial studies on cointegration utilized a methodology described by Engle and Granger (1987). The Engle and Granger (1987) methodology involved a two step process, which began by fitting a long-run relationship by estimating a least-squares model and then applying the Dickey Fuller test to the residuals of the regression. Researchers initially favored this method but began using the

cointegration methodology developed by Johansen (1990) due to the simplicity of the test and the higher power of the test. The procedure proposed by Johansen and Juselius (1990) takes into account the error structure of the underlying process and incorporates different short-run and long-run dynamics in the time series. Cheng et al. (2002) discuss how this allows for the estimation and testing of the equilibrium relationship among non-stationary series while abstracting from short-run deviations from equilibrium. For this study a maximum likelihood approach developed by Johansen and Juselius (1990) was chosen because of the power of the test and the ease with which the results of the study can be interpreted.

In order to determine whether there is any longer term interdependent relationship between the equity markets in the Caribbean and the United States, each time series must first be tested in order to determine if a unit root is present. Cointegration analysis is dependent on the stationarity of the index levels under consideration; therefore careful attention is given to this step in the investigation. According to Choudhry (1997), cointegration requires that all index levels under consideration become stationary after first-differencing in order for the analysis to yield meaningful results. There are two unit root tests that are implemented in this study to verify that the time series under consideration are indeed integrated to the order one, i.e., I(1).

Baillie and Bollerslev (1989) discuss the high degree of dependence and time-dependent variance that is observed in many economic time series. For their study they implement the Phillips-Perron test to confirm the presence of unit roots. For this study, two commonly used formal tests will be implemented to verify the presence of unit roots. In addition to the Phillips-Perron test, the Augmented Dickey Fuller (ADF) test is also

implemented to support the results obtained from the former test. This strategy has become a common precursor to cointegration analysis as can be observed in Corhay et al. (1993) and Chen et al. (2002). In addition to the heteroskedastic nature of financial time series and the type of unit root tests that must be implemented to account for this characteristic, unit root tests are characterized by low power and inclusion of an intercept and time trend is critical in interpreting ADF or Phillips-Perron statistics. If the null hypothesis is not rejected in the most general version of the specification, the significance of the trend and intercept can then be tested in turn to see if they can be omitted, thereby increasing the power of the unit root test. For this study we test three different models, with intercept, with intercept and trend and without intercept and trend for both the ADF and the Phillips-Perron tests.

4.1 Unit Roots

The ADF test builds on an initial approach developed by Dickey and Fuller (1979). The DF test considers a simple autoregressive process of order one that is not correlated at higher order lags. The AR(1) process is specified as:

$$y_t = \rho\, y_{t-1} + x_t'\delta + \varepsilon_t, \qquad (1)$$

In this AR model, x_t are the optimal exogenous regressors which may consist of constant, or a constant and trend, the term ε_t are assumed to be white noise and the parameters ρ and δ are to be estimated (Greene 1993). Consequently, if $|\rho| \geq 1$ the time series y is a nonstationary process and the variance increases with time and tends to infinity. Conversely, if $|\rho| < 1$, the time series y, is characterized as a (trend) stationary series. Therefore, we can estimate the stochastic properties of a time series by testing if the absolute value of ρ is less than one.

To investigate the time series for this study we look at the Dickey-Fuller test as represented by the following specification:

$$\Delta y_t = \alpha y_{t-1} + x_t'\delta + \varepsilon_t, \tag{2}$$

Where $\alpha = \rho - 1$. The hypotheses for the DF test can be written as:

$$\begin{aligned} H_0 &: \alpha = 0 \\ H_1 &: \alpha < 0 \end{aligned} \tag{3}$$

The test is then assessed using the conventional t-ratio for α:

$$t_\alpha = \acute{\alpha}/(se(\acute{\alpha})) \tag{4}$$

where $\acute{\alpha}$ is the estimate of α, and $se(\acute{\alpha})$is the coefficient standard error.

The ADF test is preferred to the standard Dickey and Fuller test because the former allows for higher-order autoregressive moving average processes in ε_t. The ADF test modifies the original DF test by allowing for a parametric correction for higher-order correlation by assuming that the y series follows an AR (p) process and adding p lagged difference terms of the dependent variable y to the right hand side of the regression equation.

The ADF regression is given by:

$$\Delta y_t = \mu + \gamma^* y_{t-1} + \sum_{j=1}^{p-1} \varphi_j \Delta y_{t-1} + \varepsilon_t, \tag{5}$$

where

$$\varphi_j = -\sum_{k=j+1}^{p} \gamma_k \tag{6}$$

and

$$\gamma^* = \left(\sum_{i=1}^{p} \gamma_i \right) - 1 \tag{7}$$

The three models that are investigated for the ADF test are as follows[12]:

- $\Delta y_t = \mu + \gamma^* y_{t-1} + \sum_{j=1}^{p-1} \varphi_j \Delta y_{t-j} + \varepsilon_t$ ***(intercept)*** (8)
- $\Delta y_t = \mu + \beta t + \gamma^* y_{t-1} + \sum_{j=1}^{p-1} \varphi_j \Delta y_{t-j} + \varepsilon_t$ ***(intercept and trend)*** (9)
- $\Delta y_t = \gamma^* y_{t-1} + \sum_{j=1}^{p-1} \varphi_j \Delta y_{t-j} + \varepsilon_t$ ***(no intercept or trend)*** (10)

This study considers both the ADF and the Phillips-Perron test to determine if unit roots are present. Phillips and Perron (1998) propose an alternative nonparametric unit root test for controlling for serial correlation when testing time series for stationarity. The Phillips-Perron test, does not require lagged values of the dependent variable to account for possible serial correlation at higher order lags and is robust with respect to the presence of time-varying heteroskedasticity. To determine the appropriate lag length for the higher-order autoregressive models, the Akaike Information Criterion is implemented for both unit root tests.

The Phillips-Perron regression is given by:

$$\Delta y_t = \alpha y_{t-1} + x_t' \delta + \varepsilon_t,$$

The Phillips-Perron method estimates the non-augmented DF test equation (2), and modifies the t-ratio of the α coefficient so that serial correlation does not affect the asymptotic distribution of the test statistic.

[12] The same three models are used for the Phillips-Perron test.

The test is evaluated using the following statistic:

$$\tilde{t}_{\alpha} = t_{\alpha}\left(\frac{\gamma_0}{f_0}\right)^{1/2} - \frac{T(f_0 - \gamma_0)(se(\hat{\alpha}))}{2f_0^{1/2}s} \tag{11}$$

where $\hat{\alpha}$ is the estimate, and t_{α} the t-ratio of α, $se(\hat{\alpha})$ is coefficient standard error, and s is the standard error of the test regression. In addition, γ_0 is a consistent estimator of the error variance in (2). Finally, kernel-based sum-of-covariances or autoregressive spectral density estimation is used by EViews to estimate the residual spectrum at frequency zero represented by f_0.

4.2 Johansen Cointegration

The theory of cointegration suggests that two (or more) variables which are not individually stationary may become stationary if expressed as a linear combination. For example, if two variables X and Y are both I(1) but a linear combination of them (X-φY) is I(0), then they are said to be cointegrated, where φ approximates their cointegrating relationship. The common stochastic trend will tie the variables over the long run as the correlation between the two cointegrated series approach one and unique shocks die out as each variable adjusts back towards the common trend. To investigate cointegration let us consider a vector autoregressive (VAR) process of order p, where X_t is a p-vector of I(1) variables and ε_t is a vector of innovations, as given in:

$$X_t = A_1 X_{t-1} + \cdots A_p X_{t-p} + \varepsilon_t \tag{12}$$

We can rewrite this expression as:

$$\Delta X_t = \Pi X_{t-1} + \sum_{j=1}^{p-1} \Gamma_j \Delta X_{t-j} + \varepsilon_t \qquad (13)$$

where ΔX_t is the vector of changes in period t and

$$\Pi = \sum_{j=1}^{p} A_j - I \text{ and } \Gamma_j = -\sum_{i=j+1}^{p} A_i \qquad (14)$$

Short-run dynamics in the model are represented by Γ and A is defined as an identity matrix. The long-run impact matrix, from which the rank r is determined to assess the number of stationary linear combinations of X_t, is defined by Π. **The** cointegration methodology seeks to determine the rank of Π in order to determine the number of stationary linear combinations of X_t. Three possible scenarios exist in regards to the rank of Π:

- Cheng et al. (2002) states that Π can be full rank, which means that the error process itself is assumed to be stationary, lending to stationarity of the levels of the X_t process. This implies that the time series itself does not follow a stochastic trend therefore violating the necessary requirement of a I(1) data series.
- Π can be rank zero or null matrix, which would reduce equation (13) to a standard VAR in first differences, and there are no stationary long-run relationship among the elements of X_t.
- Finally, the coefficient matrix Π can be of reduced rank $0 < r < n$, for which there are r cointegrating vectors. In this case, matrices described by n x r are both α

and β such that $\Pi = \alpha\beta'$. The intermediate rank model describes the equilibrium relationship in which the expression $\beta' X_t$ illustrates the magnitude of deviation from the long-run relative price relation. The long-run cointegration relationship in this model is represented by β' and α represent the speed at which deviations from the long-run relationship will revert back to its equilibrium relationship.

The model implemented in this study incorporates a constant that enters only via the error correction term and there is no separate drift in the vector error correction model.

$$\Delta y_t = \alpha(\beta', \beta_0)(y'_{t-1}, 1)' + \sum_{i=1}^{p-1} \Phi_i^x \Delta y_{t-i} + \varepsilon_t \qquad (15)$$

Two tests statistics, the Trace statistic and the maximum Eigenvalue, are used to test for the maximum number of cointegrating vectors when the Johansen method is employed. Lütkepohl et al. (2001) conclude that the Trace statistic is a more powerful test statistic than the Maximal Eigenvalue statistic, despite some shortcomings with respect to size distortions where the maximum Eigenvalue statistic is more favorable. Their study also recommends that researchers use at a minimum the Trace statistic or for the most relevant results implement both test statistics to their investigation. Both statistics will be used to confirm the presence of cointegrating vectors in this study and a significance level of 5% will be employed.

The Trace statistic is given by:

$$\lambda_{trace} = -n \sum_{i=r+1}^{p} \ln(1 - \lambda_i) \qquad (16)$$

The Maximal Eigenvalue is given by:

$$\lambda_{max} = -n \ \ln(1 - \lambda_{r+1}) \tag{17}$$

In accordance with Bernard (1991), this study implements a requirement for complete integration, in that a system of n indices must have n-1 cointegrating vectors to be characterized as "completely integrated". In addition to this requirement, a minimum of 95% confidence in both the Trace and maximum Eigenvalue test statistics is required for complete integration to be determined. Partial integration will also be considered in this investigation which may be present in some of the systems.

5.0 Empirical Results

5.1 Unit Root Tests

As a precursor to the cointegration test, time series stochastic properties must be verified. Tables 3 - 14, display the results for the unit root tests. Three different models including, intercept, intercept and trend or neither intercept nor trend, of ADF tests are implemented to determine the integration order of the time series for the monthly and weekly data. The AIC is utilized to determine the proper number of lags in each model used in the tests. All models indicate that the null hypothesis cannot be rejected for the non-differenced time series. However, the null hypothesis is rejected at the 1% confidence level for all time series once they are first differenced. Therefore, all time series are integrated of order 1, which is required for the cointegration test.

Phillips-Perron tests were also implemented to support the findings of the ADF tests. For these tests, the Newey-West option in Eviews was selected to determine the proper lag for the unit root test. As in the ADF tests, three different models were used in

the Phillips-Perron test to verify for the presence of unit roots. The results of the Phillips-Perron tests yield qualitatively identical findings for all models, confirming that each market's index is indeed I(1) for both the full monthly and weekly time series as well as for the subsequent sub-periods.

5.2 Cointegration Test Results

As a precursor to cointegration analysis for the determination of a common long term component, all time series were identified as I(1) according to ADF and Phillips-Perron tests. The AIC is utilized to determine the proper lag length for the Johansen and Juselius (1990) cointegration test. Both the Trace and the Maximal Eigenvalue statistics are utilized to determine whether the time series in question are cointegrated. Both tests must yield statistically significant results at the 5% confidence level for the time series to be considered cointegrated. Results for the Johansen method are displayed in Tables 15 - 32.

5.2.1 Bivariate Test Results

In bivariate tests, the following paired relationships are examined:

{BSE, JSE} {BSE, S&P} {BSE, TNT} {JSE, S&P} {JSE, TNT} {S&P, TNT}

The bivariate test results reveal that there is a common stochastic trend between the JSE and TTSE markets and the S&P exchange. There is strong evidence of cointegration between the JSE and the S&P from January 1997 to December 2003. The null is rejected at the 1 percent level of confidence for both Trace and Maximal Eigenvalue tests. However, this stochastic trend is not evident throughout the entire sample period or in the sub-period spanning January 1990 through December 1996. The

TTSE also displays evidence of cointegration with the S&P. Both sub-periods demonstrate strong evidence of cointegration with both statistics rejecting the null hypotheses at the 1 percent level of confidence. Notwithstanding, the entire sample does not display a common stochastic trend, which indicated there may be a level of time-variance in the stochastic relationship. Both Caribbean exchanges seem to demonstrate an evolving relationship with the American exchange. Yang et al. (2004) and Bookstaber (1997) propose that the correlation between global emerging markets and developed markets can increase substantially during and after market crises thereby reducing diversification potential and increasing market cointegration. The observed cointegration of the S&P with the JSE and TTSE for the time period that spans January 1997 to December 2003 may be due to market crisis and must be considered.

Although a previous study by Darrat et al. (2000) indicated that regional markets have a common stochastic trend that links the markets over the long term, the Johansen method did not produce results that indicate any of the markets in the Caribbean are cointegrated. This finding is not surprising due to the low intra-regional trade between markets in CARICOM. According to CARICOM Intra-Regional Trade 1990 – 2000, regional trade only represents 9.85 percent of all imports among the three markets under investigation. In addition, it is not surprising that the two largest exchanges in the Caribbean display a level of cointegration with the U.S. exchange. The United States market represents almost 80 percent of the regional exports to the Jamaican and Trinidadian economy and is geographically, politically and economically close to these markets.

5.2.2 Trivariate Test Results

A series of trivariate tests were conducted to investigate the following relationships:

{BSE, JSE, TTSE} {BSE, JSE, S&P} {JSE, TTSE, S&P}

The results from the trivariate tests were qualitatively similar to the results from the bivariate tests. The system investigating the relationship between the BSE, JSE and S&P did not display any indication of cointegration for the full sample or for either of the sub-periods. There is no stochastic trend that governs the relationship for this system in any time period investigated herein.

There is also no evidence of cointegration between the JSE, TTSE and BSE. Over the entire sample period no stochastic trend is observed and only slight evidence is demonstrated for either sub-period. These results are in-line with the low level of intra-regional trade between these economies. In Row B of Table 18 the results for the first time period spanning January 1990 through December 1996 are displayed and only one cointegrating vector is observed. Although the null hypothesis for no cointegrating vectors is rejected at 5 percent level of significance, cointegration is not observed because we cannot reject the null hypotheses for "*At most one*". In order for the system to be considered completely integrated, *n-1* vectors must be determined, therefore we must observe two cointegrating vectors for a trivariate system. For the second sub period, with results presented in Row C, only the Trace test rejects the null hypothesis for "At most one" at the 5 percent level. The Maximal Eigenvalue test fails to reject the null hypothesis for "*At most one*", therefore complete integration is rejected.

The trivariate system with JSE, TTSE and S&P provides further evidence to

support the findings of the bivariate system of JSE and S&P and TTSE and S&P. There is strong evidence of cointegration in the second sub-period which can be seen in Row F of Table. The null hypothesis is rejected at the 1 percent level of significance and 5 percent level of significance for the Trace and Maximal Eigenvalue tests, respectively. This result offers further evidence to support the results obtained in the bivariate tests. According to CARICOM Intra-Regional Trade 1990 – 2000, 80.2% of Jamaica's imports originate from Trinidad whereas only 4.2% of imports originate from Barbados. Therefore, the results are congruent with the economic trading patterns of these markets seeing that the U.S. in the largest trading partner with the CARICOM region and intra-regional imports only account for 10% of all regional imports.

5.2.3 Quadrivariate Test Results

The following quadrivariate test was considered:

{BSE, JSE, TTSE, S&P}

Table 20 displays the results for the quadrivariate system and the Johansen cointegration methodology and does not indicate that the system is cointegrated. There are no cointegrating vectors observed for the full sample period. As for the separate sub-periods, there are only slight indications of cointegration. For the first time period only one cointegrating vector is observed with either test statistic. Although three cointegrating vectors are observed, for the second time period, in Row C of Table 20 only the Trace test statistic rejects the null hypothesis with the required level of confidence.

These results are extremely important for the regional markets and for CARICOM. The United States is the largest trading partner with the CARICOM region

and the countries of the three regional markets being investigated; therefore other factors must be contributing to the lack of integration between the markets. One theory proposed by Roll (1992) states that different monetary policies may play a part in the deviation observed between international exchanges. He also cites industrial composition as a relevant factor in explaining stock market movements and explaining market volatility. This last point is also supported by Lessard (1976).

5.3 Robustness Tests

Two robustness checks were used to verify the findings of the country denominated monthly time series. The first robustness check involved converting all the local currencies to U.S. dollars to investigate the possibility that currency fluctuations played a role in the cointegration relationship. Roll (1992) states that when returns of indices are expressed in a nation's local currency, part of the index's return volatility is induced by monetary phenomena such as changes in anticipated and actual inflation rates. For this reason we run cointegration tests with both local currency and USD denominated data. This is a procedure that was also employed by Cheng et al. (2003) and Hamao et al. (1990). These studies indicate that results are not impacted by the conversion to a common currency. Employing this approach is important for two reasons. First, results in terms of U.S. dollars are more appealing to international investors and second, there was a large devaluation of the Jamaica dollar during the time period which may have biased the outcome of the previous tests. The second robustness check that was conducted employed weekly time series data to support the results obtained from the cointegration test of monthly time series.

5.3.1 Monthly USD denominated time series

The cointegration results for the monthly time series that were converted to a common USD currency provided very different results from the results observed with the monthly cointegration test when data was denominated in local currencies. The first difference can be noted in Table 24 Row B, where a strong level of cointegration is observed between the BSE and JSE. In addition, the results for the USD converted data indicate that the JSE is not cointegrated with any other market, which is contrary to what was found in the previous study.

The results presented in Table 26 are for the Johansen method for the Trinidad stock exchange. In this table we see that the only market that the TTSE displays a cointegration relationship with is the BSE, however the cointegrating vector is only found for one sub-period and not the entire sample period. Congruent with the results with the JSE, the TTSE results differ substantially from the results obtained for the cointegration analysis for time series in local currency.

The trivariate system of the JSE and TTSE for the USD denominated indices demonstrated a strong level of cointegration with the S&P for the second time period spanning January 1997 through December 2003. This result is consistent with the results obtained for the study conducted with indices in local currencies. In both investigations, the JSE, TTSE and S&P have a strong indication of two cointegrating vectors governing the relationship between the three markets. Table 27 Row F contains the results of the Johansen test. According to this test, the null hypothesis is rejected at the 95% level of significance.

The trivariate system composed of the BSE, JSE and TTSE did not have any

cointegrating vectors. Further evidence of the lack of cointegration with the BSE, JSE and TTSE is evident in the results obtained from the previous study. In addition, the quadrivariate system does not have any significant level of cointegration. Thus, the USD denominated time series supports the results obtained for the monthly time series denominated in local currencies.

5.3.2 Weekly Time Series

The weekly bivariate test results show that there is a cointegrating vector for the full time series for the {JSE, TTSE} system. Both Trace and Maximal Eigenvalue test statistics reject the null hypothesis at the 1% level of significance. This result was not obtained in the investigation with the monthly time series data. For the time period spanning January 1997 through December 2003, two cointegrating vectors are found for both tests using weekly data and this was also the case for the monthly investigation. Notwithstanding, the results for the second time period supported the conclusions of the results in the monthly analysis. The bivariate system with the JSE and the S&P also displayed a weak indication of a cointegrating vector for the entire time series. The Maximal Eigenvalue test rejected the null hypothesis at the 5% level of significance while the Trace test only rejected the null hypothesis at the 10% level. On the other hand, very strong evidence of a single cointegrating vector is displayed in Table 21 Row F for the second sub-period. This result is consistent with the results obtained in the monthly analysis.

The analysis of the weekly time series for the TTSE provides the first indication of complete integration regardless of the time series. The Johansen method for the complete weekly time series produced one cointegrating vector for the bivariate system.

In addition, each sub-period also produced one cointegrating vector with the minimum level of significance being 5%.

Table 23 contains the results for the weekly trivariate system with the JSE, TTSE and S&P. The results obtained for the weekly data supports the findings of the monthly Johansen method. The second time period is the only series to demonstrate statistical support for complete integration.

5.3.3 Weekly USD denominated time series

The final part of the Johansen test involved investigating the effects of converting local denominated indices to a common denominated currency for weekly time series. The bivariate systems for the JSE produced results, seen in Table 30, that were not consistent with the results observed in the investigation for indices denominated in the local currency. The bivariate system, containing the JSE and the TTSE produced only one system with a cointegrating relationship. The second sub-period displayed strong evidence of one cointegrating vector, whereas the complete time period and the first sub-period displayed no cointegration. The bivariate system with the JSE and S&P only produced a cointegrating relationship for one of the time periods. The data range spanning from January 1990 to December 1996 produced strong evidence of a single cointegrating vector.

The bivariate system for the TTSE and the S&P produced significant results for the investigation (see Table 31). Two of the three time periods rejected the null hypothesis at the 5% level of significance whereas the results from the weekly investigation rejected the null hypothesis for all time periods. The TTSE and the S&P display a strong long term trend. Notwithstanding the strong evidence of cointegration

between the TTSE and S&P, only the second sub-period of the bivariate system for the TTSE and the JSE yielded a cointegrating vector.

The trivariate system for the JSE, TTSE and S&P rejected the null hypothesis at the 5% level of significance for two cointegrating vectors (see Table 32). This is the only system that yields a cointegration relationship regardless of time series chosen. This is an extremely important finding from the perspective of portfolio diversification for regional and international investors. Since the relationship is consistent across both time series the potential diversification benefit is reduced for all investors regardless of their investment horizon. These results imply, when taken in combination with the results of the bivariate tests, that the TTSE market is the binding factor for the long term interaction among the markets in question.

5.4 Analysis

Analysis of the results indicate that depending on the time series of data chosen, very different inferences can be obtained. Kasa (1992) points out that when cointegration is observed in any system, the correlation observed is only relevant to the investment horizon used in the time series. Therefore, monthly time series yield monthly correlation whereas weekly time series yield weekly correlation. This factor is of utmost importance for investors, because although a system may display a common stochastic trend in the long term, an investor with a shorter time horizon than the time required for the system to revert to its long term trend may still benefit from diversification.

Three significant relationships were observed between the markets in the study. The first noteworthy finding in this study is the apparent cointegration between the TTSE and the S&P. Kim and Langrin (1998) demonstrate that the TTSE market was

informationally efficient since the late 1980's in regards to volatility spillover for the U.S. market. Therefore the evidence of a stochastic trend that binds the two regions is supported by the results presented by Kim and Langrin (1998).

Second, regional investors still maintain the ability to diversify their portfolio through regional markets as no indication of a common long term stochastic trend is evident in the region. Darrat and Zhong (2005) have documented that one of the primary reasons behind the equity market relationship in the NAFTA region is due to the interdependent goods markets in the region. However, this is not the case in the CARICOM region. As reported by CARICOM Intra-Regional Trade 1990 – 2000, intra-regional trade only represents approximately 10 percent of all trade between CARICOM countries. Another factor that may cause the equity markets to diverge, notwithstanding the tireless efforts by CARICOM to integrate the regional economies, may be attributed to vastly different monetary policies between the countries under consideration. Although the liberalization policies adopted by CARICOM may aid in the development of the regional economy, no signs of integration are yet evident in the region.

The most important relationship is the trivariate relationship that governs the JSE, TTSE and S&P during the second sub-period spanning January 1997 to December 2003. The results imply that either the JSE or the TTSE may be used in conjunction with the S&P market to increase international diversification, but the inclusion of both markets will negate the diversification benefits over the long-run. The TTSE seems to be the crucial link between the observed stochastic trend between the markets. In addition, the fact that the entire time series and the first sub-period do not display any evidence of integration admits the possibility that there is a time-varying relationship that governs the

stochastic trend.

The cointegration between the JSE, TTSE and S&P is surprising since there is no long term trend that binds the JSE and TTSE. One would expect that a long term trend would be evident between these two markets in view of the fact that securities are cross listed on the CARICOM exchanges. This however is not the case. The Barbadian equity market is the only exchange in the study that created a separate index for cross listed securities, whereas the JSE and TTSE include cross-listed securities in their indexes. As a consequence, it is not surprising that the BSE does not display any signs of integration while the JSE and TTSE produce significant common long term trends.

6. Summary and Conclusions

This study investigates the integration of the CARICOM region and market integration with the U.S. market using Johansen and Juselius (1990) methodology over the period from January 1990 to December 2003. Both monthly and weekly time series are used in this investigation to test for the presence of a long term stochastic trend.

Each series is tested for the presence of unit roots and are all found to be integrated of order one. Following this procedure each series is then tested for the presence of a long term trend with the monthly data. Robustness checks are also performed for the monthly time series. First, two sub-periods spanning January 1990 to December 1996 and January 1997 to December 2003 are examined. Second an analysis is conducted using common U.S. dollar denominated index prices for monthly and weekly data.

The investigation of the equity markets of the Caribbean yield three important results. To begin with, international investors can effectively diversify their portfolios by including all three markets in the study since no long term cointegration relationship is found between the CARICOM region and the U.S. market. The next relevant finding in the study shows that from January 1997 to December 2003 the TTSE displays strong evidence of cointegration with the U.S. exchange. This result is supported by the fact that Trinidad maintains a stable monetary policy, a large trade relationship with the U.S. and represents one of the most industrially diverse markets in the CARICOM region. Finally, a common long term trend is observed between the JSE, TTSE and the S&P. Therefore, if international investors wish to diversify their portfolios by investing in the CARICOM region they can either participate in all the markets of the region or as an alternative they can invest uniquely in the BSE or JSE. Diversification benefits should not be expected by simultaneously investing in the JSE and the TTSE in conjunction with the S&P.

6.1 Future Research

The findings of this study offer international investors another opportunity to help create an optimal portfolio. In spite of the results observed in this study, there is some indication that there is a time-varying relationship between the markets in CARICOM. Further investigations should be undertaken to test for the presence of a time-varying relationship and whether it alters the results presented herein. In addition, a cointegration test that allows for structural breaks can also be implemented to determine when the common stochastic trend shifts.

Another area of interest for international investors would be to investigate the magnitude of the adjustment coefficient for a cointegrated system in the CARICOM region. Although the results presented in this study display a common long term stochastic trend, the speed at which the markets' converge once they deviate from the trend due to short term shocks may allow for adequate diversification for international investors with shorter investment horizons.

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Table 1. Descriptive Statistics of Monthly Stock Returns of the U.S. (S&P 500) and Three Caribbean Markets Sample Period: January 1990 – December 2003

This table provides results for the descriptive statistics of the United States, Barbados, Jamaica and Trinidad and Tobago's national stock exchanges using monthly data from the 1990:1–2003:12 sample period.

	U.S.	Barbados	Jamaica	Trinidad
Mean	0.0082	0.0053	0.0252	0.0166
Median	0.0100	-0.0009	0.0115	0.0088
Maximum	0.1124	0.2497	0.4467	0.2545
Minimum	-0.1374	-0.1870	-0.1615	-0.1080
Standard Deviation	0.0428	0.0445	0.0956	0.0436
Skewness	-0.4374	1.8030	1.5504	1.3938
Kurtosis	0.3967	11.4884	3.7398	5.3518
JB	6.4213	1008.8756	164.2275	253.3803
n	167	167	167	167

Table 2. Descriptive Statistics of Weekly Stock Returns of the U.S. (S&P 500) and Three Caribbean Markets Sample Period: January 1990 – December 2003

This table provides results for the descriptive statistics of the United States, Barbados, Jamaica and Trinidad and Tobago's national stock exchanges using weekly data from the 1990:1–2003:12 sample period.

	U.S.	Barbados	Jamaica	Trinidad
Mean	0.0018	0.0004	0.0054	0.0037
Median	0.0027	-0.0002	0.0012	0.0016
Maximum	0.0703	0.2742	0.2437	0.1188
Minimum	-0.1083	-0.1829	-0.1445	-0.0655
Standard Deviation	0.0216	0.0249	0.0367	0.0138
Skewness	-0.3224	3.9630	1.3060	1.7432
Kurtosis	2.1352	68.0711	6.5378	12.3954
JB	151.1138	142656.20	1505.56	5036.193
n	729	259	729	729

Table 3. Unit Root Tests - Augmented Dickey-Fuller Tests for Full Monthly Sample Period: January 1990 – December 2003

This table provides results of ADF unit root tests for Barbados, Jamaica, S&P 500 and Trinidad and Tobago using monthly index data from 1990:1-2003:12 sample periods. The number of lags chosen using the Akaike information criteria (AIC) is represented in the parentheses. {1}, {2} and {3} represents the model used for the ADF test. {1} represents a model with an intercept and critical values for 1%, 5% and 10% level of significance of -3.4710, -2.8790 and -2.5760, respectively. {2} represents a model with a trend and intercept and critical values for 1%, 5% and 10% level of significance of -4.0162, -3.4377 and -3.1428, respectively. {3} represents a model with no intercept and no trend and critical values for 1%, 5% and 10% level of significance of -2.5780, -1.9417 and -1.6167, respectively. *Rejection of the null hypothesis at the 1% level.

Country	Level			First Difference		
	{1}	{2}	{3}	{1}	{2}	{3}
Barbados	-0.3565	-1.8159	0.9497	-9.6149*	-9.6654*	-9.5438*
Lags	(2)	(2)	(2)	(2)	(2)	(2)
Jamaica	1.4918	-0.0086	2.7786	-7.0615*	-7.2654*	-6.6698*
Lags	(1)	(1)	(1)	(1)	(1)	(1)
Trinidad	0.9445	-1.3758	2.4355	-5.7728*	-6.0125*	-5.2033*
Lags	(2)	(1)	(2)	(1)	(1)	(1)
United States	-1.0212	-1.1150	0.9052	-9.6928*	-9.6851*	-9.5297*
Lags	(1)	(1)	(1)	(1)	(1)	(1)

Table 4. Unit Root Tests- Augmented Dickey-Fuller Tests for Monthly Sample Period: January 1990 – December 1996

This table provides results of ADF unit root tests for Barbados, Jamaica, S&P 500 and Trinidad and Tobago using monthly index data from 1990:1-1996:12 sample periods. The number of lags chosen using the Akaike information criteria (AIC) is represented in the parentheses. {1}, {2} and {3} represents the model used for the ADF test. {1} represents a model with an intercept and critical values for 1%, 5% and 10% level of significance of -3.5121, -2.8972 and -2.5855, respectively. {2} represents a model with a trend and intercept and critical values for 1%, 5% and 10% level of significance of –4.0742, -3.4652 and -3.1589, respectively. {3} represents a model with no intercept and no trend and critical values for 1%, 5% and 10% level of significance of -2.5915, -1.9442 and -1.6178, respectively. *Rejection of the null hypothesis at the 1% level.

Country	Level			First Difference		
	{1}	{2}	{3}	{1}	{2}	{3}
Barbados	-2.3627	-2.4047	-0.5412	-4.8421*	-4.9149*	-4.8524*
Lags	(2)	(2)	(2)	(1)	(1)	(1)
Jamaica	-1.8179	-1.9063	-0.2737	-5.5076*	-5.5072*	-5.4829*
Lags	(1)	(1)	(1)	(1)	(1)	(1)
Trinidad	0.5087	-0.8569	2.4449	-5.4566*	-5.5953*	-4.9125*
Lags	(1)	(1)	(1)	(1)	(1)	(1)
United States	xxx	xxx	xxx	xxx	xxx	xxx
Lags	(1)	(1)	(1)	(1)	(1)	(1)

Table 5. Unit Root Tests - Augmented Dickey-Fuller Tests for Monthly Sample Period: January 1997 – December 2003

This table provides results of ADF unit root tests for Barbados, Jamaica, S&P 500 and Trinidad and Tobago using monthly index data from 1997:1-2003:12 sample periods. The number of lags chosen using the Akaike information criteria (AIC) is represented in the parentheses. {1} represents a model with an intercept and critical values for 1%, 5% and 10% level of significance of -3.5121, -2.8972 and -2.5855, respectively. {2} represents a model with a trend and intercept and critical values for 1%, 5% and 10% level of significance of –4.0742, -3.4652 and -3.1589, respectively. {3} represents a model with no intercept and no trend and critical values for 1%, 5% and 10% level of significance of -2.5915, -1.9442 and -1.6178, respectively. *Rejection of the null hypothesis at the 1% level.

Country	Level			First Difference		
	{1}	{2}	{3}	{1}	{2}	{3}
Barbados	-2.1950	-2.1569	0.8306	-6.9034*	-6.8778*	-6.7752*
Lags	(2)	(2)	(2)	(1)	(1)	(1)
Jamaica	2.6354	0.5884	3.6094	-4.1759*	-4.7482*	-3.4398*
Lags	(1)	(1)	(1)	(1)	(1)	(1)
Trinidad	-0.7823	-1.7358	2.0586	-4.1479*	-4.1156*	-3.6610*
Lags	(1)	(1)	(1)	(1)	(1)	(1)
United States	-1.8398	-1.9016	0.2957	-6.8216*	-7.0384*	-6.8046*
Lags	(1)	(1)	(1)	(1)	(1)	(1)

Table 6. Unit Root Tests - Augmented Dickey-Fuller Tests for Full Weekly Sample Period: January 1990 – December 2003

This table provides results of ADF unit root tests for Jamaica, S&P 500 and Trinidad and Tobago using weekly index data from 1990:1-2003:12 sample periods. The number of lags chosen using the Akaike information criteria (AIC) is represented in the parentheses. {1}, {2} and {3} represents the model used for the ADF test. {1} represents a model with an intercept and critical values for 1%, 5% and 10% level of significance of -3.4419, -2.8659 and -2.5691, respectively. {2} represents a model with a trend and intercept and critical values for 1%, 5% and 10% level of significance of –3.9754, -3.4182 and -3.1312, respectively. {3} represents a model with no intercept and no trend and critical values for 1%, 5% and 10% level of significance of -2.5685, -1.9398 and -1.6158, respectively. *Rejection of the null hypothesis at the 1% level.

Country	Level			First Difference		
	{1}	{2}	{3}	{1}	{2}	{3}
Jamaica	2.0781	0.6005	3.4831	-10.9183*	-11.0846*	-10.6036*
Lags	(2)	(2)	(2)	(3)	(3)	(3)
Trinidad	1.8057	-0.9750	4.0337	-12.2658*	-12.4800*	-11.6861*
Lags	(1)	(1)	(1)	(1)	(1)	(1)
United States	-0.9909	-1.1440	0.8979	-14.6552*	-14.6568*	-14.5647*
Lags	(1)	(1)	(1)	(3)	(3)	(3)

Table 7. Unit Root Tests - Augmented Dickey-Fuller Tests for Weekly Sample Period: January 1990 – December 1996

This table provides results of ADF unit root tests for Jamaica, S&P 500 and Trinidad and Tobago using weekly index data from 1990:1-1996:12 sample periods. The number of lags chosen using the Akaike information criteria (AIC) is represented in the parentheses. {1}, {2} and {3} represents the model used for the ADF test. {1} represents a model with an intercept and critical values for 1%, 5% and 10% level of significance of -3.4504, -2.8697 and -2.5711, respectively. {2} represents a model with a trend and intercept and critical values for 1%, 5% and 10% level of significance of –3.9872, -3.4239 and -3.1346, respectively. {3} represents a model with no intercept and no trend and critical values for 1%, 5% and 10% level of significance of -2.5713, -1.9404 and -1.6161, respectively. *Rejection of the null hypothesis at the 1% level.

Country	Level			First Difference		
	{1}	{2}	{3}	{1}	{2}	{3}
Jamaica	-1.6332	-1.5963	-0.1490	-6.2859*	-6.3018*	-6.2581*
Lags	(2)	(2)	(2)	(4)	(4)	(4)
Trinidad	0.6047	-0.7533	2.8254	-9.6182*	-9.6892*	-9.2139*
Lags	(1)	(1)	(1)	(1)	(1)	(1)
United States	2.6342	0.3817	4.1580	-11.2364*	-11.4969*	-10.6018*
Lags	(5)	(5)	(5)	(2)	(2)	(2)

Table 8. Unit Root Tests - Augmented Dickey-Fuller Tests for Weekly Sample Period: January 1997 – December 2003

This table provides results of ADF unit root tests for Jamaica, S&P 500 and Trinidad and Tobago using weekly index data from 1997:1-2003:12 sample periods. The number of lags chosen using the Akaike information criteria (AIC) is represented in the parentheses. {1}, {2} and {3} represents the model used for the ADF test. {1} represents a model with an intercept and critical values for 1%, 5% and 10% level of significance of -3.4504, -2.8697 and -2.5711, respectively. {2} represents a model with a trend and intercept and critical values for 1%, 5% and 10% level of significance of -3.9872, -3.4239 and -3.1346, respectively. {3} represents a model with no intercept and no trend and critical values for 1%, 5% and 10% level of significance of -2.5713, -1.9404 and -1.6161, respectively. *Rejection of the null hypothesis at the 1% level.

Country	Level			First Difference		
	{1}	{2}	{3}	{1}	{2}	{3}
Jamaica	2.6294	0.5683	3.8003	-7.4895*	-7.9754*	-6.9189*
Lags	(3)	(3)	(3)	(3)	(3)	(3)
Trinidad	-0.8082	-1.5255	2.8260	-8.7572*	-8.7449*	-8.1671*
Lags	(1)	(1)	(1)	(1)	(1)	(1)
United States	-1.9172	-1.9348	0.3340	-13.4775*	-13.5344*	-13.4748*
Lags	(1)	(1)	(1)	(1)	(1)	(1)

Table 9. Unit Root Tests - Phillips-Perron Tests for Full Monthly Sample Period: January 1990 – December 2003

This table provides results of PP unit root tests for Barbados, Jamaica, S&P 500 and Trinidad and Tobago using monthly index data from 1990:1-2003:12 sample periods. The number of lags chosen was suggested by the Newey-West option in Eviews 4.0. {1}, {2} and {3} represents the model used for the Phillips-Perron test. {1} represents a model with an intercept and critical values for 1%, 5% and 10% level of significance of -3.4706, -2.8788 and -2.5759, respectively. {2} represents a model with a trend and intercept and critical values for 1%, 5% and 10% level of significance of -4.0155, -3.4374 and -3.1427, respectively. {3} represents a model with no intercept and no trend and critical values for 1%, 5% and 10% level of significance of -2.5779, -1.9417 and -1.6167, respectively. *Rejection of the null hypothesis at the 1% level.

Country	Level			First Difference		
	{1}	{2}	{3}	{1}	{2}	{3}
Barbados	-0.4923	-1.9706	0.8258	-8.2983*	-8.3285*	-8.2661*
Lags	(4)	(4)	(4)	(4)	(4)	(4)
Jamaica	1.5014	-0.0838	2.8791	-10.2109*	-10.3850*	-9.8712*
Lags	(4)	(4)	(4)	(4)	(4)	(4)
Trinidad	1.3448	-1.3363	3.3872	-8.6028*	-8.8495*	-7.9412*
Lags	(4)	(4)	(4)	(4)	(4)	(4)
United States	-1.0092	-1.1193	0.9440	-13.0213*	-13.0010*	-12.8862*
Lags	(4)	(4)	(4)	(4)	(4)	(4)

Table 10. Unit Root Tests - Phillips-Perron Tests for Monthly Sample Period: January 1990 – December 1996

This table provides results of PP unit root tests for Barbados, Jamaica, S&P 500 and Trinidad and Tobago using monthly index data from 1990:1-1996:12 sample periods. The number of lags chosen was suggested by the Newey-West option in Eviews 4.0. {1}, {2} and {3} represents the model used for the Phillips-Perron test. {1} represents a model with an intercept and critical values for 1%, 5% and 10% level of significance of -3.5101, -2.8963 and -2.5851, respectively. {2} represents a model with a trend and intercept and critical values for 1%, 5% and 10% level of significance of -4.0713, -3.4639 and -3.1581, respectively. {3} represents a model with no intercept and no trend and critical values for 1%, 5% and 10% level of significance of -2.5909, -1.9441 and -1.6178, respectively. *Rejection of the null hypothesis at the 1% level.

Country	Level			First Difference		
	{1}	{2}	{3}	{1}	{2}	{3}
Barbados	-2.2931	-2.2571	-0.7197	-8.0809*	-8.1704*	-8.1004*
Lags	(3)	(3)	(3)	(3)	(3)	(3)
Jamaica	-1.7555	-1.8424	-0.2743	-7.3169*	-7.2995*	-7.3097*
Lags	(3)	(3)	(3)	(3)	(3)	(3)
Trinidad	0.5185	-0.8591	2.6681	-7.8900*	-7.9860*	-7.3370*
Lags	(3)	(3)	(3)	(3)	(3)	(3)
United States	1.7001	-0.6275	3.6180	-9.6571*	-10.0645*	-8.7595*
Lags	(3)	(3)	(3)	(3)	(3)	(3)

Table 11. Unit Root Tests - Phillips-Perron Tests for Full Monthly Sample Period: January 1997 – December 2003

This table provides results of PP unit root tests for Barbados, Jamaica, S&P 500 and Trinidad and Tobago using monthly index data from 1997:1-2003:12 sample periods. The number of lags chosen was suggested by the Newey-West option in Eviews 4.0. {1}, {2} and {3} represents the model used for the Phillips-Perron test. {1} represents a model with an intercept and critical values for 1%, 5% and 10% level of significance of -3.5101, -2.8963 and -2.5851, respectively. {2} represents a model with a trend and intercept and critical values for 1%, 5% and 10% level of significance of -4.0713, -3.4639 and -3.1581, respectively. {3} represents a model with no intercept and no trend and critical values for 1%, 5% and 10% level of significance of -2.5909, -1.9441 and -1.6178, respectively. *Rejection of the null hypothesis at the 1% level.

Country	Level			First Difference		
	{1}	{2}	{3}	{1}	{2}	{3}
Barbados	-2.1428	-2.0911	0.7638	-5.7977*	-5.751*	-5.7279*
Lags	(3)	(3)	(3)	(3)	(3)	(3)
Jamaica	2.9579	0.5872	4.0822	-6.9698*	-7.6251*	-6.215*
Lags	(3)	(3)	(3)	(3)	(3)	(3)
Trinidad	-0.9088	-1.7287	2.5123	-5.9751*	-5.9360*	-5.3089*
Lags	(3)	(3)	(3)	(3)	(3)	(3)
United States	-1.8232	-1.8289	0.3219	-9.0200*	-9.1367*	-9.0327*
Lags	(3)	(3)	(3)	(3)	(3)	(3)

Table 12. Unit Root Tests- Phillips-Perron Tests for Full Weekly Sample Period: January 1990 – December 2003

This table provides results of PP unit root tests for Jamaica, S&P 500 and Trinidad and Tobago using weekly index data from 1990:1-2003:12 sample periods. The number of lags chosen was suggested by the Newey-West option in Eviews 4.0. {1}, {2} and {3} represents the model used for the Phillips-Perron test. {1} represents a model with an intercept and critical values for 1%, 5% and 10% level of significance of -3.4419, -2.8659 and -2.5691, respectively. {2} represents a model with a trend and intercept and critical values for 1%, 5% and 10% level of significance of -3.9753, -3.4182 and -3.1312, respectively. {3} represents a model with no intercept and no trend and critical values for 1%, 5% and 10% level of significance of -2.5685, -1.9398 and -1.6158, respectively. *Rejection of the null hypothesis at the 1% level.

Country	Level			First Difference		
	{1}	{2}	{3}	{1}	{2}	{3}
Jamaica	2.0332	0.5176	3.4942	-25.5787*	-25.6943*	-25.3536*
Lags	(6)	(6)	(6)	(6)	(6)	(6)
Trinidad	2.0022	-0.8614	4.5207	-15.0413*	-15.2334*	-14.4807*
Lags	(6)	(6)	(6)	(6)	(6)	(6)
United States	-0.9746	-1.2120	0.8561	-30.2398*	-30.2294*	-30.1626*
Lags	(6)	(6)	(6)	(6)	(6)	(6)

Table 13. Unit Root Tests - Phillips-Perron Tests for Weekly Sample Period: January 1990 – December 1996

This table provides results of PP unit root tests for Jamaica, S&P 500 and Trinidad and Tobago using weekly index data from 1990:1-2003:12 sample periods. The number of lags chosen was suggested by the Newey-West option in Eviews 4.0. {1}, {2} and {3} represents the model used for the Phillips-Perron test. {1} represents a model with an intercept and critical values for 1%, 5% and 10% level of significance of -3.4503, -2.8697 and -2.5711, respectively. {2} represents a model with a trend and intercept and critical values for 1%, 5% and 10% level of significance of -3.9871, -3.4238 and -3.1346, respectively. {3} represents a model with no intercept and no trend and critical values for 1%, 5% and 10% level of significance of -2.5713, -1.9404 and -1.6161, respectively. *Rejection of the null hypothesis at the 1% level.

Country	Level			First Difference		
	{1}	{2}	{3}	{1}	{2}	{3}
Jamaica	-1.5816	-1.4759	-0.1032	-18.4816*	-18.4828*	-18.4712*
Lags	(5)	(5)	(5)	(5)	(5)	(5)
Trinidad	0.6615	-0.7059	3.0417	-12.8741*	-12.9259*	-12.5061*
Lags	(5)	(5)	(5)	(5)	(5)	(5)
United States	2.3774	-0.3859	3.7905	-20.2918*	-20.6384*	-19.6835*
Lags	(5)	(5)	(5)	(5)	(5)	(5)

Table 14. Unit Root Tests - Phillips-Perron Tests for Weekly Sample Period: January 1997 – December 2003

This table provides results of PP unit root tests for Jamaica, S&P 500 and Trinidad and Tobago using weekly index data from 1990:1-2003:12 sample periods. The number of lags chosen was suggested by the Newey-West option in Eviews 4.0. {1}, {2} and {3} represents the model used for the Phillips-Perron test. {1} represents a model with an intercept and critical values for 1%, 5% and 10% level of significance of -3.4503, -2.8697 and -2.5711, respectively. {2} represents a model with a trend and intercept and critical values for 1%, 5% and 10% level of significance of -3.9871, -3.4238 and -3.1346, respectively. {3} represents a model with no intercept and no trend and critical values for 1%, 5% and 10% level of significance of -2.5713, -1.9404 and -1.6161, respectively. *Rejection of the null hypothesis at the 1% level.

Country	Level			First Difference		
	{1}	{2}	{3}	{1}	{2}	{3}
Jamaica	3.1989	0.7550	4.4756	-17.3827*	-17.7510*	-16.9044*
Lags	(5)	(5)	(5)	(5)	(5)	(5)
Trinidad	-0.7379	-1.3801	3.3357	-10.5049*	-10.4907*	-9.9009*
Lags	(5)	(5)	(5)	(5)	(5)	(5)
United States	-1.9733	-1.9748	0.3292	-21.3780*	-21.4561*	-21.3785*
Lags	(5)	(5)	(5)	(5)	(5)	(5)

Table 15. Johansen Cointegration Bivariate Test Results: Monthly Barbados Data

This table provides the results of the bivariate cointegration relationship (Johansen Method) between the Barbados Stock Exchange Index and the Jamaica Stock Exchange (Panel A-C), Trinidad and Tobago Stock Exchange (Panel D-F), and S&P 500 Index (Panel G-I). The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
A. Cointegration System: With Jamaica for Full Sample									
None	9.21	24.74	19.99	17.79	6.2	20.2	15.67	13.75	4
At most one	3.01	12.73	9.13	7.5	3.01	12.97	9.24	7.52	4
B. Cointegration System: With Jamaica for Sample Period: January 1990 – December 1996									
None	**21.76****	24.74	19.99	17.79	12.9	20.2	15.67	13.75	1
At most one	**8.86***	12.73	9.13	7.5	**8.86***	12.97	9.24	7.52	1
C. Cointegration System: With Jamaica for Sample Period: January 1997 – December 2003									
None	16.86	24.74	19.99	17.79	11.2	20.2	15.67	13.75	4
At most one	5.66	12.73	9.13	7.5	5.66	12.97	9.24	7.52	4
D. Cointegration System: With Trinidad for Full Sample									
None	14.81	24.74	19.99	17.79	10.96	20.2	15.67	13.75	3
At most one	3.85	12.73	9.13	7.5	3.85	12.97	9.24	7.52	3
E. Cointegration System: With Trinidad for Sample Period: January 1990 – December 1996									
None	**19.23***	24.74	19.99	17.79	**16.95****	20.2	15.67	13.75	1
At most one	2.28	12.73	9.13	7.5	2.28	12.97	9.24	7.52	1
F. Cointegration System: With Trinidad for Sample Period: January 1997 – December 2003									
None	9.16	24.74	19.99	17.79	7.72	20.2	15.67	13.75	1
At most one	1.14	12.73	9.13	7.5	1.14	12.97	9.24	7.52	1
G. Cointegration System: With U.S. (S&P 500) Full Sample									
None	13.04	24.74	19.99	17.79	10.28	20.2	15.67	13.75	3
At most one	2.76	12.73	9.13	7.5	2.76	12.97	9.24	7.52	3
H. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1990 – December 1996									
None	17.72	24.74	19.99	17.79	12.28	20.2	15.67	13.75	1
At most one	5.43	12.73	9.13	7.5	5.43	12.97	9.24	7.52	1
I. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1997 – December 2003									
None	17.31	24.74	19.99	17.79	10.19	20.2	15.67	13.75	2
At most one	7.13	12.73	9.13	7.5	7.13	12.97	9.24	7.52	2

Table 16. Johansen Cointegration Bivariate Test Results for Monthly Jamaica Data

This table provides the results of the bivariate cointegration relationship (Johansen Method) between the Jamaica Stock Exchange Index and the Barbados Stock Exchange (Panel A-C), Trinidad and Tobago Stock Exchange (Panel D-F), and S&P 500 Index (Panel G-I). The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
A. Cointegration System: With Barbados for Full Sample									
None	9.21	24.74	19.99	17.79	6.2	20.2	15.67	13.75	4
At most one	3.01	12.73	9.13	7.5	3.01	12.97	9.24	7.52	4
B. Cointegration System: With Barbados for Sample Period: January 1990 – December 1996									
None	**21.76****	24.74	19.99	17.79	12.9	20.2	15.67	13.75	1
At most one	**8.86***	12.73	9.13	7.5	**8.86***	12.97	9.24	7.52	1
C. Cointegration System: With Barbados for Sample Period: January 1997 – December 2003									
None	16.86	24.74	19.99	17.79	11.2	20.2	15.67	13.75	4
At most one	5.66	12.73	9.13	7.5	5.66	12.97	9.24	7.52	4
D. Cointegration System: With Trinidad for Full Sample									
None	14.46	24.74	19.99	17.79	12.8	20.2	15.67	13.75	2
At most one	1.66	12.73	9.13	7.5	1.66	12.97	9.24	7.52	2
E. Cointegration System: With Trinidad for Sample Period: January 1990 – December 1996									
None	13.96	24.74	19.99	17.79	10.51	20.2	15.67	13.75	1
At most one	3.45	12.73	9.13	7.5	3.45	12.97	9.24	7.52	1
F. Cointegration System: With Trinidad for Sample Period: January 1997 – December 2003									
None	**24.78*****	24.74	19.99	17.79	13.48	20.2	15.67	13.75	2
At most one	**11.3****	12.73	9.13	7.5	**11.3****	12.97	9.24	7.52	2
G. Cointegration System: With U.S. (S&P 500) Full Sample									
None	16.24	24.74	19.99	17.79	13.8	20.2	15.67	13.75	1
At most one	2.44	12.73	9.13	7.5	2.44	12.97	9.24	7.52	1
H. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1990 – December 1996									
None	14.49	24.74	19.99	17.79	11.48	20.2	15.67	13.75	1
At most one	3.01	12.73	9.13	7.5	3.01	12.97	9.24	7.52	1
I. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1997 – December 2003									
None	**28.55*****	24.74	19.99	17.79	**23.56*****	20.2	15.67	13.75	1
At most one	4.99	12.73	9.13	7.5	4.99	12.97	9.24	7.52	1

Table 17. Johansen Cointegration Bivariate Test Results for Monthly Trinidad Data

This table provides the results of the bivariate cointegration relationship (Johansen Method) between the Trinidad and Tobago Stock Exchange Index and the Barbados Stock Exchange (Panel A-C), Jamaica Stock Exchange (Panel D-F), and S&P 500 Index (Panel G-I). The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
A. Cointegration System: With Barbados for Full Sample									
None	14.81	24.74	19.99	17.79	10.96	20.2	15.67	13.75	3
At most one	3.85	12.73	9.13	7.5	3.85	12.97	9.24	7.52	3
B. Cointegration System: With Barbados for Sample Period: January 1990 – December 1996									
None	**19.23***	24.74	19.99	17.79	**16.95****	20.2	15.67	13.75	1
At most one	2.28	12.73	9.13	7.5	2.28	12.97	9.24	7.52	1
C. Cointegration System: With Barbados for Sample Period: January 1997 - December 2003									
None	9.16	24.74	19.99	17.79	7.72	20.2	15.67	13.75	3
At most one	1.14	12.73	9.13	7.5	1.14	12.97	9.24	7.52	3
D. Cointegration System: With Jamaica for Full Sample									
None	14.46	24.74	19.99	17.79	12.8	20.2	15.67	13.75	2
At most one	1.66	12.73	9.13	7.5	1.66	12.97	9.24	7.52	2
E. Cointegration System: With Jamaica for Sample Period: January 1990 - December 1996									
None	13.96	24.74	19.99	17.79	10.51	20.2	15.67	13.75	1
At most one	3.45	12.73	9.13	7.5	3.45	12.97	9.24	7.52	1
F. Cointegration System: With Jamaica for Sample Period: January 1997 - December 2003									
None	**24.78*****	24.74	19.99	17.79	13.48	20.2	15.67	13.75	2
At most one	**11.3****	12.73	9.13	7.5	**11.3****	12.97	9.24	7.52	2
G. Cointegration System: With U.S. (S&P 500) Full Sample									
None	14.37	24.74	19.99	17.79	12.33	20.2	15.67	13.75	2
At most one	2.03	12.73	9.13	7.5	2.03	12.97	9.24	7.52	2
H. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1990 - December 1996									
None	**27.95*****	24.74	19.99	17.79	**24.8*****	20.2	15.67	13.75	1
At most one	3.15	12.73	9.13	7.5	3.15	12.97	9.24	7.52	1
I. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1997 - December 2003									
None	**26.74*****	24.74	19.99	17.79	**25.59*****	20.2	15.67	13.75	1
At most one	1.15	12.73	9.13	7.5	1.15	12.97	9.24	7.52	1

Table 18. Johansen Cointegration Trivariate Test Results – for Monthly Jamaica and Trinidad Data

This table provides the results of the trivariate cointegration relationship (Johansen Method) between the Jamaica Stock Exchange Index and the Trinidad and Tobago Stock Exchange Index with the Barbados Stock Exchange (Panel A-C), and S&P 500 Index (Panel D-F). The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
A. Cointegration System: With Barbados Full Sample Period									
None	**33.32***	40.84	34.8	31.88	**24.06****	26.81	22	19.77	2
At most one	9.26	24.74	19.99	17.79	7.38	20.2	15.67	13.75	
At most two	1.88	12.73	9.13	7.5	1.88	12.97	9.24	7.52	
B. Cointegration System: With Barbados Sample Period: January 1990 - December 1996									
None	**40.33****	40.84	34.8	31.88	**22.92****	26.81	22	19.77	1
At most one	17.42	24.74	19.99	17.79	11.86	20.2	15.67	13.75	
At most two	5.55	12.73	9.13	7.5	5.55	12.97	9.24	7.52	
C. Cointegration System: With Barbados Sample Period: January 1997 - December 2003									
None	**43.3*****	40.84	34.8	31.88	**22.2****	26.81	22	19.77	2
At most one	**21.12****	24.74	19.99	17.79	12.03	20.2	15.67	13.75	
At most two	**9.07***	12.73	9.13	7.5	**9.07***	12.97	9.24	7.52	
D. Cointegration System: With S&P 500 Full Sample Period									
None	23.97	40.84	34.8	31.88	15.71	26.81	22	19.77	2
At most one	8.26	24.74	19.99	17.79	6.84	20.2	15.67	13.75	
At most two	1.42	12.73	9.13	7.5	1.42	12.97	9.24	7.52	
E. Cointegration System: With S&P 500 Sample Period: January 1990 - December 1996									
None	**44.77*****	40.84	34.8	31.88	**35.1*****	26.81	22	19.77	1
At most one	9.67	24.74	19.99	17.79	7.75	20.2	15.67	13.75	
At most two	1.92	12.73	9.13	7.5	1.92	12.97	9.24	7.52	
F. Cointegration System: With S&P 500 Sample Period: January 1997 - December 2003									
None	**54.52*****	40.84	34.8	31.88	**28.05*****	26.81	22	19.77	1
At most one	**26.46*****	24.74	19.99	17.79	**18.13****	20.2	15.67	13.75	
At most two	**8.34***	12.73	9.13	7.5	**8.34***	12.97	9.24	7.52	

Table 19. Johansen Cointegration Trivariate Test Results – for Monthly Barbados and U.S. (S&P 500) Data

This table provides the results of the trivariate cointegration relationship (Johansen Method) between the Barbados Stock Exchange Index and the U.S. S&P 500 Index with the Jamaica Stock Exchange (Panel A-C), and Trinidad and Tobago Stock Exchange (Panel D-F). The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

A. Cointegration System: With Jamaica Full Sample Period

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
None	26.8	40.84	34.8	31.88	16.24	26.81	22	19.77	2
At most one	10.55	24.74	19.99	17.79	9.59	20.2	15.67	13.75	
At most two	0.96	12.73	9.13	7.5	0.96	12.97	9.24	7.52	

B. Cointegration System: With Jamaica Sample Period: January 1990 - December 1996

None	34.59	40.84	34.8	31.88	14.14	26.81	22	19.77	1
At most one	20.44	24.74	19.99	17.79	11.86	20.2	15.67	13.75	
At most two	8.58	12.73	9.13	7.5	8.58	12.97	9.24	7.52	

C. Cointegration System: With Jamaica Sample Period: January 1997 - December 2003

None	**38.21****	40.84	34.8	31.88	**21.73***	26.81	22	19.77	3
At most one	16.48	24.74	19.99	17.79	12.31	20.2	15.67	13.75	
At most two	4.17	12.73	9.13	7.5	4.17	12.97	9.24	7.52	

D. Cointegration System: With Trinidad Full Sample Period

None	30.54	40.84	34.8	31.88	22.02**	26.81	22	19.77	5
At most one	8.53	24.74	19.99	17.79	5.85	20.2	15.67	13.75	
At most two	2.68	12.73	9.13	7.5	2.68	12.97	9.24	7.52	

E. Cointegration System: With Trinidad Sample Period: January 1990 - December 1996

None	**42.98*****	40.84	34.8	31.88	**28.46*****	26.81	22	19.77	1
At most one	14.51	24.74	19.99	17.79	10.76	20.2	15.67	13.75	
At most two	3.79	12.73	9.13	7.5	3.79	12.97	9.24	7.52	

F. Cointegration System: With Trinidad Sample Period: January 1997 - December 2003

None	27.6	40.84	34.8	31.88	14.11	26.81	22	19.77	2
At most one	13.48	24.74	19.99	17.79	12.07	20.2	15.67	13.75	
At most two	1.41	12.73	9.13	7.5	1.41	12.97	9.24	7.52	

Table 20. Johansen Cointegration Quadrivariate Test Results – for Monthly Barbados, Jamaica and Trinidad Data

This table provides the results of the quadrivariate cointegration relationship (Johansen Method) among the Barbados Stock Exchange Index, the Jamaica Stock Exchange Index, the Trinidad and Tobago Stock Exchange Index with the U.S. S&P 500 Index with the (Panel A-C). The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

A. Cointegration System: With S&P 500 Full Sample Period

Ho=Number of	Trace Test				Maximal Eigenvalue Test				Akaike
Cointegrating Vectors	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
None	45.11	60.42	53.42	49.92	24.48	33.24	28.14	25.56	2
At most one	20.6	40.84	34.8	31.88	13.67	26.81	22	19.77	
At most two	6.96	24.74	19.99	17.79	6.01	20.2	15.67	13.75	
At most three	0.95	12.73	9.13	7.5	0.95	12.97	9.24	7.52	

B. Cointegration System: With S&P 500 Sample Period: January 1990 - December 1996

None	**69.81*** **	60.42	53.42	49.92	**37.77*** **	33.24	28.14	25.56	1
At most one	**32.04***	40.84	34.8	31.88	14.15	26.81	22	19.77	
At most two	**17.9***	24.74	19.99	17.79	12.84	20.2	15.67	13.75	
At most three	**5.06**	12.73	9.13	7.5	5.06	12.97	9.24	7.52	

C. Cointegration System: With S&P 500 Sample Period: January 1997 - December 2003

None	**61.19*** **	60.42	53.42	49.92	**28.28** **	33.24	28.14	25.56	2
At most one	**32.91***	40.84	34.8	31.88	12.8	26.81	22	19.77	
At most two	**20.11** **	24.74	19.99	17.79	11.98	20.2	15.67	13.75	
At most three	**8.13***	12.73	9.13	7.5	8.13*	12.97	9.24	7.52	

Table 21. Johansen Cointegration Bivariate Test Results for Weekly Jamaica Data

This table provides the results of the bivariate cointegration relationship (Johansen Method) between the Jamaica Stock Exchange Index with Trinidad and Tobago Stock Exchange (Panel A-C), and U.S. S&P 500 Index (Panel D-F). The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
A. Cointegration System: With Trinidad for Full Sample									
None	**27.77*** **	24.74	19.99	17.79	**26.64*** **	20.2	15.67	13.75	2
At most one	1.13	12.73	9.13	7.5	1.13	12.97	9.24	7.52	2
B. Cointegration System: With Trinidad for Sample Period: January 1990 - December 1996									
None	11.45	24.74	19.99	17.79	7.97	20.2	15.67	13.75	3
At most one	3.47	12.73	9.13	7.5	3.47	12.97	9.24	7.52	3
C. Cointegration System: With Trinidad for Sample Period: January 1997 - December 2003									
None	**33.7*** **	24.74	19.99	17.79	**21.4*** **	20.2	15.67	13.75	2
At most one	**12.29** **	12.73	9.13	7.5	**12.29** **	12.97	9.24	7.52	2
D. Cointegration System: With U.S. (S&P 500) Full Sample									
None	**18.73***	24.74	19.99	17.79	**16.32** **	20.2	15.67	13.75	2
At most one	2.41	12.73	9.13	7.5	2.41	12.97	9.24	7.52	2
E. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1990 - December 1996									
None	**17.95***	24.74	19.99	17.79	**14.68**	20.2	15.67	13.75	3
At most one	3.27	12.73	9.13	7.5	3.27	12.97	9.24	7.52	3
F. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1997 - December 2003									
None	**34.08*** **	24.74	19.99	17.79	**28.38*** **	20.2	15.67	13.75	1
At most one	5.7	12.73	9.13	7.5	5.7	12.97	9.24	7.52	1

Table 22. Johansen Cointegration Bivariate Test Results for Weekly Trinidad Data

This table provides the results of the bivariate cointegration relationship (Johansen Method) between the Trinidad and Tobago Stock Exchange Index with Jamaica Stock Exchange Index (Panel A-C), and U.S. S&P 500 Index (Panel D-F). The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
A. Cointegration System: With Jamaica for Full Sample									
None	**27.77*** **	24.74	19.99	17.79	**26.64*** **	20.2	15.67	13.75	2
At most one	1.13	12.73	9.13	7.5	1.13	12.97	9.24	7.52	2
B. Cointegration System: With Jamaica for Sample Period: January 1990 - December 1996									
None	11.45	24.74	19.99	17.79	7.97	20.2	15.67	13.75	3
At most one	3.47	12.73	9.13	7.5	3.47	12.97	9.24	7.52	3
C. Cointegration System: With Jamaica for Sample Period: January 1997 - December 2003									
None	**33.7*** **	24.74	19.99	17.79	**21.4*** **	20.2	15.67	13.75	2
At most one	**12.29** **	12.73	9.13	7.5	**12.29** **	12.97	9.24	7.52	2
D. Cointegration System: With U.S. (S&P 500) Full Sample									
None	**23.8** **	24.74	19.99	17.79	**21.73*** **	20.2	15.67	13.75	2
At most one	2.07	12.73	9.13	7.5	2.07	12.97	9.24	7.52	2
E. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1990 - December 1996									
None	**31.05*** **	24.74	19.99	17.79	**27.78*** **	20.2	15.67	13.75	2
At most one	3.28	12.73	9.13	7.5	3.28	12.97	9.24	7.52	2
F. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1997 - December 2003									
None	**20.46** **	24.74	19.99	17.79	**19.23** **	20.2	15.67	13.75	2
At most one	1.23	12.73	9.13	7.5	1.23	12.97	9.24	7.52	2

Table 23. Johansen Cointegration Test Results – Jamaica and Trinidad (Weekly)

This table provides the results of the trivariate cointegration relationship (Johansen Method) between the Jamaica Stock Exchange Index and the Trinidad and Tobago Stock Exchange Index with the U.S. S&P 500 Index (Panel A-C). The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

A. Cointegration System: With S&P 500 Full Sample Period

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
None	**38.61****	40.84	34.8	31.88	**30.27*****	26.81	22	19.77	2
At most one	8.35	24.74	19.99	17.79	7.03	20.2	15.67	13.75	
At most two	1.32	12.73	9.13	7.5	1.32	12.97	9.24	7.52	

B. Cointegration System: With S&P 500 Sample Period: January 1990 - December 1996

None	**47.35*****	40.84	34.8	31.88	**37.36*****	26.81	22	19.77	2
At most one	9.99	24.74	19.99	17.79	8.12	20.2	15.67	13.75	
At most two	1.87	12.73	9.13	7.5	1.82	12.97	9.24	7.52	

C. Cointegration System: With S&P 500 Sample Period: January 1997 - December 2003

None	**46.23*****	40.84	34.8	31.88	**21.46***	26.81	22	19.77	2
At most one	**24.77*****	24.74	19.99	17.79	**16.17****	20.2	15.67	13.75	
At most two	**8.61***	12.73	9.13	7.5	**8.61***	12.97	9.24	7.52	

Table 24. Johansen Cointegration Bivariate Test Results: Monthly USD Barbados Data

This table provides the results of the bivariate cointegration relationship (Johansen Method) between the Barbados Stock Exchange Index and the Jamaica Stock Exchange (Panel A-C), Trinidad and Tobago Stock Exchange (Panel D-F), and S&P 500 Index (Panel G-I). All index values are converted to USD using rates obtained from each country's central bank. The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
A. Cointegration System: With Jamaica for Full Sample									
None	13.65	24.74	19.99	17.79	12.09	20.2	15.67	13.75	4
At most one	1.55	12.73	9.13	7.5	1.55	12.97	9.24	7.52	4
B. Cointegration System: With Jamaica for Sample Period: January 1990 – December 1996									
None	**26.05*** **	24.74	19.99	17.79	**20.83*** **	20.2	15.67	13.75	5
At most one	5.22	12.73	9.13	7.5	5.22	12.97	9.24	7.52	5
C. Cointegration System: With Jamaica for Sample Period: January 1997 – December 2003									
None	9.84	24.74	19.99	17.79	8.29	20.2	15.67	13.75	4
At most one	1.55	12.73	9.13	7.5	1.55	12.97	9.24	7.52	4
D. Cointegration System: With Trinidad for Full Sample									
None	13.10	24.74	19.99	17.79	9.21	20.2	15.67	13.75	3
At most one	3.89	12.73	9.13	7.5	3.89	12.97	9.24	7.52	3
E. Cointegration System: With Trinidad for Sample Period: January 1990 – December 1996									
None	**17.99***	24.74	19.99	17.79	**17.49****	20.2	15.67	13.75	1
At most one	0.50	12.73	9.13	7.5	0.50	12.97	9.24	7.52	1
F. Cointegration System: With Trinidad for Sample Period: January 1997 – December 2003									
None	9.18	24.74	19.99	17.79	7.69	20.2	15.67	13.75	3
At most one	1.49	12.73	9.13	7.5	1.49	12.97	9.24	7.52	3
G. Cointegration System: With U.S. (S&P 500) Full Sample									
None	13.04	24.74	19.99	17.79	10.28	20.2	15.67	13.75	3
At most one	2.76	12.73	9.13	7.5	2.76	12.97	9.24	7.52	3
H. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1990 – December 1996									
None	17.72	24.74	19.99	17.79	12.28	20.2	15.67	13.75	1
At most one	5.43	12.73	9.13	7.5	5.43	12.97	9.24	7.52	1
I. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1997 – December 2003									
None	17.31	24.74	19.99	17.79	10.19	20.2	15.67	13.75	2
At most one	7.13	12.73	9.13	7.5	7.13	12.97	9.24	7.52	2

Table 25. Johansen Cointegration Bivariate Test Results for Monthly USD Jamaica Data

This table provides the results of the bivariate cointegration relationship (Johansen Method) between the Jamaica Stock Exchange Index and the Barbados Stock Exchange (Panel A-C), Trinidad and Tobago Stock Exchange (Panel D-F), and S&P 500 Index (Panel G-I). All index values are converted to USD using rates obtained from each countries central bank. The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
A. Cointegration System: With Barbados for Full Sample									
None	13.65	24.74	19.99	17.79	12.09	20.2	15.67	13.75	4
At most one	1.55	12.73	9.13	7.5	1.55	12.97	9.24	7.52	4
B. Cointegration System: With Barbados for Sample Period: January 1990 – December 1996									
None	**26.05*** **	24.74	19.99	17.79	**20.83*** **	20.2	15.67	13.75	5
At most one	5.22	12.73	9.13	7.5	5.22	12.97	9.24	7.52	5
C. Cointegration System: With Barbados for Sample Period: January 1997 – December 2003									
None	9.84	24.74	19.99	17.79	8.29	20.2	15.67	13.75	4
At most one	1.55	12.73	9.13	7.5	1.55	12.97	9.24	7.52	4
D. Cointegration System: With Trinidad for Full Sample									
None	16.3	24.74	19.99	17.79	9.65	20.2	15.67	13.75	2
At most one	6.65	12.73	9.13	7.5	6.65	12.97	9.24	7.52	2
E. Cointegration System: With Trinidad for Sample Period: January 1990 – December 1996									
None	9.56	24.74	19.99	17.79	7.95	20.2	15.67	13.75	2
At most one	1.61	12.73	9.13	7.5	1.61	12.97	9.24	7.52	2
F. Cointegration System: With Trinidad for Sample Period: January 1997 – December 2003									
None	16.49	24.74	19.99	17.79	13.45	20.2	15.67	13.75	2
At most one	3.05	12.73	9.13	7.5	3.05	12.97	9.24	7.52	2
G. Cointegration System: With U.S. (S&P 500) Full Sample									
None	9.45	24.74	19.99	17.79	6.94	20.2	15.67	13.75	2
At most one	2.51	12.73	9.13	7.5	2.51	12.97	9.24	7.52	2
H. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1990 – December 1996									
None	**18.31***	24.74	19.99	17.79	12.89	20.2	15.67	13.75	2
At most one	5.43	12.73	9.13	7.5	5.43	12.97	9.24	7.52	2
I. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1997 – December 2003									
None	10.74	24.74	19.99	17.79	6.80	20.2	15.67	13.75	1
At most one	3.94	12.73	9.13	7.5	3.94	12.97	9.24	7.52	1

Table 26. Johansen Cointegration Bivariate Test Results for Monthly USD Trinidad Data

This table provides the results of the bivariate cointegration relationship (Johansen Method) between the Trinidad and Tobago Stock Exchange Index and the Barbados Stock Exchange (Panel A-C), Jamaica Stock Exchange (Panel D-F), and S&P 500 Index (Panel G-I). All index values are converted to USD using rates obtained from each countries central bank. The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
A. Cointegration System: With Barbados for Full Sample									
None	13.10	24.74	19.99	17.79	9.21	20.2	15.67	13.75	3
At most one	3.89	12.73	9.13	7.5	3.89	12.97	9.24	7.52	3
B. Cointegration System: With Barbados for Sample Period: January 1990 – December 1996									
None	**17.99****	24.74	19.99	17.79	**17.49****	20.2	15.67	13.75	1
At most one	0.50	12.73	9.13	7.5	0.50	12.97	9.24	7.52	1
C. Cointegration System: With Barbados for Sample Period: January 1997 - December 2003									
None	9.18	24.74	19.99	17.79	7.69	20.2	15.67	13.75	3
At most one	1.49	12.73	9.13	7.5	1.49	12.97	9.24	7.52	3
D. Cointegration System: With Jamaica for Full Sample									
None	16.3	24.74	19.99	17.79	9.65	20.2	15.67	13.75	2
At most one	6.65	12.73	9.13	7.5	6.65	12.97	9.24	7.52	2
E. Cointegration System: With Jamaica for Sample Period: January 1990 - December 1996									
None	9.56	24.74	19.99	17.79	7.95	20.2	15.67	13.75	2
At most one	1.61	12.73	9.13	7.5	1.61	12.97	9.24	7.52	2
F. Cointegration System: With Jamaica for Sample Period: January 1997 - December 2003									
None	16.49	24.74	19.99	17.79	13.45	20.2	15.67	13.75	2
At most one	3.05	12.73	9.13	7.5	3.05	12.97	9.24	7.52	2
G. Cointegration System: With U.S. (S&P 500) Full Sample									
None	12.73	24.74	19.99	17.79	10.65	20.2	15.67	13.75	2
At most one	2.08	12.73	9.13	7.5	2.08	12.97	9.24	7.52	2
H. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1990 - December 1996									
None	17.41	24.74	19.99	17.79	14.98	20.2	15.67	13.75	2
At most one	2.43	12.73	9.13	7.5	2.43	12.97	9.24	7.52	2
I. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1997 - December 2003									
None	13.01	24.74	19.99	17.79	11.90	20.2	15.67	13.75	2
At most one	1.10	12.73	9.13	7.5	1.10	12.97	9.24	7.52	2

Table 27. Johansen Cointegration Trivariate Test Results – for Monthly USD Jamaica and Trinidad Data

This table provides the results of the trivariate cointegration relationship (Johansen Method) between the Jamaica Stock Exchange Index and the Trinidad and Tobago Stock Exchange Index with the Barbados Stock Exchange (Panel A-C), and S&P 500 Index (Panel D-F). All index values are converted to USD using rates obtained from each countries central bank. The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. Asymptotic critical values are obtained from the SAS outputs.

A. Cointegration System: With Barbados Full Sample Period

Ho=Number of	Trace Test				Maximal Eigenvalue Test				Akaike
Cointegrating Vectors	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
None	28.02	40.84	34.8	31.88	16.39	26.81	22	19.77	2
At most one	11.63	24.74	19.99	17.79	7.62	20.2	15.67	13.75	
At most two	4.01	12.73	9.13	7.5	4.01	12.97	9.24	7.52	
B. Cointegration System: With Barbados Sample Period: January 1990 - December 1996									
None	**46.84*** **	40.84	34.8	31.88	**29.84*** **	26.81	22	19.77	1
At most one	17.00	24.74	19.99	17.79	**15.44***	20.2	15.67	13.75	
At most two	1.56	12.73	9.13	7.5	5.55	12.97	9.24	7.52	
C. Cointegration System: With Barbados Sample Period: January 1997 - December 2003									
None	**41.67*** **	40.84	34.8	31.88	**27.98*** **	26.81	22	19.77	2
At most one	13.69	24.74	19.99	17.79	11.72	20.2	15.67	13.75	
At most two	1.96	12.73	9.13	7.5	1.96	12.97	9.24	7.52	
D. Cointegration System: With S&P 500 Full Sample Period									
None	22.39	40.84	34.8	31.88	13.62	26.81	22	19.77	2
At most one	8.78	24.74	19.99	17.79	6.94	20.2	15.67	13.75	
At most two	1.84	12.73	9.13	7.5	1.84	12.97	9.24	7.52	
E. Cointegration System: With S&P 500 Sample Period: January 1990 - December 1996									
None	28.31	40.84	34.8	31.88	17.47	26.81	22	19.77	2
At most one	10.84	24.74	19.99	17.79	8.65	20.2	15.67	13.75	
At most two	2.18	12.73	9.13	7.5	2.18	12.97	9.24	7.52	
F. Cointegration System: With S&P 500 Sample Period: January 1997 - December 2003									
None	**47.02*** **	40.84	34.8	31.88	**25.76** **	26.81	22	19.77	1
At most one	**21.25** **	24.74	19.99	17.79	**16.07** **	20.2	15.67	13.75	
At most two	5.18	12.73	9.13	7.5	5.18	12.97	9.24	7.52	

Table 28. Johansen Cointegration Trivariate Test Results – for Monthly USD Barbados and U.S. (S&P 500) Data

This table provides the results of the trivariate cointegration relationship (Johansen Method) between the Barbados Stock Exchange Index and the U.S. S&P 500 Index with the Jamaica Stock Exchange (Panel A-C), and Trinidad and Tobago Stock Exchange (Panel D-F). All index values are converted to USD using rates obtained from each countries central bank. The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

A. Cointegration System: With Jamaica Full Sample Period

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
None	25.61	40.84	34.8	31.88	15.97	26.81	22	19.77	2
At most one	9.64	24.74	19.99	17.79	6.56	20.2	15.67	13.75	
At most two	3.08	12.73	9.13	7.5	3.08	12.97	9.24	7.52	

B. Cointegration System: With Jamaica Sample Period: January 1990 - December 1996

None	**42.27*** **	40.84	34.8	31.88	19.76	26.81	22	19.77	1
At most one	**22.51** **	24.74	19.99	17.79	13.64	20.2	15.67	13.75	
At most two	8.87	12.73	9.13	7.5	8.87	12.97	9.24	7.52	

C. Cointegration System: With Jamaica Sample Period: January 1997 - December 2003

None	27.86	40.84	34.8	31.88	18.00	26.81	22	19.77	2
At most one	9.06	24.74	19.99	17.79	7.17	20.2	15.67	13.75	
At most two	1.88	12.73	9.13	7.5	1.88	12.97	9.24	7.52	

D. Cointegration System: With Trinidad Full Sample Period

None	29.07	40.84	34.8	31.88	**21.21***	26.81	22	19.77	5
At most one	7.83	24.74	19.99	17.79	5.31	20.2	15.67	13.75	
At most two	2.52	12.73	9.13	7.5	2.52	12.97	9.24	7.52	

E. Cointegration System: With Trinidad Sample Period: January 1990 - December 1996

None	**37.82** **	40.84	34.8	31.88	**23.52*** **	26.81	22	19.77	1
At most one	14.31	24.74	19.99	17.79	10.15	20.2	15.67	13.75	
At most two	4.15	12.73	9.13	7.5	4.15	12.97	9.24	7.52	

F. Cointegration System: With Trinidad Sample Period: January 1997 - December 2003

None	27.59	40.84	34.8	31.88	14.38	26.81	22	19.77	2
At most one	13.21	24.74	19.99	17.79	11.71	20.2	15.67	13.75	
At most two	1.50	12.73	9.13	7.5	1.50	12.97	9.24	7.52	

Table 29. Johansen Cointegration Quadrivariate Test Results – for Monthly USD Barbados, Jamaica and Trinidad Data

This table provides the results of the quadrivariate cointegration relationship (Johansen Method) among the Barbados Stock Exchange Index, the Jamaica Stock Exchange Index, the Trinidad and Tobago Stock Exchange Index with the U.S. S&P 500 Index with the (Panel A-C). All index values are converted to USD using rates obtained from each countries central bank. The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

A. Cointegration System: With S&P 500 Full Sample Period

Ho=Number of	Trace Test				Maximal Eigenvalue Test				Akaike
Cointegrating Vectors	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
None	44.66	60.42	53.42	49.92	21.30	33.24	28.14	25.56	2
At most one	23.36	40.84	34.8	31.88	14.26	26.81	22	19.77	
At most two	9.10	24.74	19.99	17.79	6.95	20.2	15.67	13.75	
At most three	2.15	12.73	9.13	7.5	2.15	12.97	9.24	7.52	

B. Cointegration System: With S&P 500 Sample Period: January 1990 - December 1996

None	**65.19*** **	60.42	53.42	49.92	**32.44*** **	33.24	28.14	25.56	1
At most one	**32.75***	40.84	34.8	31.88	18.14	26.81	22	19.77	
At most two	14.61	24.74	19.99	17.79	12.12	20.2	15.67	13.75	
At most three	2.49	12.73	9.13	7.5	2.49	12.97	9.24	7.52	

C. Cointegration System: With S&P 500 Sample Period: January 1997 - December 2003

None	**61.15*** **	60.42	53.42	49.92	**26.37***	33.24	28.14	25.56	2
At most one	**34.78***	40.84	34.8	31.88	**20.91***	26.81	22	19.77	
At most two	13.87	24.74	19.99	17.79	11.80	20.2	15.67	13.75	
At most three	2.07	12.73	9.13	7.5	2.07	12.97	9.24	7.52	

Table 30. Johansen Cointegration Bivariate Test Results for Weekly USD Jamaica Data

This table provides the results of the bivariate cointegration relationship (Johansen Method) between the Jamaica Stock Exchange Index with Trinidad and Tobago Stock Exchange (Panel A-C), and U.S. S&P 500 Index (Panel D-F). All index values are converted to USD using rates obtained from each country's central bank. The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
A. Cointegration System: With Trinidad for Full Sample									
None	16.90	24.74	19.99	17.79	10.37	20.2	15.67	13.75	6
At most one	6.53	12.73	9.13	7.5	6.53	12.97	9.24	7.52	6
B. Cointegration System: With Trinidad for Sample Period: January 1990 - December 1996									
None	9.75	24.74	19.99	17.79	8.28	20.2	15.67	13.75	6
At most one	1.48	12.73	9.13	7.5	1.48	12.97	9.24	7.52	6
C. Cointegration System: With Trinidad for Sample Period: January 1997 - December 2003									
None	**21.19****	24.74	19.99	17.79	**16.69****	20.2	15.67	13.75	2
At most one	4.50	12.73	9.13	7.5	4.50	12.97	9.24	7.52	2
D. Cointegration System: With U.S. (S&P 500) Full Sample									
None	9.41	24.74	19.99	17.79	7.14	20.2	15.67	13.75	2
At most one	2.15	12.73	9.13	7.5	2.27	12.97	9.24	7.52	2
E. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1990 - December 1996									
None	**25.74*****	24.74	19.99	17.79	**20.43*****	20.2	15.67	13.75	6
At most one	5.30	12.73	9.13	7.5	5.30	12.97	9.24	7.52	6
F. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1997 - December 2003									
None	11.56	24.74	19.99	17.79	7.52	20.2	15.67	13.75	1
At most one	4.04	12.73	9.13	7.5	4.04	12.97	9.24	7.52	1

Table 31. Johansen Cointegration Bivariate Test Results for USD Weekly Trinidad Data

This table provides the results of the bivariate cointegration relationship (Johansen Method) between the Trinidad and Tobago Stock Exchange Index with Jamaica Stock Exchange Index (Panel A-C), and U.S. S&P 500 Index (Panel D-F). All index values are converted to USD using rates obtained from each country's central bank. The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
A. Cointegration System: With Jamaica for Full Sample									
None	16.90	24.74	19.99	17.79	10.37	20.2	15.67	13.75	2
At most one	6.53	12.73	9.13	7.5	6.53	12.97	9.24	7.52	2
B. Cointegration System: With Jamaica for Sample Period: January 1990 - December 1996									
None	9.75	24.74	19.99	17.79	8.28	20.2	15.67	13.75	6
At most one	1.48	12.73	9.13	7.5	1.48	12.97	9.24	7.52	6
C. Cointegration System: With Jamaica for Sample Period: January 1997 - December 2003									
None	**21.19****	24.74	19.99	17.79	**16.69****	20.2	15.67	13.75	2
At most one	4.50	12.73	9.13	7.5	4.50	12.97	9.24	7.52	2
D. Cointegration System: With U.S. (S&P 500) Full Sample									
None	**21.98****	24.74	19.99	17.79	**19.91****	20.2	15.67	13.75	2
At most one	2.07	12.73	9.13	7.5	2.07	12.97	9.24	7.52	2
E. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1990 - December 1996									
None	**21.29****	24.74	19.99	17.79	**18.73****	20.2	15.67	13.75	4
At most one	2.55	12.73	9.13	7.5	2.55	12.97	9.24	7.52	4
F. Cointegration System: With U.S. (S&P 500) for Sample Period: January 1997 - December 2003									
None	**19.51***	24.74	19.99	17.79	**18.22****	20.2	15.67	13.75	2
At most one	1.29	12.73	9.13	7.5	1.29	12.97	9.24	7.52	2

Table 32. Johansen Cointegration Test Results – USD Jamaica and Trinidad (Weekly)

This table provides the results of the trivariate cointegration relationship (Johansen Method) between the Jamaica Stock Exchange Index and the Trinidad and Tobago Stock Exchange Index with the U.S. S&P 500 Index (Panel A-C). All index values are converted to USD using rates obtained from each country's central bank. The first panel for each country's index represents the full sample period 1990:1-2003:12, whereas the two following panels represent the sub-periods 1990:1-1996:12 and 1997:1-2003:12. The Akaike Information Criterion is used to determine the proper lag length. An * indicates rejection of the null hypotheses at the 10% level of significance, ** indicates rejection at the 5% level and *** indicates rejection at the 1% level. The asymptotic critical values are obtained from the SAS outputs.

Ho=Number of Cointegrating Vectors	Trace Test				Maximal Eigenvalue Test				Akaike
	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Statistics	C.V. (1%)	C.V. (5%)	C.V. (10%)	Lag
A. Cointegration System: With S&P 500 Full Sample Period									
None	23.96	40.84	34.8	31.88	16.78	26.81	22	19.77	2
At most one	7.18	24.74	19.99	17.79	5.47	20.2	15.67	13.75	
At most two	1.71	12.73	9.13	7.5	1.71	12.97	9.24	7.52	
B. Cointegration System: With S&P 500 Sample Period: January 1990 - December 1996									
None	29.60	40.84	34.8	31.88	**21.44***	26.81	22	19.77	3
At most one	8.17	24.74	19.99	17.79	6.42	20.2	15.67	13.75	
At most two	1.74	12.73	9.13	7.5	1.74	12.97	9.24	7.52	
C. Cointegration System: With S&P 500 Sample Period: January 1997 - December 2003									
None	**39.76****	40.84	34.8	31.88	**20.39***	26.81	22	19.77	2
At most one	**20.36****	24.74	19.99	17.79	**15.68****	20.2	15.67	13.75	
At most two	3.68	12.73	9.13	7.5	3.68	12.97	9.24	7.52	

Figure 1. Monthly Closing Index Values for Barbados Stock Exchange. Time series spans January 1990 – December 2003.

This figure displays the Barbados stock exchange closing index values denominated in local currency using monthly data from the 1990:1–2003:12 sample period.

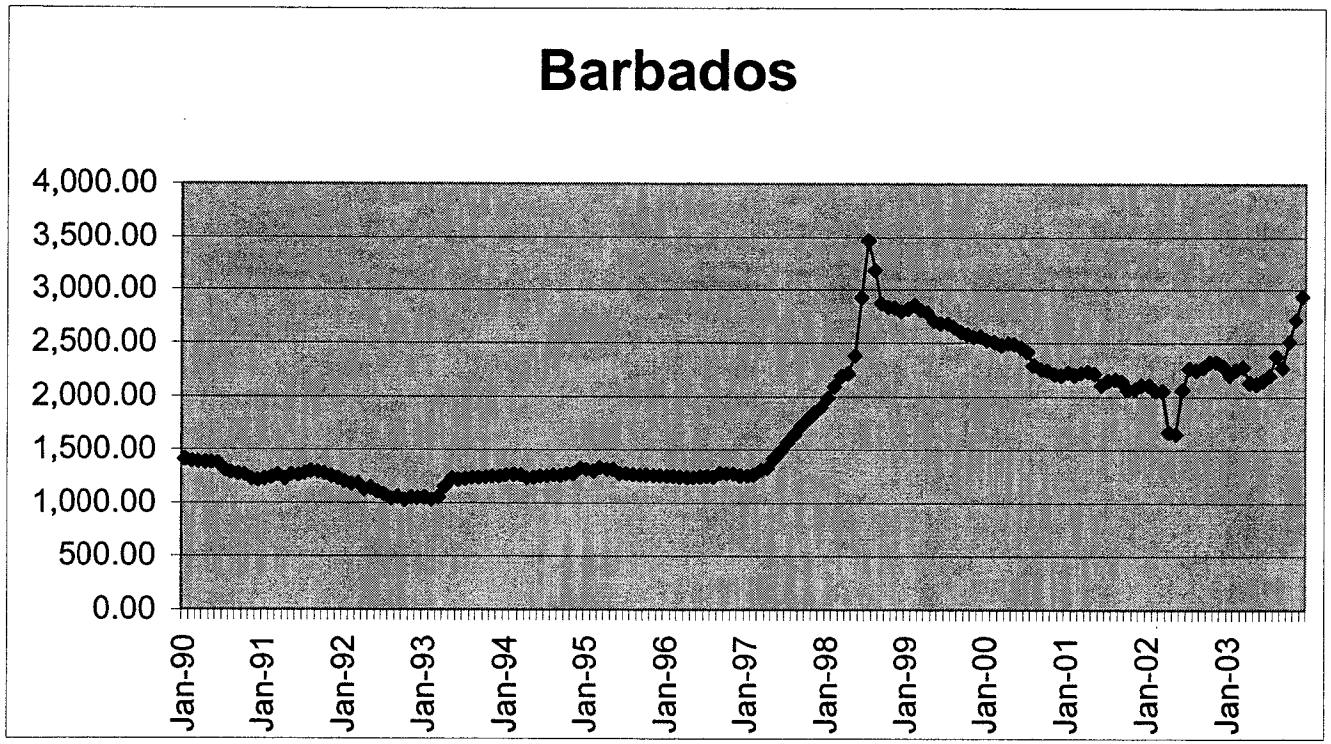

Figure 2. Monthly Closing Index Values for Jamaica Stock Exchange. Time series spans January 1990 – December 2003.

This figure displays the Jamaica stock exchange closing index values denominated in local currency using monthly data from the 1990:1–2003:12 sample period.

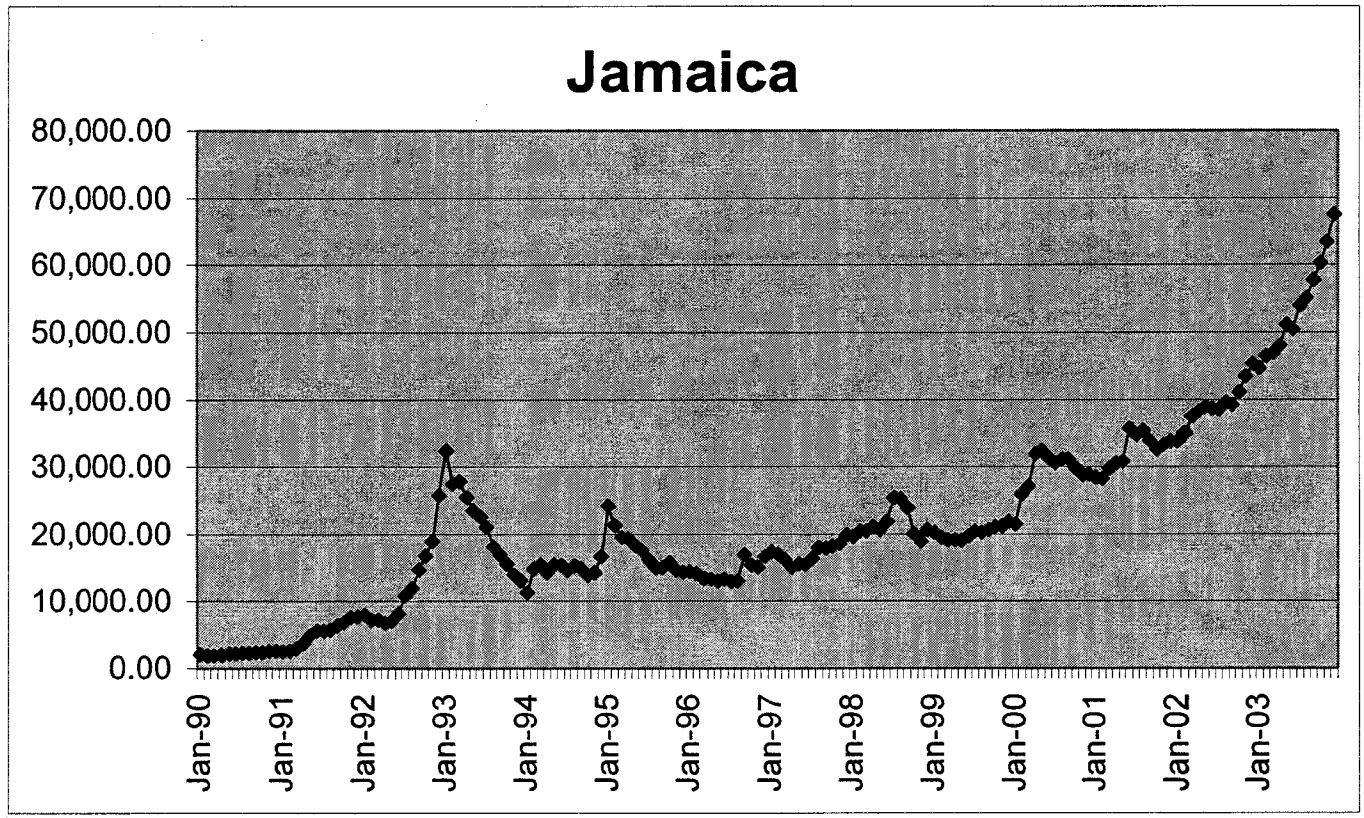

Figure 3. Monthly Closing Index Values for Trinidad & Tobago Stock Exchange. Time series spans January 1990 – December 2003.

This figure displays the Trinidad and Tobago stock exchange closing index values denominated in local currency using monthly data from the 1990:1–2003:12 sample period.

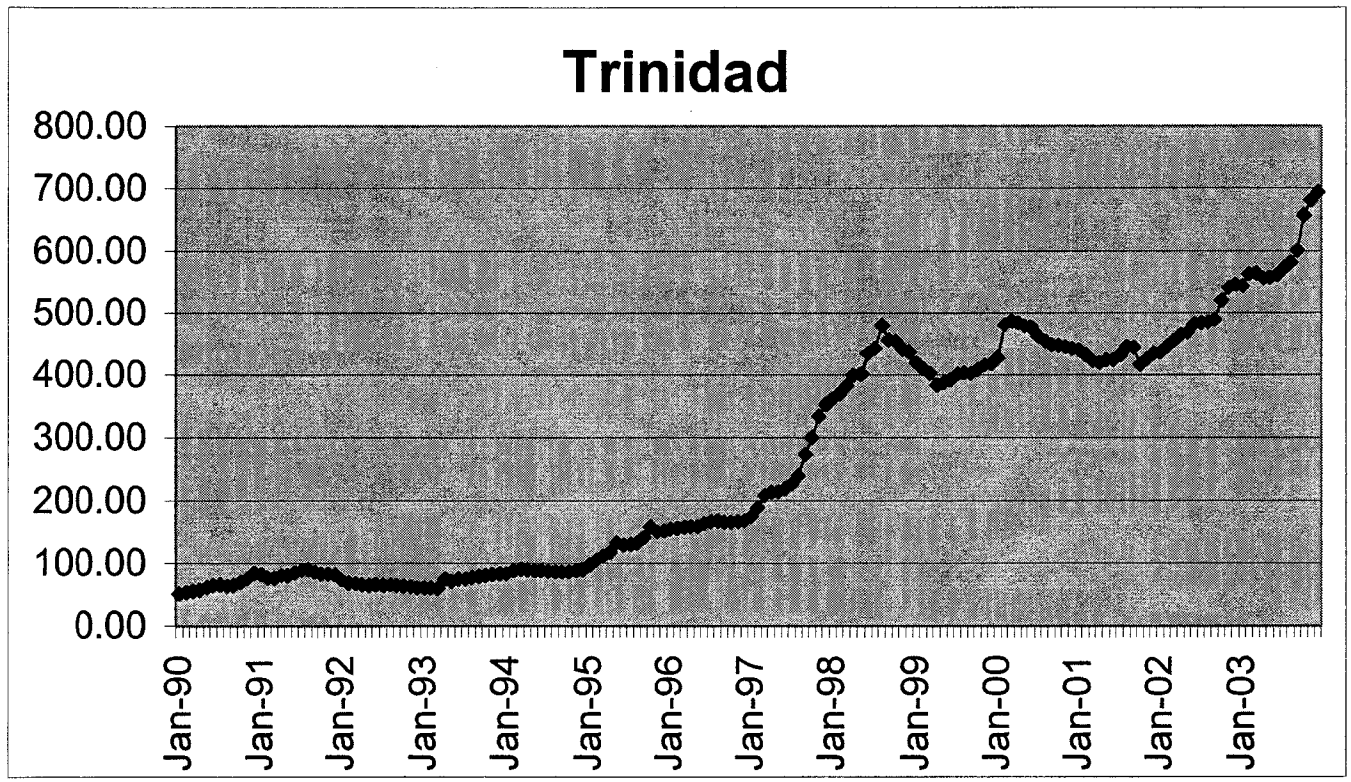

Figure 4. Monthly Closing Index Values for Standard & Poor's 500 Index. Time series spans January 1990 – December 2003.

This figure displays the S&P 500 United States stock exchange closing index values denominated in local currency using monthly data from the 1990:1–2003:12 sample period.