

**The Impact of Cross-border
listing on the Stock Markets of
Barbados, Jamaica and
Trinidad & Tobago**

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TABLE OF CONTENTS

1. Abstract.....	5
2. Introduction.....	5
3. Literature Review.....	7
4. Data and Methodology.....	20
5. Empirical Analysis.....	29
6. Limitations of Study.....	80
7. Policy Recommendations / Conclusions.....	81
References.....	83

Table of Figures

<i>Figure 1: Proportions of number of transactions for cross-listings and domestic securities for the period 2005 -2010</i>	27
<i>Figure 2: Comparison of cross-listed trading volumes (in millions of shares) for the BSE, JSE, TTSE and All Three</i>	28
<i>Figure 3: Total values of shares traded (Cross-listings) for BSE and JSE (in millions of U.S. dollars) for the period 1994 - 2010</i>	30
<i>Figure 4: Proportion of Total Value of shares traded (Cross-listings) to Total Market Values traded for BSE and JSE (1994 – 2010)</i>	31
<i>Figure 5: Total values of shares traded (Cross-listings) for TTSE (in millions of U.S. dollars) for the period 2003 - 2010</i>	32
<i>Figure 6: Proportion of Total Value of shares traded (Cross-listings) to Total Market Values traded for TTSE for the period 2003 – 2010</i>	32
<i>Figure 7: Comparison of the Cross-listed Turnover Ratios for the BSE, the JSE and the TTSE (1994 – 2010)</i>	34
<i>Figure 8: Chart of Total value of shares traded ratios for cross-listed securities (1994 – 2010)</i>	35
<i>Figure 9: Total value of shares traded ratios (Regional) (2003 – 2010)</i>	35
<i>Figure 10: Chart of Cross-listed Market Capitalisations (in millions of U.S. dollars) (1994–2010)</i>	36
<i>Figure 11: Trends in Cross-listing Market Capitalisation as a percentage of Total Market Capitalisation for the BSE, JSE and the TTSE</i>	37
<i>Figure 12: Trends in Cross-listing Market Capitalisation Ratios for the BSE, JSE and the TTSE</i>	39
<i>Figure 13: Barbados Shipping and Trading Limited</i>	42
<i>Figure 14: British West Indies Airways Limited</i>	42
<i>Figure 15: Life of Barbados Limited</i>	42
<i>Figure 16: Neal and Massey Holdings Limited</i>	42
<i>Figure 17: One Caribbean Media Limited</i>	42
<i>Figure 18: Sagicor Financial Corporation Limited</i>	42
<i>Figure 19: Capital & Credit Financial Group Limited</i>	45
<i>Figure 20: Guardian Holdings Limited</i>	45
<i>Figure 21: National Commercial Bank of Jamaica Limited</i>	45
<i>Figure 22: Scotia Investments Jamaica Limited</i>	45
<i>Figure 23: Supreme Ventures Limited</i>	46
<i>Figure 24: FirstCaribbean International Bank Limited</i>	48
<i>Figure 25: GraceKennedy Limited</i>	48
<i>Figure 26: Jamaican Money Market Brokers Limited</i>	48
<i>Figure 27: RBTT Financial Holdings Limited</i>	48
<i>Figure 28: Trinidad Cement Limited</i>	49
<i>Figure 29: Stock price graph (TTSE) for BCB Holdings Limited</i>	50

<i>Table 1: List of CARICOM cross-listed companies.....</i>	23
<i>Table 2: Comparisons of number of cross-listed securities and company listings.....</i>	24
<i>Table 3: Table showing the number of trades transacted on the BSE, JSE and TTSE (2005 - 2010).....</i>	26
<i>Table 4: Comparison Statistics (Cross-listings) for the period 2003 –2010.....</i>	33
<i>Table 5: Interpolated Dickey-Fuller Unit Root Analysis Results for cross-listed stocks on the TTSE and the BSE.....</i>	52
<i>Table 6: Results from Johansen’s co-integration tests for cross-listed stocks on the TTSE and the BSE.....</i>	52
<i>Table 7: Interpolated Dickey-Fuller Unit Root Analysis Results for cross-listed stocks on the TTSE and the JSE.....</i>	54
<i>Table 8: Results from Johansen’s co-integration tests for cross-listed stocks on the TTSE and the JSE.....</i>	54
<i>Table 9: Interpolated Dickey-Fuller Unit Root Analysis Results for cross-listed stocks listed on all three exchanges.....</i>	56
<i>Table 10: Johansen’s co-integration test results for cross-listed stocks on the BSE, the JSE and the TTSE.....</i>	56
<i>Table 11: Hasbrouck and Gonzalo-Granger Test Results for cross-listings on the BSE and the TTSE.....</i>	58
<i>Table 12: Hasbrouck and Gonzalo-Granger Test Results for Stocks on the JSE and the TTSE.....</i>	60
<i>Table 13: Hasbrouck and Gonzalo-Granger Test Results for Stocks on all three markets.....</i>	61

Abstract

The focus of this paper is to analyse the impact of cross-listed securities on the three major CARICOM equity markets: those of Jamaica, Trinidad and Tobago and Barbados. This will be accomplished through the use of a set of “market indicators” which are similar to those used in Cozier (2010) pertaining to regional stock market development. In addition, the degree to which market information is reflected in the prices of the cross-listed securities shall be determined through the use of the Gonzalo-Granger (1995) Permanent-Transitory Decomposition and the Hasbrouck Estimation (1995) methodologies. Finally, an attempt is made to determine whether arbitrage takes place within the region. The evidence seems to suggest that the cross-listing of securities has not produced the desired effects in the three major CARICOM equity markets, particularly in Jamaica and Barbados where little interest has been shown by its investors. Market liquidity has not seen any improvement as a result of the initiative. Interestingly, the market capitalisations of these cross-listed companies represent a significant portion of Jamaica’s total capitalisation, which may allude to a bias against these securities.

1. Introduction

Cross-listed securities have always had a significant role in stock market development. The process itself may be defined as one where a firm seeks to place its securities for sale on a stock exchange that resides outside of their home jurisdiction. Hargis (2000) succinctly alludes to its role in development by stating that international cross-listing has been shown to “*transform a segmented local equity market from an equilibrium of low liquidity and market capitalisation to an integrated market with high liquidity and market capitalisation...*”¹ Foucault and Gehrig (2006) also postulated that a cross-listing enables firms to better evaluate investment decisions due to the enhancement of “*stock price informativeness,*”² while Adelegan (2008) noted that the process can bring significant benefits. Some of these included the financing of corporate and development needs of stock markets, the provision of wealth diversification, greater efficiency, the

¹ See Hargis (2000), p.101.

² One of the propositions that were made to explain this phenomenon was that the presence of a cross-listing in a capital market would increase the number of informed traders in it.

lowering of the cost of capital, increased market access for small stock markets, and the potential to mitigate the effects of foreign investment outflows in shallow markets. Much of the literature has touched on it has affected focal areas of research such as its impact on equity prices and the cost of capital, just to name a few. The literature is rife with case studies that focused on capital markets within the developed countries. However, while there are earlier works which studied the major regional Caribbean financial markets,³ there remains a gap in the literature with respect to investigating cross-listings within the Caribbean which this paper seeks to fill.

When discussing cross-listings, it is also worth looking at the efficiency of market information transmission. Also referred to as the price discovery, it describes the process through which new market information concerning a security is incorporated into its price. Merton (1987, p. 486) directly alluded to this point when he stated that *“recognition of the different speeds of information diffusion is particularly important in empirical research, where the growth in sophisticated and sensitive techniques to test ever more refined financial behavior patterns severely strains the simple information structure of our asset pricing models.”* Thus, the greater the pace in which the information is incorporated, the more efficient a market is said to be. This market efficiency remains a goal for all associated. Any analysis of this nature necessitates the use of co-integration analysis as its prerequisite. Such an argument can be said to be theoretically sound as a highly efficient price discovery process should result in the convergence of equity prices across the markets, which usually denotes the presence of unit roots and, consequentially, co-integration. This paper also seeks to fill a fairly significant gap in the literature as it represents the first to investigate the price discovery processes of the Barbados, Jamaica and Trinidad & Tobago Stock Exchanges. As such, it will be organised as follows. Section 2 discusses the relevant academic literature that is pertinent to the analysis of cross-listings and price discovery. Section 3 will discuss the data and methodologies that were employed in the paper. Section 4 will set out the results of the estimations and Section 5 will outline some of the limitations that affected this

³ See examples such as Kitchen (1986), Sergeant (1995), Haynes (1997) and Cozier (2010).

study. Section 6 will conclude this article by providing a summary of the results as well as providing some policy implications.

2. *Literature Review*

It can be argued that part of the allure of cross-listed securities stems from the opportunity to own something “exotic”: stocks in companies that local investors normally would not be able to purchase unless they were able to afford to hire an investment advisor in that company’s country of origin. The academic literature on cross-border stock listings has become quite extensive. This review shall focus on the following areas of interest that this paper seeks to examine: (1) cross-listing and stock market development, (2) the impact of cross-listing on equity valuation, (3) price discovery and (4) cross-border listing in the Caribbean.

2.1 Cross-listing and stock market development

One area in which the effects of a cross-listing are being studied in the literature is through the examination of its perceived success based upon a number of measurable indicators. For example, Pagano et al. (2001) sought to examine the factors that determine the success of a stock exchange as evidenced from the cross-listing decisions of firms. They argued that in spite of the presence of increased integration of capital markets, geography remained a relevant influence in decisions made within the financial world and that European public companies would seek to list abroad in larger, more liquid markets such as those of the United States. There were also other factors which affected a firm’s decision to cross-list.⁴ Baker et al. (2002) attempted to show that international firms that list their shares on the New York Stock Exchange or the London Stock Exchange tended to experience a significant increase in visibility. They therefore concluded that a reduction in the cost of equity capital had occurred which had directly stemmed from the upsurge in analyst following. This finding was argued to be congruent

⁴ These factors were a) the presence of better investor protection, b) more efficient courts, c) bureaucracy and d) the presence of more stringent accounting standards. The latter was seen as having an adverse effect on the firm’s cross-listing decision as its strict adherence tended to erode any potential gains from cross-listing.

with Merton's (1987) investor relations hypothesis,⁵ and that their results were robust to conditioning based on a number of varying factors.⁶ In Coffee Jr. (2002), securities markets were observed to be now able to compete on a global basis due to the looming forces of globalisation and rapid technological change in information communication technologies. He contended that a natural consequence of this competition would be "*a wave of mergers, consolidations, and related alliances.*" It was also noted that there had been little attention paid to the "*impact of this new competition on corporate governance,*" despite the presence of different regulatory regimes. Coffee Jr. maintained that this underlying competition among the exchanges will result in the following:

- a) The restraint of centralising forces that others see as leading to a natural monopoly of a few dominant "super exchanges."
- b) The improvement of corporate governance via increased protection of minority shareholders.⁷

2.2 *The Impact of Cross-listing on equity valuation*

Another area in which scholars have been eager to investigate is the impact of cross-listing on share prices. This area has a significant role in explaining the degree of integration within financial markets as they are indeed inextricably linked. In Foerster and Karolyi (1993), they examined whether the extent of economic and financial market integration (segmentation) between a firm's home country and listing country influenced stock price reaction.⁸ They determined that evidence that was consistent with financial market segmentation between the Canadian and the U.S. markets. However, there seemed to be indications that there may have been industry-related factors which may have also been an important determinant of integration.

⁵ See Merton (1987).

⁶ These included a) the firm's home country capital market type (developed or emerging), b) the country's geographical region, c) analysts' tendencies to initiate coverage on firms with good prospects, and d) the popularity of a firm's industry or country.

⁷ See Coffee Jr. (2002), p. 4.

⁸ See Foerster, S.R. and G.A. Karolyi. (1993).

McConnell et al. (1996) reviewed and synthesized empirical studies that examined new and dual international and intra-national listings of common stocks. Their objective was to provide managers and policymakers with information about the effects of listing on stock prices. In turn, this would have then provided insights about issues such as market organisation, market micro-structure, factors that determine stock prices and returns, and international market integration. McConnell et al. tended to focus on studies of capital market integration that exploited dual international listings in order to draw inferences about the extent to which capital markets were integrated. Hargis (2000) examined cross-listings from three perspectives. Firstly, he studied the impact of what was termed “*participation externalities*”⁹ on financial market development and also sought to demonstrate the means by which market capitalisation and market liquidity can be increased through cross-listing. It was noted that the transformation of a segmented domestic market to “*an integrated market with high liquidity and market capitalisation*” can be ascribed to the alteration of incentives which encourage participation in the market on both a company and individual level (Hargis, p. 101). The article also sought to highlight the negative correlation between the benefits of internationalisation for stock market development and welfare with the degree of correlation between the international equity market and the relative size of the domestic equity market.¹⁰ He further postulated that the price impact of an international listing is dependent on the liquidity conditions prior to its listing.

King and Segal (2003) examined the topic of equity valuation from a three-pronged approach. Firstly, they investigated the impact that corporate governance has on equity valuation, and then followed this with an examination of the impact of investor protection. Finally, King and Segal (2003) proceeded to test the impact of cross-listing on home bias.¹¹ This was accomplished through the comparison of Canadian cross-listed

⁹ Hargis stated that the presence of a participation externality is evident when one individual’s participation in a stock market makes it more attractive for others to participate. As such, it was argued that the decision to enter a market is correlated across individuals in equilibrium.

¹⁰ See Hargis (2000), p.103.

¹¹ Dahlquist et al. (2003) provides a background into formulating a definition of home bias.

firms with other U.S. listings by using the financial results reported under U.S. GAAP.¹² The obtained results suggested that cross-listed Canadian firms tended to trade at a discount valuation relative to other U.S.-listed firms. Consequently, they rejected the hypothesis that investors regarded a cross-listed foreign firm as a substitute for a U.S. firm.¹³ Adelegan (2008) analysed data for a panel of thirteen (13) stock markets in sub-Saharan African countries from 1990 to 2007. This was done in order to investigate the impact of regional cross-listing of stocks on the respective market depths. Rosenboom and van Dijk (2009) sought to examine the differences in market reactions to cross-listings across a sampling of “destination markets” and the extent to which divergent factors for value creation can elucidate the variances in market reactions across cross-listings on a number of markets.¹⁴ Through the analysis of five hundred and twenty six (526) cross-listings from forty four (44) countries on eight (8) major exchanges, Rosenboom and van Dijkascertained that there were significant announcement returns for the U.S., London, continental European exchangesas well as the Tokyo Stock Exchange (though this was not found to be significant). They also found evidence consistent with improved disclosure and bondingcreating value for cross-listings on US exchanges; while overcoming segmentation and bonding are associatedwith higher announcement returns on the London Stock Exchange. The evidence was determined to be mixed for the continentalEuropean exchanges as well as for Tokyo. Cross-listing was said to affect a firm’s information environment. The presence of strict listing and accounting regulations were argued to be deterrents to cross-listings as noted in Saudagaran and Biddle (1992, 1995), while other aspects of the academic literature suggested that the stringent disclosure requirements were used by these cross-listed firms to denote their quality to investors.¹⁵ Rosenboom and van Dijk also highlighted the role of the destination market

¹² This is an acronym for Generally Accepted Accounting Principles. For more information, see the following website: <http://cpaclass.com/gaap/gaap-us-01a.htm>

¹³ King and Segal (2003) claim that this finding is consistent with the literature on home bias, which suggests that U.S. disclosure is not a guarantee of information quality. They also noted that international cross-listing does not seem to remove the valuation discount based on book-to-market, although the earnings-to-price discount seems to be small.

¹⁴ The factors identified were overcoming market segmentation, increased market liquidity, improved information disclosure, and better investor protection or “bonding.”

¹⁵ See Cantale (1996), Fuerst (1998), and Moel (2001).

invalue creation around cross-listings. Furthermore, as was highlighted by Rosenboom and van Dijk (2009), Baker et al. (2002) and Lang et al. (2003a,b) both demonstrated an association between cross-listings with increased media attention, greater analyst coverage, better analysts' forecast accuracy, and higher quality of accounting information.

2.3 Price discovery

The issue of price discovery (or the incorporation of new information in the formulation of prices) is also of relevance to the questions being asked in this paper as one would necessarily be intrigued to determine whether new market information are being efficiently incorporated into the prices of the cross-listed securities of the CARICOM region. Agarwal et al (2006) referred to this notion of where a security's price discovery was occurring, and perhaps more importantly, whether the home market will always exhibit dominance within this process as natural intuition suggests that this should be the case. However, upon further investigation of the relevant literature, Agarwal et al had found instances which highlighted the dominance of the foreign jurisdictions in which the firm had cross-listed.

There is anatural intuitive association that can be made between the existence of stock price co-movements in the markets (i.e. the co-integration of the markets) and the efficiency of the price discovery process within the subject markets. It stands to reason that a highly efficient price discovery process would have a significant positive impact on a respective stock market's price co-movements and vice versa. Hameed et al. (2010) observed the importance of this phenomenon when they stated that "*informed risk arbitrage generates stock price movements and profit-maximizing arbitrageurs presumably pay for additional information until their expected revenue from a marginal bit no longer covers its costs.*"¹⁶ Hameed et al. also remarked that there were different costs that were attributed to different kinds of information as well as yield different likely

¹⁶ As noted in Hameed et al. (2010), one can also look at Diamond and Verrecchia (1981), Grossman and Stiglitz (1980) as well as Shleifer and Vishny (1997) for further reference on this topic.

arbitrage revenues. These would therefore deliver different opportunities for private sector information intermediaries. In their respective studies of future markets, both Chan (1992) and later Hsiao et al. (2011) indicated that these markets tended to have a certain degree of correlation due to advantageous market microstructure features such as “*low transaction cost, high level of liquidity, full disclosure of information, more rapid response to market information, and price discovery function that leads the spot market.*” As noted by Hsiao et al. (2011), Johansen (1991) and Wahab and Lashgari (1993) also seemed to attest to the importance of the information transmission effect that the spot market has upon the futures market.¹⁷ Even though these particular studies were relatively narrow in its scope of study, they proved adequate in illustrating some semblance of the association between co-movement in the markets and information transmission effects.

When attempting to empirically measure this phenomenon in the market microstructure, the two main methodologies employed by researchers are the Hasbrouck Estimation and the Gonzalo-Granger decomposition methodologies. In his seminal work, Hasbrouck (1995) noted this significance when he noted the need to determine where price discovery is occurring due to the increasing prevalence of homogeneous or closely-linked securities being traded in multiple markets.¹⁸ Hasbrouck (1995) discussed the basic principles of analysing price discovery in terms of a simple microstructure model, which was followed by a generalized statement on co-integrated microstructure models in order to provide “*a richer characterisation*” of price discovery contributions. He then developed an empirical methodology to measure this process. In a subsequent article, Hasbrouck (2002) observed that market frictions such as bid-ask bounce, discreteness, inventory control, etc., tended to introduce transient components into security price processes. He stated that in the presence of such components, these prices are most definitely not martingales. The martingale was noted to be still prominent in his analysis due to the fact that this property “*characterizes a sequence of conditional expectations, such as those formed by traders regarding a security’s ultimate value.*” Hasbrouck also

¹⁷ See Hsiao et al (2011), p. 2285.

¹⁸ See Hasbrouck (1995), p.1175.

noted that the sequence of expectations was unobserved and, as such, the martingale must be considered as being an implicit property.¹⁹ Upper and Werner (2007) sought to analyze “*the information content of trades in Bund futures and German government bonds before and during the 1998 financial market turbulences.*” In addition, they tested to determine whether “*the contributions to price discovery of the two market segments were constant over time.*”²⁰

2.4 *Cross-listing in the Caribbean*

There is a dearth in the academic literature where it concerns the impact of cross-listings within the Caribbean. In fact, most of the literature usually pays a cursory glance at the issue of cross-listed securities in the Caribbean. Sergeant (2006) provides the most comprehensive analysis on this topic in the overarching academic literature. In his presentation, Sergeant’s overall analysis focused on issues that were affecting equity market development at that time. In one of its subsections, Sergeant detailed the number and names of cross-listings listed on the exchanges in 2005 as well as delineating the benefits (to both the company and individual investor) and challenges of the cross-listing process. There was no empirical assessment of the impact of these securities on the adopted markets. Other than this, the literature is relatively sparse on this topic as most of the literature tended to be concentrated on issues of stock market development and whatever information can be gleaned from the annual reports issued by the respective stock exchanges. As a consequence, this paper seeks to fill this void in the literature by analysing its impact on areas of importance such as market liquidity and size, the degree of co-integration among the cross-listed securities as well as the issue of price discovery. The next section will highlight the data and methodology employed in this paper.

3. *Data and Methodology*

¹⁹ See Hasbrouck (2000), p.19.

²⁰ This was noted in the abstract of their book which was published in 2007.

3.1 Methodology

The descriptive element of this essay will be two-fold. First, this paper shall employ statistical measures in order to evaluate the impact that the cross-listing initiative has had on the three major regional stock exchanges for the period 1989 – 2009. These measures are similar thematically to the statistical indicators used to evaluate overall stock market development used in Yartey and Adjasi (2007) and Yartey (2008). These are to include the ratio of the number of cross-listed securities to the number of company listings for each exchange; the ratio of the number of trades involving cross-listed securities to the total number of trades transacted;²¹ the ratio of the volume of shares sold for cross-listed securities to total market volumes for each exchange; the ratio of the value of shares sold for cross-listed securities to total market traded value for each exchange; the ratio of market capitalisation for the cross-listed securities to total market capitalisation for each exchange; the cross-listed market capitalisation ratio;²² the turnover ratio for cross-listed securities;²³ the Value of shares traded ratio for cross-listed securities²⁴ as well as the aforementioned stock price graphs. Due to the similar thematic of the measures to those used in Cozier (2010), these should be able to provide considerable insight into the degree to which the cross-listing initiative has impacted upon several important facets of regional stock market development such as market size, demand, depth and liquidity. Its immediate impact on areas such as market size will be immediately apparent. Its impact on the market liquidity of the respective stock markets should be of special interest to researchers because the cross-listing of securities has long been argued to be a means by which the CARICOM stock markets can alleviate its long-standing liquidity problems. The modified stock market development liquidity measures

²¹ Due to the unavailability of data for the TTSE prior to 2003, this measure was calculated for the period, 2003 – 2010.

²² This is calculated by dividing the market capitalisation for the cross-listed securities by the country's Gross Domestic Product.

²³ This is calculated by dividing the value of shares traded for the cross-listed securities by the average of the market capitalisations of the previous and current years.

²⁴ This is calculated by dividing the value of shares traded for the cross-listed securities by the country's Gross Domestic Product.

will provide a vivid description into the efficacy of this subsection in improving overall market liquidity.

For the co-integration analysis, this involved the use of daily stock price data for companies which have listed on at least two of the three major regional stock exchanges. The prices were collected from various sources within the three regional stock exchanges and then converted to U.S. currency for ease of comparison.²⁵ In the case of the information share analysis, the aforementioned daily stock price data for the cross-listed securities was employed in performing the Hasbrouck and Gonzalo-Granger methodological tests. While these tests normally require the use of stock index data (in the form of a Cross-listed stock index), the inadequate nature of such data emanating from Jamaica and Trinidad and Tobago makes such analytical approaches difficult. The cross-listed indices for the JSE and the TTSE were only recently implemented in 2009, thereby providing a very limited time series dataset to conduct any meaningful analysis. However, the use of the daily price information for the cross-listed securities should act as a reasonable proxy in this regard as the dataset is much more substantial.

The conversions to a common currency (such as the U.S. dollar) in the stock price trend analysis is mainly due to facilitating much easier comparison of the securities across borders and has always been common practice when attempting these types of academic exercises. Additionally, the graphs would also illustrate whether there were instances where investors should have been able to benefit (at least from a theoretical perspective) from any presence of arbitrage in the markets in terms of U.S. currency. From a more practical viewpoint, the presence of arbitrage would also indicate that there are opportunities for regional investors to reap financial benefits by engaging in speculative investment strategies with the cross-listed securities. The importance of such comparisons cannot be understated as they would tend to provide some insight into the attractiveness of cross-listed securities as investments. Its presence would also reaffirm

²⁵ This author would like to take the opportunity to thank Messrs. Geron Burnett and Barry Williams of the TTSE as well as Messrs. Terry Williams and his successor Barry Blenman of the BSE for their assistance in my data collection efforts.

previous observations in the academic literature that the regional stock markets are highly inefficient based on criteria put forward by Fama's Efficient Markets Hypothesis (Fama, 1965).

The econometric tests that were employed in this analysis were conducted either through the use of STATA statistical software or MATLAB. In the case of the Dickey-Fuller test and the Johansen test for co-integration, STATA was the 'weapon of choice,' while MATLAB was employed for the information share analysis which entailed the use of the Hasbrouck and the Gonzalo-Granger tests. In the first instance, the evaluation of whether there has been any co-movement in the returns of the regional cross-listed securities represents an intriguing aspect of any analysis which seeks to investigate the impact of any cross-listing initiative. The demonstration of co-movement in the returns would provide further evidence which could be used to suggest that the regional stock markets have indeed become more integrated over the years. This process will be evaluated through the use of the aforementioned Dickey-Fuller tests for the presence of unit roots as well as the Johansen's test for co-integration. Fabozzi et al. (2006) stated that one of the key issues in financial econometrics was *"to decide whether time series are integrated and, if so, what order integration they have."*²⁶

Crucial to this discussion is the issue of information share or how disseminated information becomes reflected in the market prices of the securities listed on the stock exchanges. Hasbrouck (2002) duly noted that price discovery analysis was based on the econometrics of co-integrated vector autoregressions. In the context of a security listed across several markets, it seems natural to assume that the prices listed across these markets share a common non-stationary component, but that market's microstructure frictions result in temporary deviations from the equilibrium price. With this in mind, assume X_t to be a vector of non-stationary prices of a security S available on $i=$

²⁶ See Fabozzi et al. (2006), p.478.

1, ... n markets. It is also assumed that the set of series is, because of long run arbitrage, co-integrated.²⁷ Its price process is given by the following vector error correction model:

$$\Delta \mathbf{X}_t = \boldsymbol{\alpha} \boldsymbol{\beta}' \mathbf{X}_{t-1} + \sum_{j=1}^k A_j \Delta \mathbf{X}_{t-j} + \boldsymbol{\varepsilon}_t \quad (1)$$

Where $\boldsymbol{\alpha}$ is the error correction vector and $\boldsymbol{\varepsilon}_t$ a zero-mean vector of serially uncorrelated innovations. One should note that the first term in (1) depicts the long-run equilibrium dynamics of the prices series, while second one represents the short-run dynamics induced by market imperfections. In line with Hasbrouck (1995), equation (1) can be transformed into the integrated form of a vector moving average:

$$\mathbf{X}_t = \boldsymbol{\Psi}(\mathbf{I}) \sum_{s=1}^t \boldsymbol{\varepsilon}_s + \boldsymbol{\Psi}^*(\mathbf{L}) \boldsymbol{\varepsilon}_t \quad (2)$$

Where $\boldsymbol{\Psi}^*(\mathbf{L})$ and $\boldsymbol{\Psi}(\mathbf{L})$ are matrix polynomials of the lag operator L, so that $\boldsymbol{\Psi}(\mathbf{I}) \boldsymbol{\varepsilon}_t$ is long-run impact of an innovation on each price. If one assumes the long-run impact to be the same across all n markets, then one can rewrite (2) as:

$$\mathbf{X}_t = \boldsymbol{\zeta} \boldsymbol{\delta} \sum_{s=1}^t \boldsymbol{\varepsilon}_s + \boldsymbol{\Psi}^*(\mathbf{L}) \boldsymbol{\varepsilon}_t \quad (3)$$

Where $\boldsymbol{\zeta}$ is a $n \times 1$ column vector of 1's and $\boldsymbol{\delta}$ the common row vector in $\boldsymbol{\Psi}(\mathbf{I})$. Hasbrouck (1995) defines $\boldsymbol{\delta} \boldsymbol{\varepsilon}_t$ to be the common efficient price (common factor) between the prices across the n markets. It thus represents that part of the price changes that is permanently impounded in the price, likely due to new information about the security S, but not the transient effects. Hasbrouck's (1995) defines the information share of market i as the variance $\boldsymbol{\delta}_i \boldsymbol{\varepsilon}_{it}$ scaled by the total variance of the common trend innovations $\boldsymbol{\delta}' \boldsymbol{\varepsilon}_t$. Stated differently, the information share of a market i is the proportion of the variance in the common factor due to innovations in that market. In this regard one should note that if the elements of $\boldsymbol{\varepsilon}_t$ are correlated then the information shares of the markets i are not uniquely defined and one can only determine their range. More specifically, in order to eliminate the contemporaneous correlation use the Cholesky factorization of the covariance matrix of $\boldsymbol{\varepsilon}_t$. However, such factorization requires the prices to be ordered and thus the results on the information shares are order dependent, where the largest

²⁷ The discussion here is largely based on Baillie et al (2002) and de Jong (2001).

(smallest) information share will result when the market is first (last) in the sequence if the cross-correlations are positive. Hasbrouck (1995) thus argues that different orderings can thus be used to determine upper and lower information share bounds. The range between the upper and lower bounds will depend on the degree of contemporaneous correlation across the components of ε_t , where the lower bound only considers a market's own contribution to the transient process while the upper bound also incorporates the correlation with all other markets as part of the information share. Given that the bounds often tend to be far apart, particularly in low frequency data as we here, Baillie et al (2002) argue that the means of the bounds can instead serve as a good indicator of the information share an insightful measure.

In comparing the information share by Hasbrouck (1995) to that by Gonzalo and Granger (1995) it is convenient to note that the Hasbrouck (1995) approach is closely related to the Stock and Watson (1988) common trend representation:

$$\mathbf{X}_t = \mathbf{f}_t + \mathbf{G}_t \quad (4)$$

Where \mathbf{f}_t is the common factor and \mathbf{G}_t the temporary component with no permanent effect on \mathbf{X}_t . Within Hasbrouck's (1995) context, \mathbf{f}_t is just $\delta\varepsilon_t$ while $\Psi^*(L)\varepsilon_t$ is equivalent of the the transient component \mathbf{G}_t . In contrast, Gonzalo and Granger (1995) assume the common factor of the prices to be $\mathbf{f}_t = \Gamma\mathbf{X}_t$, where Γ is the common factor coefficient vector. More specifically, Gonzalo and Granger (1995) assume that the permanent and transitory components consist of linear combinations of current values of X_t only and that there is no long-run Granger causality of \mathbf{G}_t on \mathbf{f}_t , so that the price series can be represented by:

$$\mathbf{X}_t = (\boldsymbol{\alpha}'\mathbf{1}\boldsymbol{\beta}\mathbf{1})^{-1}\boldsymbol{\alpha}'\mathbf{1}\mathbf{X}_t + \boldsymbol{\beta}\mathbf{X}_t = \boldsymbol{\lambda}\mathbf{X}_t + \boldsymbol{\beta}\mathbf{X}_t \quad (5)$$

where the first part of (5) is the permanent component, \mathbf{f}_t , and the second the transitory component \mathbf{G}_t . Once determined, $\boldsymbol{\lambda}_i$ can then be utilised as a measure of the share of information in market i .

It is insightful to consider how the two information share measures are related. Bailie et al (2002) note that in essence the main difference is that with the Hasbrouck (1995) measure the information share of a market is the proportion of variance that is

attributable to innovations in that market, while the Gonzalo and Granger (1995) measure decomposes the common factor into a combination of the prices.²⁸ Stated more intuitively by Baillie et al (2002), the latter measure assumes that the market that contributes most to innovation volatility is the one that has the greater share of the efficient price discovery, while the approach of the former ignores the correlation across markets but instead interprets the market that adjusts least to the (common) price movements in other markets as the one that has the leading role in the information sharing process. Recent efforts have been made to analyse and/or expand upon the previous works of Hasbrouck and the Gonzalo-Granger (Lien and Shresthra, 2009; Yan and Zivot, 2010), although these can be argued to still be in their preliminary stages.

The resultant analyses will add to the academic literature as it will provide a Caribbean perspective to this important topic in finance. It will also provide an opportunity to critically evaluate the efforts of regional policymakers, who have expounded upon the virtues of regional integration. When the first cross-listed stock came into existence during the late 1990's, it was seen as the first step towards true regional unification. It is theoretically supposed to be the catalyst for the implementation of a CARICOM stock exchange. The regional stock market is supposed to provide firms access to cheaper investment capital while providing investors an avenue for earning higher interest rates than what is being offered by less risky instruments (such as certificates of deposit). Any setbacks in the implementation process for the regional stock exchange could be damaging towards the realisation of a much grander ambition for policymakers: the CARICOM Single Market and Economy (the CSME). The next section shall now look at some of the empirical results achieved in this study.

4.2 *Data*

The sources of data for this essay were disparate and were representative of the breadth of the financial system. Firstly, various market data were gathered from each of

²⁸ In this regard, De Jong (2001) shows that the common factors of the Gonzalo and Granger (1995) measure are just normalized elements of the vector that defines the common factor underlying the Hasbrouck (1995) measure.

the respective stock exchanges' websites and other statistical sources. In order to evaluate the impact of cross-listings on the regional stock markets through the constructed statistical measures, corresponding market figures from 1994 to 2010 (where available) were collected based on a number of criteria such as market size, liquidity and depth. In terms of evaluating each of these respective indicators, the literature has indicated that indicators employed by Yartey and Adjasi (2007) tended to provide the best insight into the state of development that a stock market has attained. As such, this necessitated the collection of relevant market data such as the number of cross-listed companies that were listed on the BSE, the JSE and the TTSE; the year-end market capitalisations for the cross-listed securities on all three regional stock markets; the total year-end market capitalisations for each of the three regional stock markets; the volume of shares traded (calculated annually) for the cross-listed securities on all three regional stock markets; the total volume of shares traded (calculated annually) for each of the three regional stock markets; the value of shares traded (calculated annually) for the cross-listed securities on all three regional stock markets; the total value of shares traded (calculated annually) for each of the three regional stock markets as well as the annual Gross Domestic Product figures for Barbados, Jamaica and Trinidad and Tobago.²⁹ The Gross Domestic Product (G.D.P) data used in the calculation of various market indicators came from the World Bank for all of the years except 2010 due to its unavailability. As a consequence, the respective countries' estimated G.D.P. figures for 2010 were collected from the Central Intelligence Agency World Fact Book and employed in the analysis. These would then be used in developing augmented impact measures for the region's cross-listed securities.

Additionally, this essay will seek to investigate the trends in stock prices of the region's cross-listed companies on the three major CARICOM stock markets. This will be accomplished by the use of stock price graphs which will illustrate price movements from their respective dates of listing. The stock prices of the various securities were converted from the local currencies of the exchanges on which each company had placed a listing into U.S. currency. The U.S. selling rates of the three countries were used as the

²⁹ The relevant market data employed in the analysis was taken as at December 31 of each year.

conversion rates and were accessed via the Central Bank websites of each country. The conversions of the stock prices for the securities listed on the Barbados Stock Exchange were made significantly simpler due to that country's maintenance of its fixed exchange rate system.³⁰

4. *Empirical Analysis*

Impact Indicators of Cross-listed securities

The Grand Anse Declaration of 1989 was supposed to signal the onset of CARICOM equity market integration. However, the data seems to provide evidentiary support to the notion that regional companies were either slow in responding to this 'clarion call' or were hampered by other factors such as bureaucratic red tape. The first cross-listed security came five years after the Grand Anse Declaration.³¹ The Trinidad and Tobago Stock Exchange attracted its first cross-listing year later in 1995. It took the Barbados Stock Exchange nine years afterwards (in 1998) to attract a regional company onto its stock exchange. The reasons for the delay are unclear. Without conducting surveys of market participants, one is left in the realm of hypothesis and speculation. Some possible explanations could be the presence of bureaucracy in the implementation of regional policy on the national level, the costs associated with exchange listings and the possible trepidation of regional companies to engage in the cross-listing process due to the aforementioned costs, bureaucracy and its perceived viability.

5.1 *Market Size*

Number of companies

As one looks at the history of the region's stock markets, it becomes quite clear that the number of companies cross-listed on any one of the given exchanges has never exceeded twelve since the initiative's inception since 1989. Additionally, the highest number of companies listed as well as proportion of cross-listings to total company listings achieved regionally was a mere twenty two and twenty percent (20.4

³⁰ The conversion rate is BBD \$2 to USD \$1.

³¹ This was CIBC (West Indies) Holdings Limited, which was first listed on the Jamaican Stock Exchange in 1994.

%) respectively which was achieved in 2008. As at December 31st2009, this figure declined infinitesimally (19.8 %) and experienced a further decline in 2010 (19.23 %) despite the number of cross-listings remaining constant. Based on the overall body of evidence, one cannot help but feel slightly underwhelmed at the progress made when attempting to evaluate the cross-listing initiative of the CARICOM stock markets.

Trinidad and Tobago Stock Exchange has had the most “success” in attracting regional securities when taken from an individual perspective, as it had twelve (12) being listed on the exchange as at December 31st2010. This amounts to over fifty five percent of total cross-listed securities as at the same date. Indeed, the TTSE has seen this figure gradually increase from one solitary company in 1995. The BSE and the JSE were less successful in this regard. While the number of cross-listed companies has increased regionally, one facet that may give a reason for concern is the inability of the three exchanges to attract a significantly higher number of cross-listed securities and company listings, in general. This is especially true for the case of Jamaica. In fact, the Jamaican Stock Exchange had less cross-listed securities (4) than the Barbados Stock Exchange (5) as at December 31st2009 as well as 2010. This is in spite of its significantly greater trading volumes and market capitalisation. One possible explanation for such a disparity (which has not been substantiated in this paper) could be that the highly volatile Jamaican dollar has made this market highly unattractive to regional companies that are seeking equity capital for expansion. Another possible factor could be that the geo-political climate in Jamaica in previous was not conducive to attracting firms into establishing operations within their borders, thereby eliminating the need to seek out capital on their capital markets necessary to fund such significant investment projects. Table 1 below provides a list of the cross-listed securities that are or have been listed on any of the three subject markets throughout the lifetime of the cross-listing initiative and Table 2 compares the number of cross-listed securities listed on each of the three major regional stock exchanges as well as an aggregate regional figure from 1989 - 2010.

Table 1: List of CARICOM cross-listed companies

<i>Name of security</i>	<i>Barbados</i>	<i>Jamaica</i>	<i>Trinidad & Tobago</i>
Barbados Shipping and Trading Co. Ltd.	<i>Home</i>	Nil	Active
BCB Holdings Ltd. ³²	Nil	Nil	Active
Capital and Credit Financial Group Ltd.	Nil	<i>Home</i>	Active
Capital and Credit Merchant Bank Ltd.	Nil	<i>Home</i>	Active
FirstCaribbean International Bank Ltd. ³³	<i>Home</i>	Active	Active
Grace, Kennedy & Co. Ltd.	Active	<i>Home</i>	Active
Guardian Holdings Ltd.	Nil	Active	Home
Jamaican Money Market Brokers Ltd.	Active	<i>Home</i>	Active
Life of Barbados Ltd.	<i>Home (Delisted)</i>	Nil	Delisted
National Commercial Bank (Jamaica) Ltd.	Nil	<i>Home</i>	Active
Neal and Massey Holdings Ltd.	Active	Nil	<i>Home</i>
One Caribbean Media Ltd.	Active	Nil	<i>Home</i>
RBTT Financial Holdings Ltd.	Delisted	Delisted	<i>Home (Delisted)</i>
Sagicor Financial Corporation Ltd.	<i>Home</i>	Delisted	Active
Scotia Investments Jamaica Ltd. ³⁴	Nil	<i>Home</i>	Active
Supreme Ventures Ltd.	Nil	<i>Home</i>	Active
Trinidad Cement Ltd.	Active	Active	<i>Home</i>

Sources of data: Barbados, Jamaica and Trinidad & Tobago Stock Exchanges

³² BCB Holdings Limited is domiciled in Belize.

³³ This security was previously known as CIBC (West Indies) Holdings Limited.

³⁴ This security has undergone two name changes within the last five years. It was formerly known as Dehring, Bunting and Golding Limited and Scotia DBG Investments Limited before the latest change.

Table 2: Comparisons of number of cross-listed securities and company listings³⁵

Year	Barbados			Trinidad & Tobago			Jamaica			<i>Region</i>	
	No. of cross-listings	No. of listings	%	No. of cross-listings	No. of listings	%	No. of cross-listings	No. of listings	%	No. of cross-listings	No. of listings
1989	0	14	0.0	0	31	0.0	0	44	0.0	0	89
1990	0	13	0.0	0	30	0.0	0	44	0.0	0	87
1991	0	14	0.0	0	30	0.0	0	44	0.0	0	88
1992	0	15	0.0	0	28	0.0	0	48	0.0	0	91
1993	0	16	0.0	0	26	0.0	0	48	0.0	0	90
1994	0	19	0.0	0	27	0.0	1	50	2.0	1	96
1995	0	19	0.0	1	27	3.7	1	51	2.0	2	97
1996	0	19	0.0	1	23	4.4	1	50	2.0	2	92
1997	0	18	0.0	2	24	8.3	1	49	2.0	3	91
1998	2	20	10.0	3	25	12.0	1	47	2.1	6	92
1999	4	23	17.4	4	27	14.8	1	45	2.2	9	95
2000	4	22	18.2	4	29	13.8	2	44	4.6	10	95
2001	5	25	20.0	4	30	13.3	3	42	7.1	12	97
2002	5	24	20.8	4	30	13.3	4	40	10.0	13	94
2003	5	24	20.8	6	32	18.8	4	41	9.8	15	97
2004	4	26	15.4	8	34	23.5	4	40	10.0	16	100
2005	5	26	19.2	8	37	21.6	4	41	9.8	17	104
2006	6	27	22.2	9	38	23.7	4	44	9.1	19	109
2007	6	26	23.1	9	38	23.7	4	44	9.1 %	19	108
2008	6	24	25.0	11	39	28.2	5	45	11.1	22	108
2009	5	22	22.7	12	38	31.6	4	46	8.7	21	106
2010	5	25	20.0	12	37	32.4	3	42	7.1	20	98

³⁵There were de-listings on the Jamaican Stock Exchange, which occurred in 2008 (RBTT Financial Holdings Limited) and 2009 (Sagcor Financial Corporation Limited).

Sources of data: The Barbados, Jamaica and Trinidad & Tobago Stock Exchanges' websites and annual reports

Number of transactions

If one was to analyse the following three statistical measures³⁶ which are (i) the ratio of number of trades for cross-listed securities to the total number of trades on the exchanges, (ii) the ratio of volume of shares sold for cross-listed securities to the total volume of shares sold and (iii) the Turnover ratio for cross-listed securities; one cannot help but paint a grim picture of the efficacy of the cross-listing initiative. Data for the first indicator (i.e. the number of trades) proved difficult to obtain as the TTSE only had data available from 2005 onwards. Consequentially, the analysis involving this indicator shall focus on the period 2005-2010 for the BSE, the JSE and the TTSE. There seemed to be little demand for regional securities listed on the BSE as well as the JSE, while there was significantly greater demand on the TTSE. Over the 2005 – 2010 periods, the total number of trades for cross-listed securities represented approximately one percent (1 % and 0.8 % respectively) of the total number of transactions conducted on the Barbados and Jamaica exchanges. Meanwhile, cross-listed securities represented approximately thirty percent (30.1 %) of Trinidad's total number of transactions over the same period. Even in absolute terms, trading in cross-listed securities on the TTSE far outweighed those of the BSE and the JSE combined over the same period. The number of trades on the TTSE was 33,678 while the two other markets had a combined figure of 2,573.³⁷ This represents a huge disparity between the two figures, which seems to affirm this author's notion that strong nationalistic attitudes are in the forefront of the decisions of Barbadian and Jamaican investors.

Taken from a regional viewpoint, trading in cross-listed securities was approximately nine per cent (8.7 %) of total trading volume for the three countries. Trading in cross-listed securities on the TTSE represented approximately eight

³⁶ These can be argued contextually to be measures of demand for regional securities.

³⁷ See Figure 2 on page 18 for a breakdown of this statistic.

per cent(8.1 %) of the total trading volume for all three of the major regional stock markets. Meanwhile, those on the BSE and the JSE were a mere 0.6 per cent of total trading. What should be great concern to administrators is the fact that the number of trades over the last two years have been declining since recording mild gains from its 2007 totals in 2008. It may be too simplistic to suggest that the declines recorded during this time can be attributed mainly to the global financial crisis. It seems more plausible that the crisis simply reinforced any prevalent bias that regional investors from the respective countries previously had towards cross-listed securities, which is in line with this author's earlier declaration of strong nationalism in certain CARICOM territories. This seems to be the most logical conclusion that can be drawn for the JSE at the onset of the crisis (2008 – 2009). While the BSE and the TTSE experienced declines of approximately fifty per cent during that time frame, the decline for the JSE was calculated to be eighty four per cent. In 2010, it seemed that the attitude of Barbadian investors toward cross-listed securities may have deteriorated while those of the Jamaicans improved slightly. This can be argued to be evidenced by the severe drop in the number of transactions on the BSE as well as the increase experienced on the JSE. For a clearer illustration of the disparity in these two markets, one should look respectively at Table 3 and Figure 1 below.

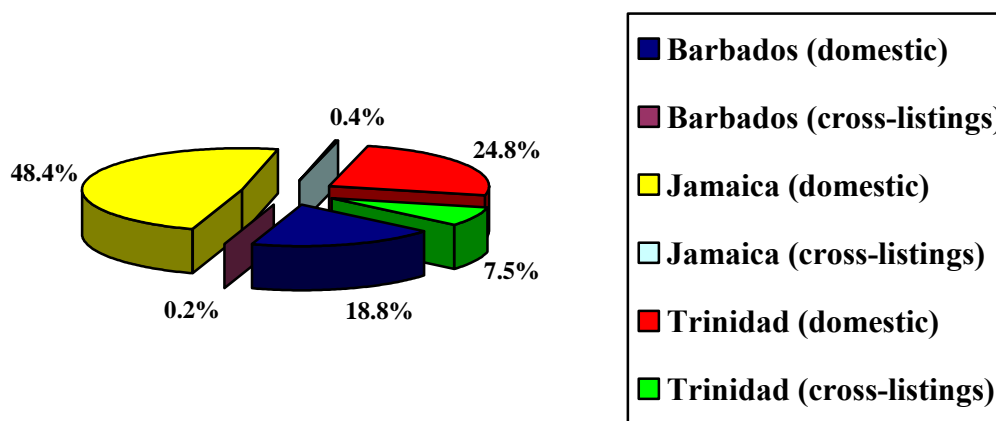
Table 3: Table showing the number of trades transacted on the BSE, JSE and TTSE(2005 -2010)

Year	Barbados			Jamaica			Trinidad and Tobago			All Three	
	No. of trades (cross-listings)	Total no. of trades	%	No. of trades (cross-listings)	Total no. of trades	%	No. of trades (cross-listings)	Total no. of trades	%	No. of trades (cross-listings)	Total no. of trades
2005	163	5,194	3.1	483	75,001	0.6	9,663	32,251	30.0	10,309	112,446
2006	165	67,195	0.3	376	41,921	0.9	6,388	21,024	30.4	6,929	130,140
2007	144	3,327	4.3	309	38,621	0.8	4,962	17,986	27.6	5,415	59,934
2008	253	5,306	4.8	377	30,330	0.6	6,798	22,283	30.5	7,428	57,919

2009	125	2,007	6.2	60	16,029	0.9	3,099	9,877	31.4	3,284	27,913
2010	39	1,839	2.1	79	18,341	0.4	2,768	8,496	32.6	2,886	28,676
Total	889	84,868	1.0	1,684	220,243	0.8	33,678	111,917	30.1	36,251	417,028

Sources of data: Barbados, Jamaica and Trinidad & Tobago Stock Exchanges and author's calculations

Figure 1: Proportions of number of transactions for cross-listings and domestic securities (2005 -2010)



Sources of data: Barbados, Jamaica and Trinidad & Tobago Stock Exchanges

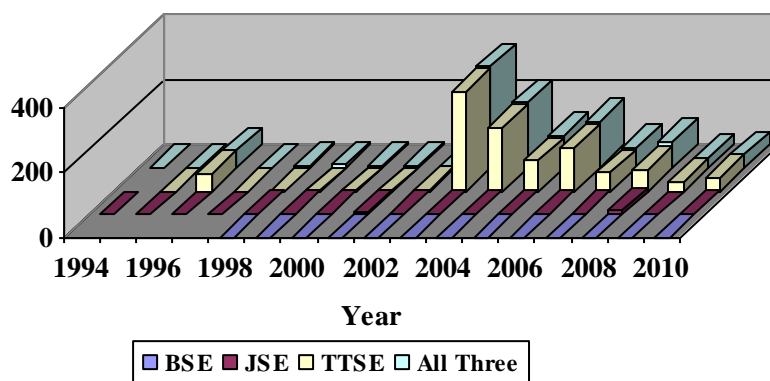
Volume of shares traded

The trend within the second indicator (i.e. the ratio of volume of shares sold for cross-listed securities to the total volume of shares sold) also lends credence to the notion that demand for regional securities by local investors was considerably muted within the Barbados and Jamaica Stock Exchanges. In the case of Barbados, the lifetime total of volume traded for cross-listed securities since their first cross-listing in 1998 represented less than one percent (0.95 %) of total market volume or approximately 9.89 million shares traded. The scenario in Jamaica is dramatically worse. Even though the lifetime total cross-listed trading volume in Jamaica was significantly greater than its corresponding figure in Barbados, it equates to a mere tenth of a percentage of total market volume (0.14 %) or a total of 52.58 million shares. The Trinidad stock market appears to be a more receptive environment for these securities as investors have readily purchased vast quantities of shares since the inception of the cross-border listing within

the region. Indeed, the volume of shares traded in cross-listed companies increased to 40.25 million in 2010 as opposed to 29.76 million in 2009. To further emphasize this point, total volume traded for cross-listed stocks on the TTSE was calculated to be approximately 953.11 million shares.

Taking these figures into context, this means that the market for cross-listed securities on the TTSE outperformed both the BSE and the JSE by a ratio of 15.26 to 1. Figure 4 below paints a clear illustration of this situation. One may be tempted to draw the conclusion that local investors in Trinidad are more open to investing in regional companies than its two CARICOM compatriots. Additionally, one may also be tempted to suggest that the trading patterns for regional cross-listings in Barbados and Jamaica are vestiges of the aforementioned strong nationalistic attitudes that have plagued the regional integration process since the days of the Federation of the West Indies.³⁸ While it would be premature to pronounce such acclamations as being valid since the data does not provide a breakdown of the nationalities for the investors for each exchange, one can probably draw such conclusions based on the prima facie evidence. For a more comprehensive overview of trading on the three regional stock exchanges, one can look at Figure 2 below.

Figure 2: Cross-listed volumes (in millions of shares) for the BSE, JSE, TTSE and All Three



³⁸ As discussed in Slepynova (1959), the Federation was viewed as a means of reinforcing Britain’s position within the region as well as a mechanism for coping with the growing “national-liberation movement” that was manifesting itself throughout the Caribbean.

Sources of data: Barbados, Jamaica and Trinidad & Tobago Stock Exchanges

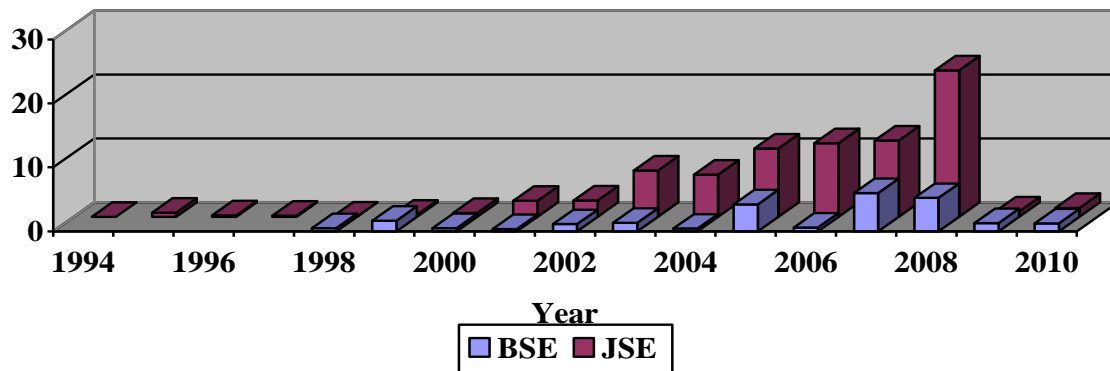
Value of shares traded

Further reinforcing the hypothesis that cross-listed securities were not (and arguably still are not) highly valued by regional investors are the low values of shares traded that were experienced by the three subject markets. Due to unavailability of pre-2003 data for the Trinidad and Tobago Stock Exchange, comparisons among the three regional markets will be restricted to the period 2003 – 2010. However, if one was to compare the values for the Barbados and Jamaica Stock Exchanges from the inceptions of their respective cross-listing initiatives, one would see markets with total traded values of USD \$24.49 million and USD \$80.19 million. The average traded values for the two exchanges were calculated to be USD \$1.88 million for the BSE (from 1998 – 2010) and USD \$4.72 million for the JSE (from 1994 – 2010) annually. Side-by-side comparisons of the two markets from 1998 – 2010 reveals that the market for cross-listed securities on the JSE appeared to be more robust than its Barbadian counterpart both in terms of total value traded as well as mean traded values. The JSE recorded total traded value of USD \$79.17 million as opposed to the BSE's aforementioned USD \$24.49 million. The mean traded value for the JSE was USD \$6.09 million whereas the BSE's was calculated to be USD \$1.88 million.

What is interesting to note is the disparity between the first four years of trading and the subsequent years in cross-listed securities on the JSE. The first four years amassed trading of USD \$1.02 million as opposed to USD \$79.17 million that occurred afterwards. While it can be unequivocally stated that the total traded values on the JSE was generally trending upwards until 2009, the same cannot be said when its proportion to total market values traded are examined. Generally, the JSE was essentially flat throughout its lifetime with little change. The BSE was slightly more volatile in both aspects. However, both markets never came close to crossing USD \$30 million in traded values and both generally had proportions that were substantially less than 10 percent of

total value of shares traded.³⁹The financial crisis seems to have had an impact on the total value of shares traded indicator. Figure 3 illustrates the total value of shares traded in cross-listed securities on the BSE and the JSE from 1994 – 2010, while Figure 4 illustrates the proportions of the value of shares traded for cross-listed securities to the total value of shares traded. As can be seen in Figure 3, the 2008 figure for the JSE represented a benchmark which was quickly followed by two consecutive periods of severely low traded values. Overall, the total value of shares traded for cross-listed securities represented 2.3 percent of total value of shares traded on the Barbados Stock Exchange while it represented only 1.37 percent on the Jamaica Stock Exchange. This would seem to suggest that cross-listed securities are not highly regarded in these two regional markets.

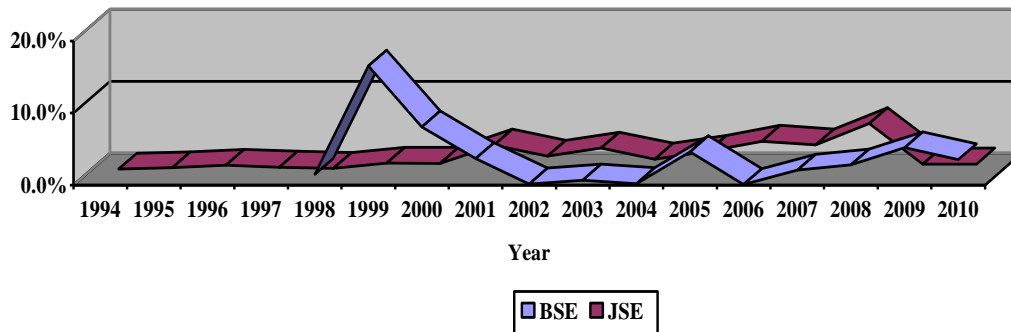
Figure 3: Total values traded (Cross-listings) for BSE and JSE (in millions of U.S. dollars) (1994 – 2010)



Sources of data: Barbados and Jamaica Stock Exchanges

³⁹The only time that the 10 per cent mark was surpassed occurred in 1999 when the BSE achieved a 16.53 per cent proportion for cross-listed traded values to total market value traded.

Figure 4: Proportion of Total Value traded (Cross-listings) to Total for BSE and JSE (1994 – 2010)

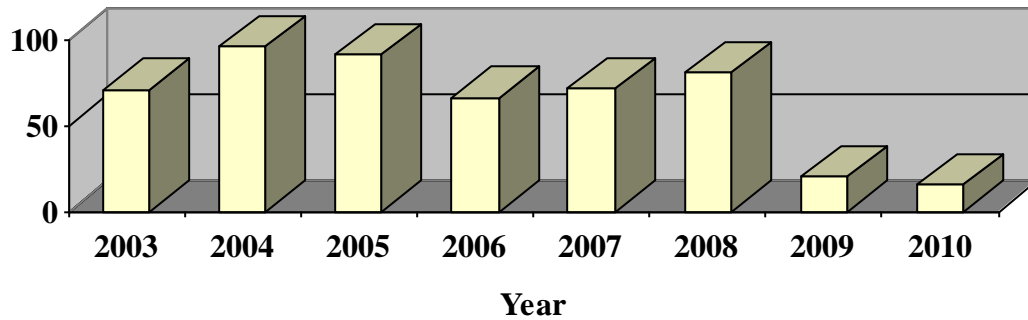


Sources of data: Barbados and Jamaica Stock Exchanges and author's calculations

In slight contrast, the TTSE had relatively more success in terms of its values of shares traded for its cross-listed securities. With the exception of 2009, the values of shares traded for its cross-listed securities have consistently crossed USD \$50 million since 2003. During this time period, the mean value of cross-listed securities traded was calculated to be USD \$71.2 million. This is remarkable when one compares this with its pre-financial crisis figure as it was only slightly higher with a mean value of USD \$79.58 million. When compared with the Barbados and Jamaica Stock Exchanges, the mean traded value for the TTSE's cross-listed securities was approximately six times higher than the combined means of both the BSE and the JSE. Additionally, the proportions of cross-listed traded values to total market values traded consistently ranged between 10 to 20 percent from 2003 – 2007. This indicator peaked in 2008 before experiencing a precipitous fall-off in 2009 while the global economy was deep in the throes of its recession. Pre-2009, the mean ratio for the TTSE was 18.22 per cent which subsequently fell to 16.89 percent. Based on this ratio, comparisons with the markets for cross-listed securities on the BSE and the JSE also indicate that they were substantially dwarfed by

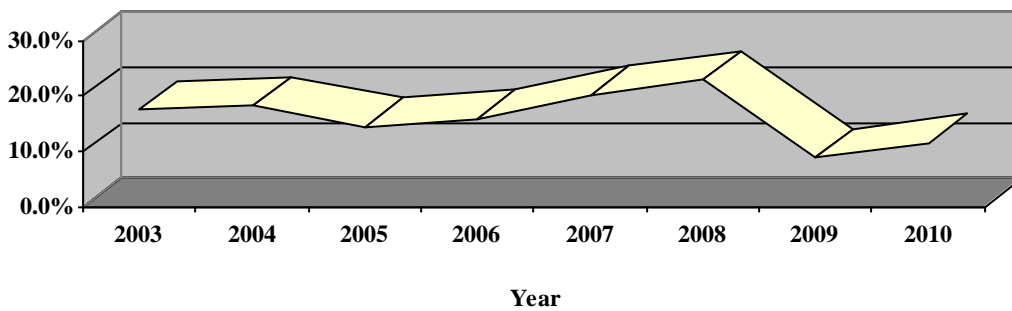
the TTSE. The mean ratio for the TTSE outsized the BSE's by a ratio of almost 8 to 1, while the JSE was outsized by a ratio of 5.6 to 1.

Figure 5: Total values of shares traded (Cross-listings) for TTSE (in millions of U.S. dollars) (2003 – 2010)



Sources of data: Trinidad & Tobago Stock Exchange

Figure 6: Proportion of Total Value of shares traded (Cross-listings) to Total for TTSE (2003 – 2010)



Sources of data: Trinidad & Tobago Stock Exchanges and author's calculations

Table 4: Comparison Statistics (Cross-listings) for the period 2003 –2010

Exchange	Mean value of shares traded for Cross-listed securities (in USD \$millions)	Ratio of cross-listed traded values to total market values traded
Barbados	2.54	0.97 %
Jamaica	9.14	2.93 %
Trinidad	64.27	16.8 %

Sources of data: Barbados, Jamaica and Trinidad & Tobago Stock Exchanges and author's calculations

5.2 Market Liquidity

Turnover Ratios

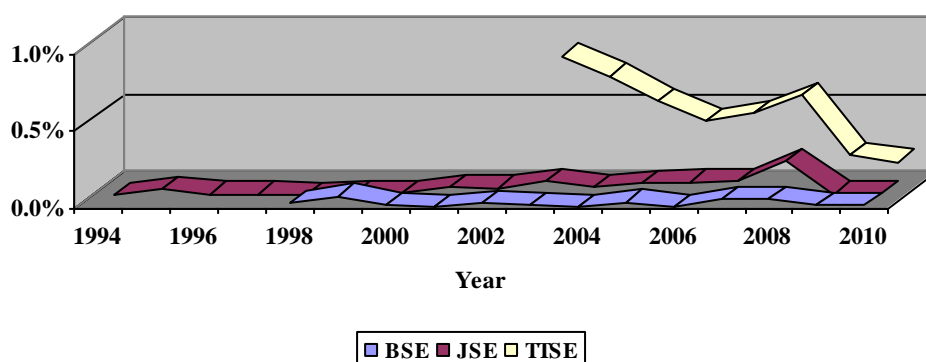
A major facet of a stock market's development is related to how efficiently market administrators can improve market liquidity mechanisms. Two statistical measures that are commonly used in the evaluation of a stock market's liquidity are the market turnover ratio and the value of shares traded ratio. The calculation of the turnover ratios for cross-listed securities can be viewed as an additional dimension on which the market depth and liquidity of a stock market can be further evaluated.⁴⁰ A cursory analysis of the data suggests that the implementation of the cross-listing initiative has done precious little to improve the liquidities of the respective stock markets which were noted to be highly illiquid.⁴¹ The ratios for the BSE and the JSE were minuscule with ratios of less than 0.01 percent throughout the sixteen year history of Caribbean cross-listings. The same can be said with cross-listings on the Trinidad and Tobago Stock Exchange. The turnover ratio for cross-listed securities on the TTSE since 2003 seems to provide credence to the notion that the cross-listing initiative has done little to improve its market liquidity. During the time period during which data was available, the average turnover ratio for TTSE's cross-listed securities was a meager 0.25 percent with a high of 0.83 percent in 2003. As a consequence, the demand for cross-listed securities regionally

⁴⁰ This relationship is highlighted in the IMF's Compilation Guide on Financial Soundness Indicators (2004).

⁴¹ See the empirical analysis for the regional market turnover ratios in "The Evolution of Stock Markets in the Caribbean: 1969 - 2010," p. 33 – 37.

seems to have been significantly suppressed due to the absence of the much-touted liquidity gains that were to be derived from the cross-listing of regional securities.

Figure 7: Cross-listed Turnover Ratios for the BSE, the JSE and the TTSE (1994 – 2010)



Sources of data: Barbados, Jamaica and Trinidad & Tobago Stock Exchanges and author's calculations

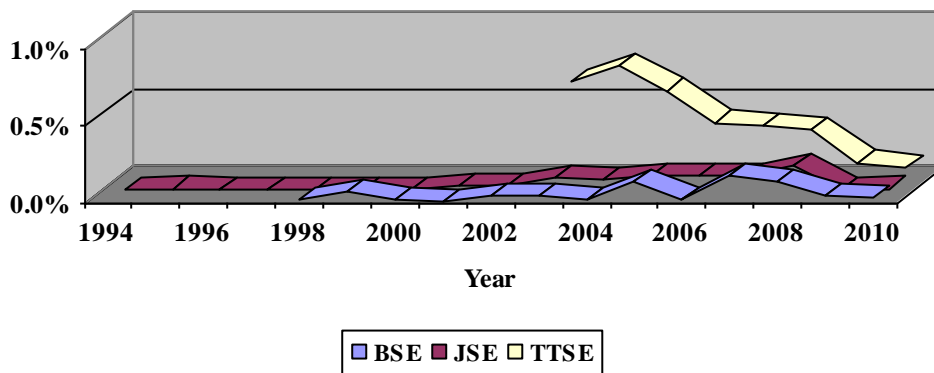
Value of shares traded ratio

The value of shares traded ratio for cross-listed securities is also essential in attempting to thoroughly evaluate the extent of a market's liquidity. It serves a similar role to the turnover ratio for cross-listed securities in that it adds a further dimension to the analysis of jurisdictional market liquidity. As noted by Mohtadi and Agarwal (2004) and further highlighted in the first chapter of this thesis,⁴² the value of shares traded ratio is a representation of market liquidity on an economy-wide basis. As such, one can naturally extend this logic to argue that the value of shares traded ratio for cross-listed securities reflects the impact that these securities have had on market liquidity and the economy at large. Figure 8 brings into stark realisation the ineffectiveness that has pervaded the cross-listing initiative throughout the major CARICOM stock markets. The ratios for the BSE and the JSE have been miniscule since the inceptions of their respective cross-listing initiatives with ratios never crossing the 0.2 % threshold. The cross-listed securities on the TTSE have fared no better. From 2004 – 2010, the total value of shares traded (cross-listings) ratios were on a consistent downward trend. More

⁴² See "The Evolution of Stock Markets in the Caribbean: From 1969 and beyond," p. 38.

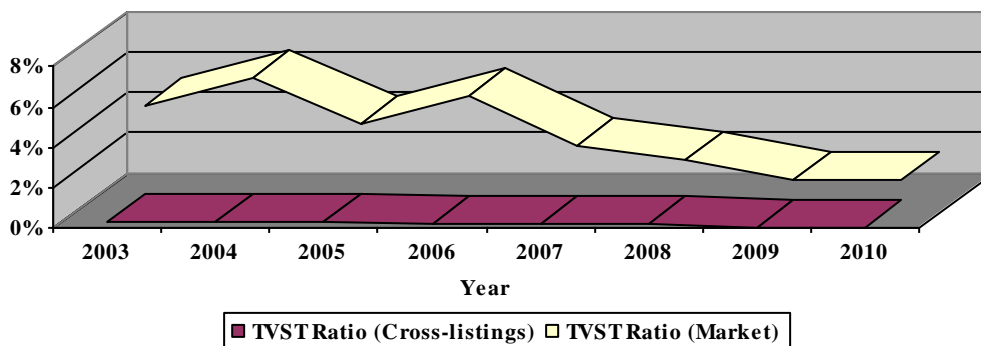
importantly, it never crossed the threshold of 0.8 per cent during that period. A comparative analysis of the total value of shares traded ratios for all three markets also highlights a similarly gloomy outlook. In a five year time frame (see Figure 9), the total value of shares traded for cross-listings ratios were consistently less than one per cent. This could hardly have been the envisioned outcome when CARICOM policymakers first enacted the Grand Anse Declaration back in 1989.

Figure 8: Total value of shares traded ratios for cross-listed securities (1994 – 2010)



Sources of data: Barbados, Jamaica and Trinidad & Tobago Stock Exchanges and author’s calculations

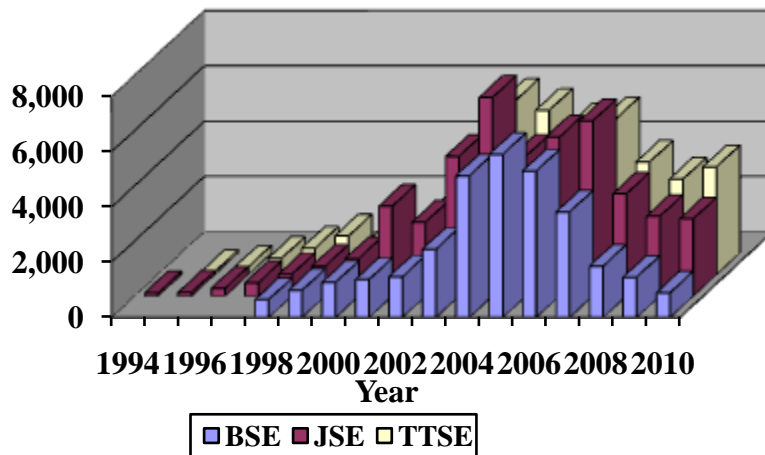
Figure 9: Total value of shares traded ratios (Regional) (2003 – 2010)



Sources of data: Barbados, Jamaica and Trinidad & Tobago Stock Exchanges and author’s calculations

With respect to the market capitalisations of cross-listed companies in the respective markets, they have tended to trend upwardly from 1994 to 2004. A brief period of flux (2005 – 2007) was immediately followed by the onset of the global financial crisis. Further evidence of the crisis’ impact on the regional stock markets can be gleaned from Figure 10, where the graph shows significant declines in market values of these securities in all three markets during this time frame. Cross-listed securities on the Barbados and the Jamaica Stock Exchanges were afflicted with precipitous declines, while those on the Trinidad and Tobago Stock Exchange were less pronounced declines. Despite this fact, cross-listed companies on the three major CARICOM stock markets lost over twenty one percent (21.4 %) of their marketvalues during the crisis. Separately, the BSE, the JSE and the TTSE each experienced declines in their cross-listed market capitalisations of 28.1 %, 25.1 % and 14 % respectively over the same period.

Figure 10: Chart of Cross-listed Market Capitalisations (in millions of U.S. dollars) (1994–2010)

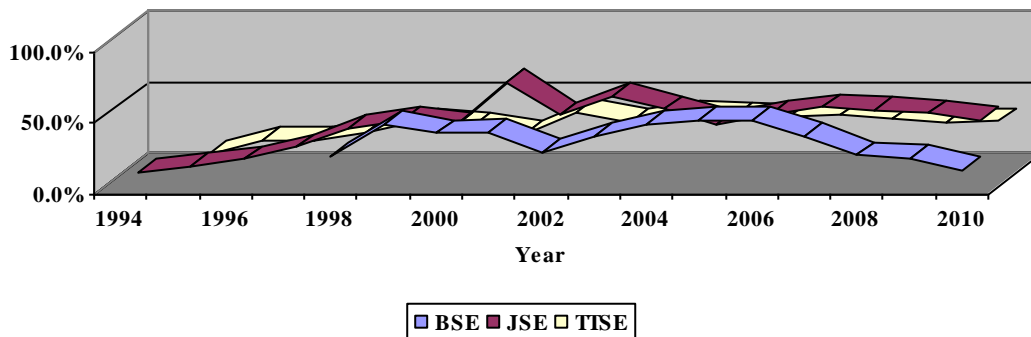


Sources of data: Barbados, Jamaica and Trinidad & Tobago Stock Exchanges

What is significant to note is the fact that the ratio of market capitalisations of cross-listed securities to its total capitalisation on the Trinidad & Tobago Stock Exchange was proportionately less than its Caribbean counterparts. On average, this ratio was calculated to be around twenty nine percent (28.98 %) with a geometric mean of twenty

seven percent (27.5 %) over the lifetime of its cross-listing initiative, as compared to Barbados (38.06 % and 36.18 %) and Jamaica (39.52 % and 34.01 %).⁴³ This seems to reinforce the earlier assertion that investors' preferences seem to tend towards investing in Trinidadian cross-listed companies. There may be a perception that the Trinidadian companies that are listed on the stock exchanges tend to possess sounder market fundamentals and operate in a more dynamic business environment at home. Additionally, many of these firms are conglomerates that have established operations in many of the islands within the Caribbean. This would have allowed them to build a significant amount of goodwill within the region. Consequently, this may be resulting in the higher stock prices that are being paid by the Barbadian and Jamaican investors because they perceive these securities to be financially viable and safe investment instruments. The cross-listings on the TTSE represent a plethora of choices to the discerning investor from the relatively discounted Jamaican securities to the more vaunted Barbados-domiciled financial and shipping shares. Figure 11 below gives a clearer illustration of the trends.

Figure 11: Trends in Cross-listing Market Capitalisation as a percentage of Total for the BSE, JSE and the TTSE



Sources of data: Barbados, Jamaica and Trinidad & Tobago Stock Exchanges and author's calculations

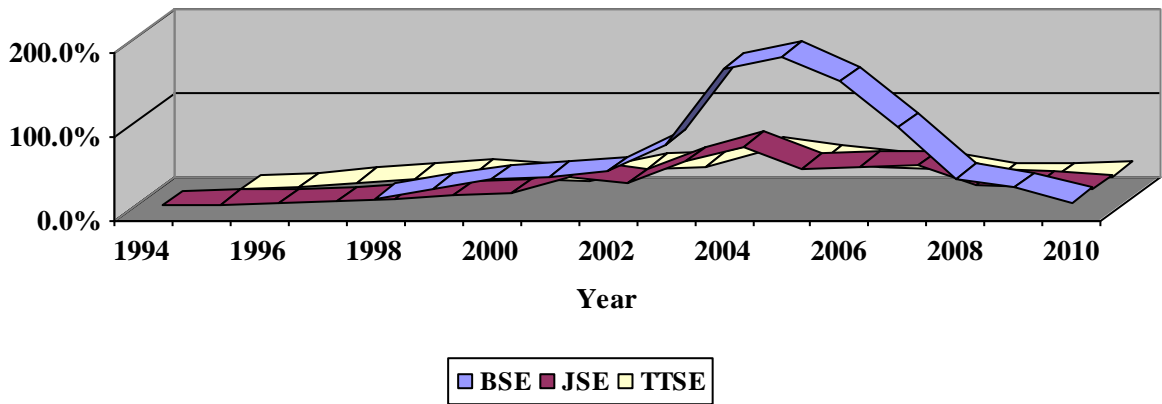
⁴³ Jamaica began cross-listing securities in 1994, Trinidad in 1995 and Barbados in 1998.

Following the logic that the Market Capitalisation ratio (MCR) is a statistical representation of the importance of the country's stock market to its economy,⁴⁴ the Cross-listing Market Capitalisation ratio (CMCR) can be interpreted to be an indication of the importance of its exchange's cross-listed securities to the vitality of that country's economic fortunes. The use of the traditional benchmark in the evaluation of MCRs seem to be appropriate as a CMCR over the 100 percent benchmark would indicate that the cross-listed securities are of great significance and that a downturn in the fortunes of the cross-listed securities would have a significant impact on that country's economic health. Figure 12 illustrates the relative importance of cross-listed securities on the BSE to the Barbadian economy during the period 2003 – 2007 as the CMCR was over the 100 percent threshold; reaching a maximum of close to 200 percent in 2005. However, that figure plummeted to around 50 percent in 2008 and was followed by subsequent declines in 2009 and 2010.

The likely explanations for this occurrence were the onset of the global financial crisis (and its associated impacts on investor confidence and stock prices) coupled with the delisting of RBTT Financial Holdings Limited. This company has a prominent economic presence in many of the Caribbean islands including Barbados. As such, its delisting likely would have significantly impacted the BSE as it represented one of its "marquee listings." Throughout its lifetime, the BSE has always had larger CMCRs than the JSE and the TTSE. In fact, the CMCRs of the BSE accelerated significantly from 2002 – 2005 while those from the JSE and the TTSE always seemed to be relatively flat with very few fluctuations throughout their respective lifetimes. Indeed, cross-listed securities on the JSE and the TTSE do not appear to be as important to these respective economies as evidenced by the relatively flat graphs in Figure 12. The fact that the CMCR ratios have barely crossed fifty percent (50 %) over the course of the cross-listing initiative also tends to lend credence to this notion. Overall, it can be argued that the cross-listed companies seemed to have had a minimalistic impact on the economies of the host jurisdiction(s) in which they have chosen to have their shares cross-listed.

⁴⁴This was noted in the first chapter of this thesis.

Figure 12: Trends in Cross-listing Market Capitalisation Ratios for the BSE, JSE and the TTSE



Sources of data: Barbados, Jamaica and Trinidad & Tobago Stock Exchanges

5.3 Stock Price Trends

Trinidad / Barbados Cross-Listings

For most of the securities that are or were cross-listed on the TTSE and the BSE (with the exceptions of British West Indies Airways Limited and One Caribbean Media Limited), the stock prices tended to trend upwardly until the onset of the global financial crisis. Afterwards, there were marked declines in their respective market prices. The range of prices varied between a little less than USD \$0.02 (in the case of British West Indies Airways Limited) to no more than USD \$10.00 (in the case of Neal and Massey Holdings Limited) on any given day. Interestingly, the graphical evidence (Figures 16 – 21) also seemed to denote a certain degree of co-integration between these markets as the graphs for these markets tended to mirror each other's movements throughout the respective time periods. The exceptions to this were British West Indies Airways Limited and One Caribbean Media Limited. As such, it stands to reason that there seems to be some degree of financial integration occurring within these two markets, though the exact nature of this relationship cannot be determined.⁴⁵ Of particular interest is the fact that the price graphs for the BSE also tended to be relatively flat with less volatility in its

⁴⁵ This will be investigated in the final chapter of this author's thesis.

movements, which seems to suggest that there were periods during which the prices of the securities remained constant on the BSE. The exception to this seems to be Sagicor Financial Corporation Limited, which is in keeping with market perception as the company is viewed as a leading light on the Barbados Stock Exchange and a major indicator of the overall health of the economy. The insurance giant has recorded significant trading volumes on both the TTSE and the BSE since its listing on both exchanges.

What is also evident from the graphs below is that there seemed to be significant opportunities for arbitrage as evidenced by the time periods in which there are gaps between the two graphs. This means simply that an investor could have theoretically purchased shares for one of these companies at a lower price on one market, then sell those shares at a profit on the other market. For example, let us take a look at the graph for Neal and Massey Holdings Limited. A glance at Figure 16 just before January 2010 would illustrate that the price (in U.S. dollars) had trended downwardly on the TTSE while its price on the BSE declined at a slower rate. This meant that investors could have capitalized on this price discrepancy from January to December 2010. This would also seem to suggest that the price discovery process between these two markets is not efficient as it seems that new information is not being incorporated quickly into the securities' closing prices. Indeed, this also seemed to be the case for the other securities with the aforementioned exception of British West Indies Airways Limited, as there are substantial gaps between the prices on the two stock exchanges. A fairly significant example would be One Caribbean Media Limited (see Figure 17), where these gaps are prevalent throughout the entire period of its listings.

However, one should note that there are certain operational aspects within these markets which would have limited such rent-seeking activities. For instance, one would only need to evaluate the case of British West Indies Airways Limited in order to demonstrate such instances. If this security was to be evaluated solely on its prima facie evidence (i.e. stock price graph), it would erroneously lead one to suggest that there were

significant arbitrage opportunities. However, trading in the security had been suspended for a significant amount of time in order to facilitate its takeover by the Government of Trinidad & Tobago. Consequentially, there would have been little to no opportunities to conduct any trading for this security, thereby severely restricting an investor's ability to capitalize on any available arbitrage opportunities. Additionally, its well-publicized cash flow and profitability issues would have also been significant deterrents to potential investors who would have sought to engage in such speculative rent-seeking activities. As such, one can argue that the price discovery process for British West Indies Airways Limited was effectively made irrelevant when the suspension of trading was enacted by the BSE and the TTSE. However, some investigation is required to ascertain the reason or reasons behind the price trends of One Caribbean Media Limited, as its patterns are contrary to the assertion that these two markets do indeed enjoy some degree of co-integration with each other.

Figures (13 – 18) – Stock price graphs for cross-listings on the BSE and the TTSE (1994 – 2010)

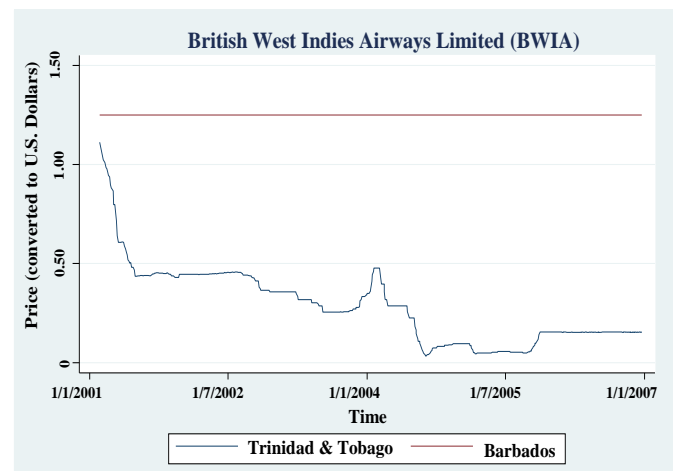
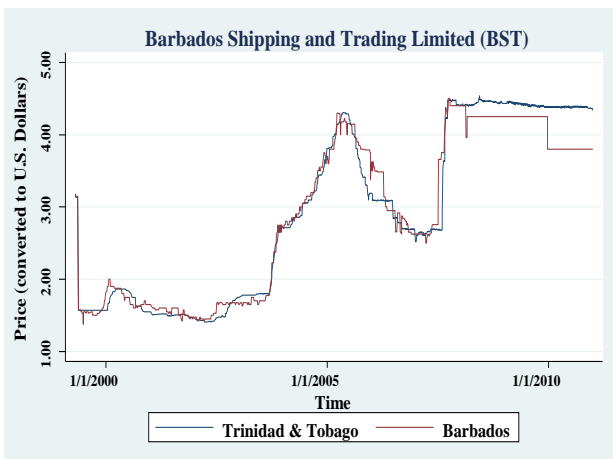


Figure 13: Barbados Shipping and Trading Limited **Figure 14: British West Indies Airways Limited**

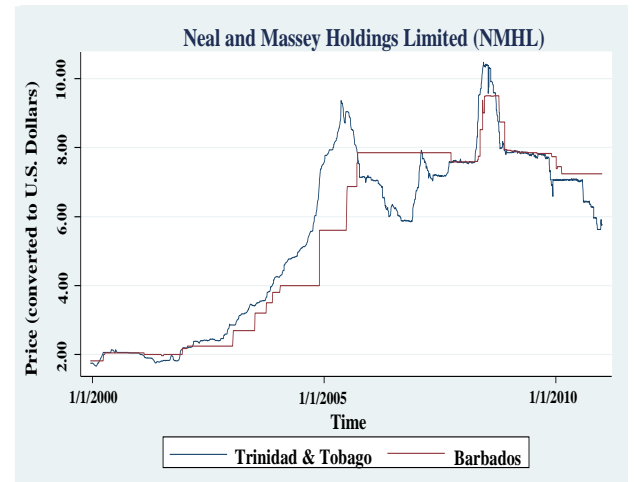
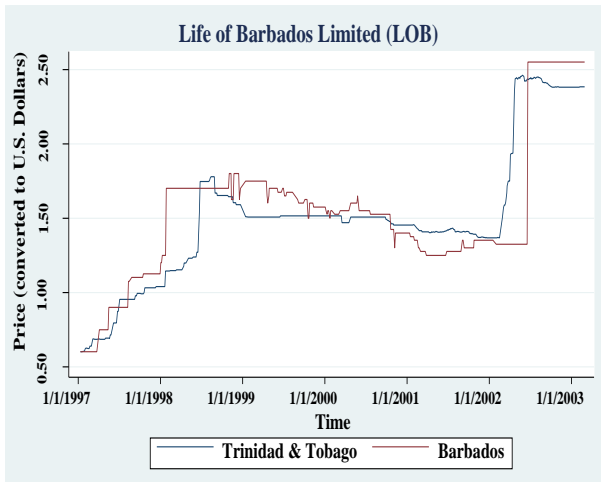


Figure 15: Life of Barbados Limited **Figure 16: Neal and Massey Holdings Limited**

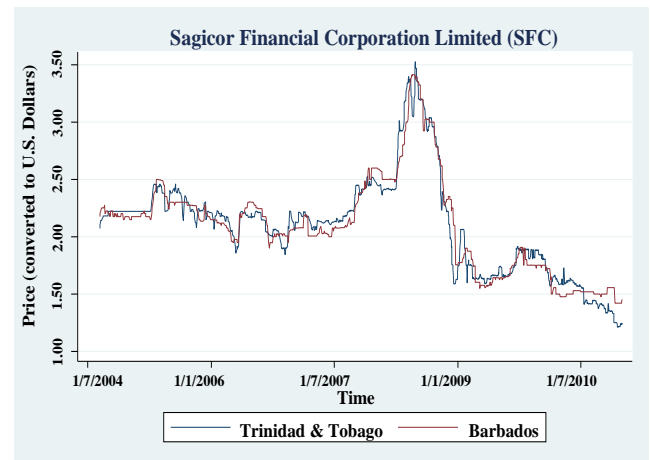
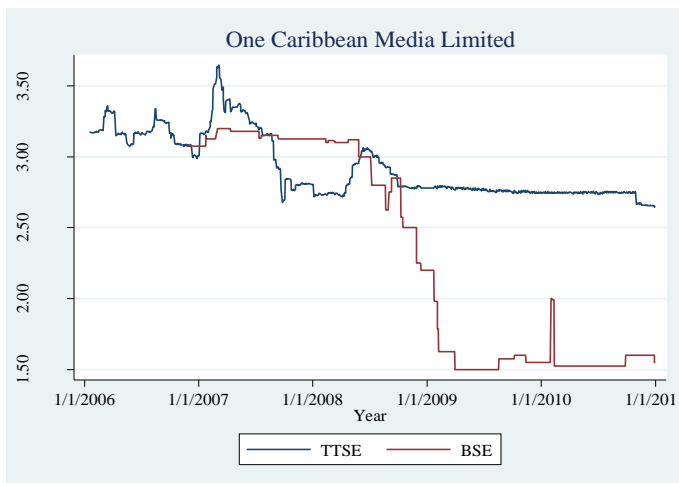


Figure 17: One Caribbean Media Limited **Figure 18: Sagikor Financial Corporation Limited**

Sources: Barbados and Trinidad & Tobago Stock Exchanges

Trinidad / Jamaica Cross-Listings

Based on the graphical evidence illustrated below (i.e. Figures 22 – 26), there appears to be a certain degree of co-integration being demonstrated by four of the five

companies that are listed on the JSE and the TTSE.⁴⁶ In particular, there were very few discrepancies between the market prices on the TTSE and the JSE for Capital & Credit Financial Group Limited and National Commercial Bank of Jamaica Limited (Figures 22 and 24 respectively). This was especially the case for Capital & Credit Financial Group Limited during the initial stage of its cross-listing (i.e. from July 2003 to approximately the first half of 2008). As a consequence, the argument could be made that market information from the home jurisdictions for these particular companies were being efficiently incorporated into their share prices on the TTSE. This did not mean that there were not any opportunities for speculative arbitrage-based investments. Indeed, one glance at the graph for Capital & Credit Financial Group Limited would show that there were significant arbitrage opportunities shortly after the first quarter of 2008 until the end of 2010. The graph suggests that if one was able to purchase a significant number of shares on the TTSE, those shares could have then been sold for a sizeable profit on the JSE. There remained a fairly significant gap between the company's market prices on the JSE and the TTSE during the first quarter of 2008 to December 31, 2010. Before then, there were other periods during which investors could have benefited from arbitrage-based opportunities such as July 2003 and July 2006.

In the case of Scotia Investments Jamaica Limited (see Figure 22), there seemed to be a notable divergence away from an efficient price discovery process that was displayed during its early days of cross-listing on the TTSE. From 2005 to mid-2008, its stock prices on the JSE and the TTSE appeared to mirror each other, which seem to be congruent with thinking that there was an efficient price discovery process. However, the aforementioned divergence occurred shortly afterwards. There was little volatility in its TTSE-listed price which seems to suggest that there was either little trading occurring or that the local investors believed that the security was trading at its true equilibrium price. For Supreme Ventures Limited (see Figure 23), the price graph seemed not to follow any discernible patterns of trading on either the JSE and the TTSE. As such, it leads to the

⁴⁶ Supreme Ventures Limited does not appear to be co-integrated based upon prima facie graphical evidence. The hypotheses that the cross-listed securities of the region are co-integrated will be examined in the Co-integration Analysis section of this paper.

inference that there is little to no co-integration occurring for this security. Its price on the TTSE appeared to have gone through four periods of trading ranges with little changes in price, while its price on the JSE appeared to be very volatile. Surprisingly, its price on its home jurisdiction (the JSE) was less than its host jurisdiction (the TTSE) on many occasions. However, these price differences were miniscule but they did represent opportunities for investors who wished to benefit from this. In addition, the price discovery for this company can be argued to be highly inefficient when based on analysis of the graphical evidence.

When compared to its Jamaican counterparts, Guardian Holdings Limited represented the most expensive among those who were listed on the TTSE and the JSE. Indeed, its share price rose appreciably during its first three years of the cross-listing initiative, especially on the JSE where it was traded at approximately USD \$8.00 per share. This also represented a tremendous opportunity for investors who wished to profit as its price on the TTSE was significantly lower. Therefore, one can argue that the price discovery process for the lone TTSE-based representative does not appear to be as efficient as Capital & Credit Financial Group Limited and National Commercial Bank of Jamaica Limited (i.e. the companies whose processes looked to be apparently efficient). Indeed, there were several areas of divergence between the prices of the two markets on which it was listed and, as a consequence, there were several opportunities for arbitrage that can be discerned from its stock price graph. As such, the presence of such opportunities should be viewed as evidence of an inefficient price discovery process (see Figure 20). Most recently, the stock price has been trending downwards, most likely as a result of the lack of investor confidence brought about by the global financial meltdown and the resultant recession that affected the region.

Figures (19 – 23) – Stock price graphs for cross-listings on the JSE and the TTSE (1994 – 2010)

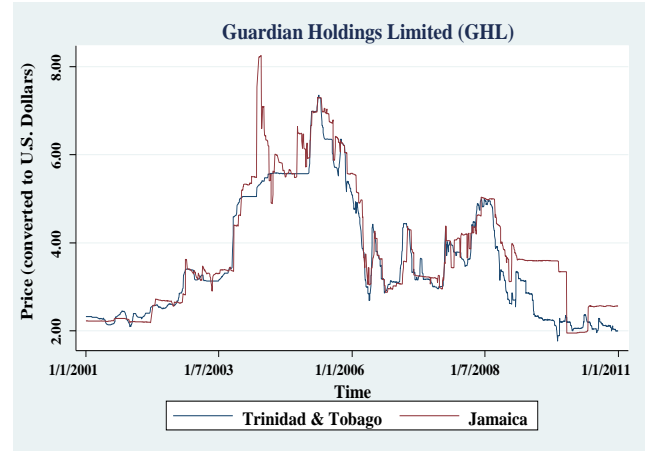
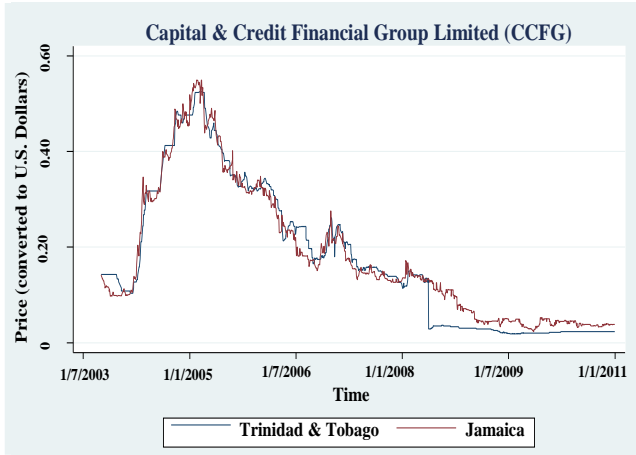


Figure 19: Capital & Credit Financial Group Limited

Figure 20: Guardian Holdings Limited

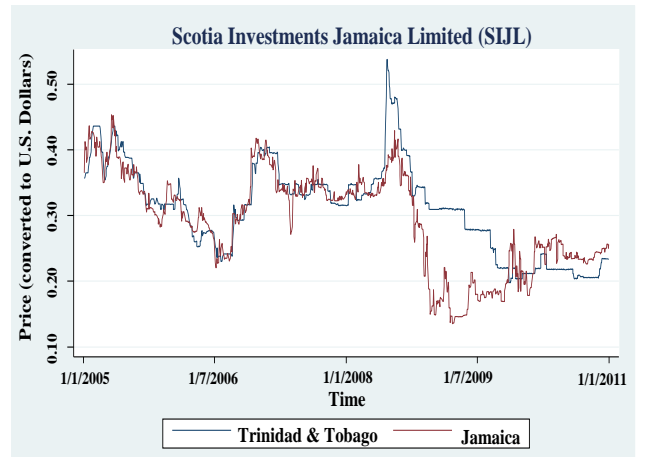
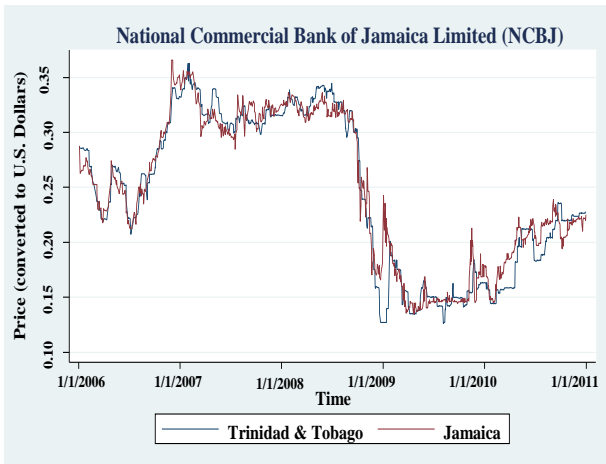


Figure 21: National Commercial Bank of Jamaica Limited

Figure 22: Scotia Investments Jamaica Limited

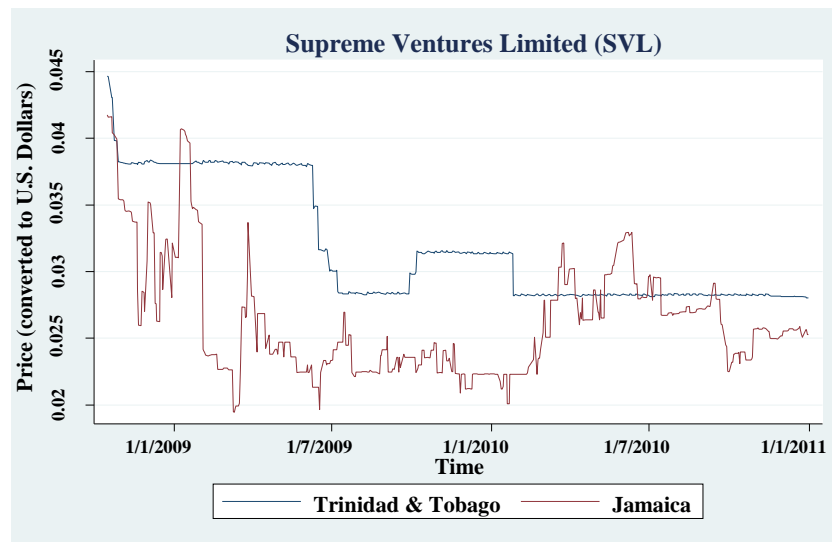


Figure 23: Supreme Ventures Limited

Sources: Jamaica and Trinidad & Tobago Stock Exchanges

All three stock exchanges

With respect to securities that are listed on all three of the major regional stock exchanges, it is interesting to note that the currently listed three market companies are not among the market leaders in terms of price as they all trade below the USD \$3 mark. Prior to its delisting, RBTT Financial Holdings Limited would have represented the exception to this phenomenon. Furthermore, there are no discernible trending patterns in the various stock prices that can be deduced from the various graphs. The prices of GraceKennedy Limited, RBTT Financial Holdings Limited and Trinidad Cement Limited trended upwardly from early to mid-2000. Their prices on the BSE also displayed little volatility as evidenced from the flat periods on their price graphs. This may suggest that there was a surfeit of trading and that Barbadian investors possibly had a bias against these regionally-based companies. As for FirstCaribbean International Bank and Jamaican Money Market Brokers Limited, their respective price graphs appeared to be anomalous to the other companies among this grouping. Indeed, the home markets of these two companies followed similar trending patterns to those that occurred on the TTSE. Furthermore, it can be argued that there appeared to be a certain degree of co-integration

between the prices of these two securities listed on the TTSE with its prices on their respective home jurisdictions based upon the graphical evidence. However, their prices on the third exchange tended to diverge away from those trending patterns. A look at Figure 24 shows that FirstCaribbean International Bank tended to trade primarily at a discount on the JSE when compared to its other two listings. The only time that this was not the case was during the latter part of 2007 to the first half of 2008. Interestingly, its price traded at the same level as the security's prices on the BSE and the TTSE. In the case of Jamaican Money Market Brokers Limited (see Figure 26), the security traded at a significant premium on the BSE than it was traded on the JSE and the TTSE. Additionally, there were also significant flat periods, which one can insinuate that there was very little trading occurring for this security on the BSE.

This would suggest that there were significant arbitrage opportunities that could have been capitalized upon by investors with respect to these two companies. Indeed, this was the case for the almost the entirety of the time that FirstCaribbean International Bank and Jamaican Money Market Brokers Limited were listed on the three regional exchanges. As stated earlier, these aforementioned opportunities were deemed (and argued) to be evidence of weak price discovery processes. While the price discovery process between the respective companies' home jurisdictions and the TTSE appeared to be relatively stable, it appears to be break down when the company listed on a third regional stock market. There was usually a wide divergence between the stock prices on the third market and the prices of the other markets. This is apparent for all of the non-TTSE based companies based on their respective stock price graphs. The divergence in the stock prices among the three markets for TTSE-based companies was not as pronounced as the previous grouping. This may allude to a greater sense of confidence towards investing in TTSE based companies by regional investors. Greater insight will be gained in Section 5.5 when the price discovery processes of the three markets are analysed through the use of the Information Share Analytical Tests (i.e. the Hasbrouck Estimation test and the Gonzalo-Granger test).

Figures (24 – 28) - Stock price graphs for cross-listings on the BSE and theTTSE(1994 – 2010)

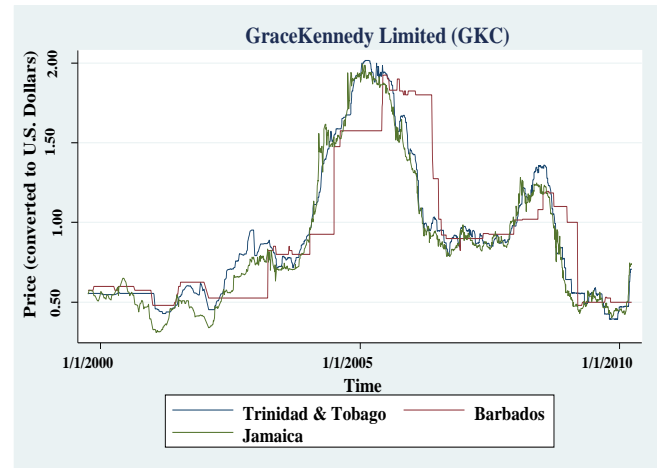
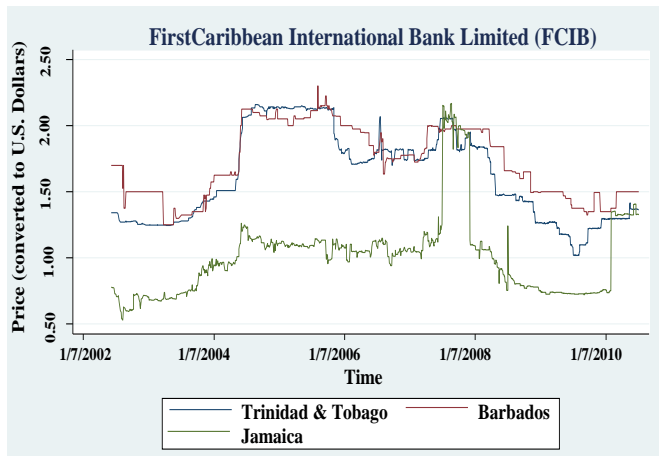


Figure 24: FirstCaribbean International Bank Limited **Figure 25: GraceKennedy Limited**

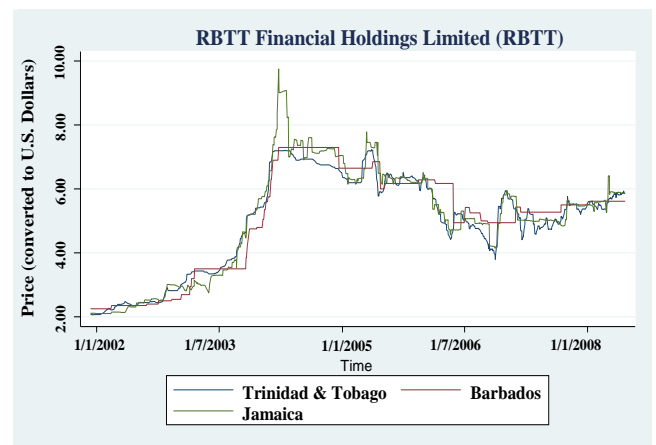
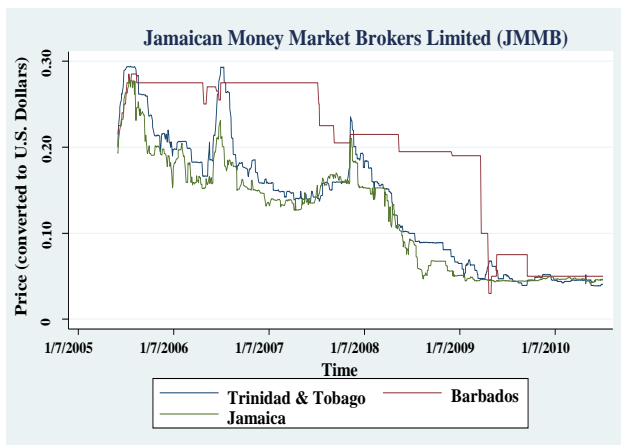


Figure 26: Jamaican Money Market Brokers Limited **Figure 27: RBTT Financial Holdings Limited**

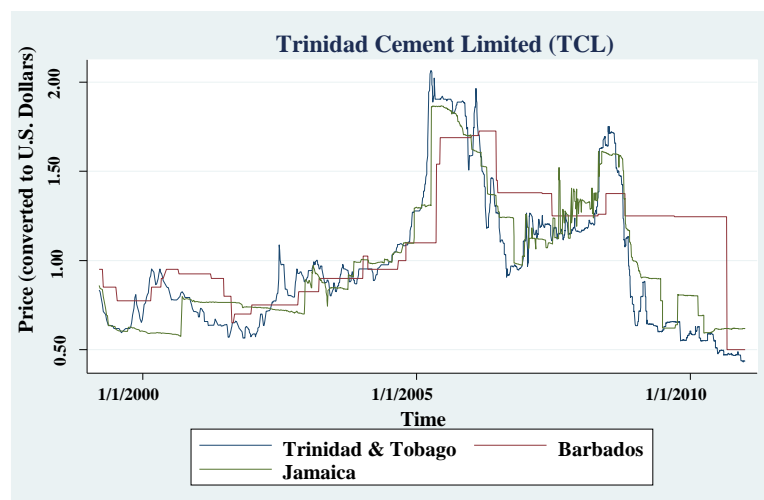


Figure 28: Trinidad Cement Limited

Source: Barbados, Jamaica and Trinidad & Tobago Stock Exchanges

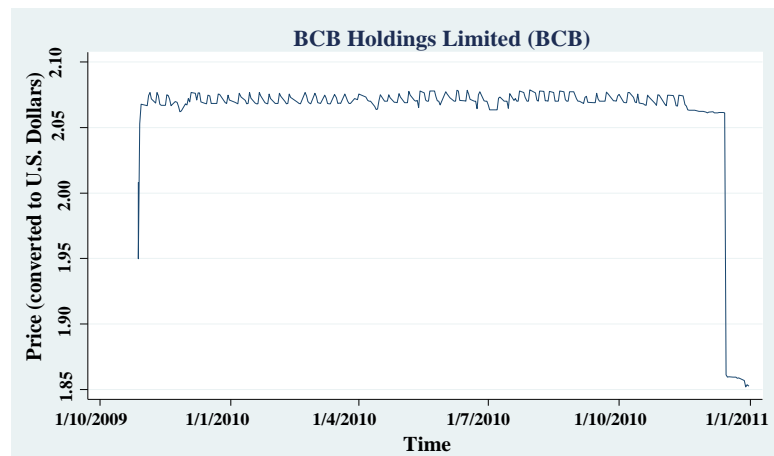
The Case of BCB Holdings Limited

Before analyzing the degree of co-movement in the prices of cross-listed securities, mention should be made of BCB Holdings Limited. This company represented a bit of an anomaly within the CARICOM capital markets as it is the only cross-listed security whose home jurisdiction is not within one of the three major CARICOM stock markets. In addition, the company is also currently listed on only one of the subject markets (i.e. TTSE). A member of the vibrant financial services component of the TTSE, BCB Holdings Limited's principal subsidiaries includes the Belize Bank Limited, the British Caribbean Bank Limited and the British Caribbean Bank International Limited.⁴⁷ Figure 29 shows a significant reduction in its market value towards the end of 2010. Indeed, this represented a precipitous decline of close to U.S. \$0.20. The stock price ended the year at U.S. \$1.85, before which, it seemed to operate within a trading range between U.S. \$2.06 and U.S. \$2.08. This represented a decline of nearly ten per cent (10%) in the company's market value. One could argue that the timing of its listing was mistimed as it occurred during the height of the malaise that had affected many of the

⁴⁷ This information can be seen at the Corporate Profile on the company's website: <http://www.bcbholdings.com/corporate-profile.html>

global capital markets with the TTSE being no exception. Almost all of the global capital markets suffered significant losses in security prices and market capitalisations. The global economies also suffered significant setbacks as evidenced by the recessionary characteristics experienced in a number of countries as well as the preponderance of austerity measures that were implemented. As such, it would not be a stretch the imagination to conclude that this combination of factors would have impacted the success of its listing. Still, it begs the question of whether the global financial crisis and its preponderance of aftershocks were the primary culprit for such a drastic decline in stock price or were the fundamental weaknesses in the company's organizational structure and market strategy to blame. This paper does not seek to launch any such inquest into the operations of BCB Holdings Limited, but simply to hopefully provide a platform for future research questions such as why they have not listed on the BSE and the JSE.

Figure 29: Stock price graph (TTSE) for BCB Holdings Limited



Source: Trinidad and Tobago Stock Exchange

5.4 *Co-integration analysis of the three major CARICOM stock markets*

Conducting a co-integration analysis on the regional cross-listed securities represents an important aspect of evaluating the overall development of the region's stock markets. Sanchez Valle (1998) noted that stock prices were anticipated to have long-run relationships in an integrated world equity market and that these relationships were indicators of the presence of common stochastic trends among the indices. Furthermore, Madura (1992) and Sanchez Valle (1998) both stated that various underlying economic factors due to its global influence on capital markets can cause stock prices to exhibit co-movement.⁴⁸ It can be argued that one of the more important goals for regional policymakers is the creation of an integrated regional capital market. Thus, this analysis provides the means for evaluating the degree to which the markets have become integrated. The first stage of the analysis focused on the companies that were cross-listed on the TTSE and the BSE. STATA statistical analysis software was used to conduct Dickey-Fuller Unit Root tests in order to investigate the null hypothesis of the presence of a unit root existed for this grouping of securities. Table 6 presents the results of the Unit Root Tests which suggested that one cannot reject the null hypothesis that there is a unit root for all of the companies that were cross-listed on the BSE and the TTSE for the respective timeframes during the cross-listing initiative (1994 – 2010).

Once the Dickey-Fuller tests were completed, the Johansen's tests for co-integration were conducted (again via STATA) for the aforementioned cross-listed companies on the TTSE and the BSE. Based on the results derived (as can be seen in Table 7), one cannot reject the null hypotheses that there exists at least one co-integrating relationship between the two stock markets for all the companies except One Caribbean Media Limited. In the case of One Caribbean Media Limited, the null hypothesis is

⁴⁸ These include such factors as market deregulation and liberalisation, technological developments in communications and trading systems, innovation in financial products and services as well as increased activities by multinational corporations. Sanchez Valle also highlighted the impact that international investors have on this issue.

rejected since its trace statistic is lower than the 1 % and the 5 % critical values. Among the companies for which the null hypothesis could not be rejected, only Neal and Massey Holdings Limited had two co-integrating relationships based upon the results of the analysis. The two tests were not done for British West Indies Airways Limited because of its flat price graph and its resultant stationarity for the TTSE. One may be led to infer from the results that the BSE and the TTSE may not be as co-integrated as policymakers would like them to be. However, this cannot be definitively stated until further research is conducted.

Table 5: Interpolated Dickey-Fuller Unit Root Analysis Results for cross-listed stocks on the TTSE and the BSE

Name of security	Test Statistic	Interpolated Dickey-Fuller			MacKinnon approximate p-value
		1% Critical Value	5% Critical Value	10% Critical Value	
Two markets (TTSE, BSE)					
Barbados Shipping and Trading Co. Ltd. (TTSE)	-0.550	-3.430	-2.860	-2.570	0.8820
Barbados Shipping and Trading Co. Ltd. (BSE)	-1.020	-3.430	-2.860	-2.570	0.7461
Life of Barbados Ltd. (TTSE)	-0.808	-3.430	-2.860	-2.570	0.8166
Life of Barbados Ltd. (BSE)	-1.418	-3.430	-2.860	-2.570	0.5738
Neal and Massey Holdings Ltd. (TTSE)	-2.289	-3.430	-2.860	-2.570	0.1756
Neal and Massey Holdings Ltd. (BSE)	-1.836	-3.430	-2.860	-2.570	0.3625
One Caribbean Media Ltd. (TTSE)	-1.430	-3.430	-2.860	-2.570	0.5676
One Caribbean Media Ltd. (BSE)	-0.931	-3.430	-2.860	-2.570	0.7776
Sagicor Financial Corporation Ltd. (TTSE)	-0.437	-3.430	-2.860	-2.570	0.9038
Sagicor Financial Corporation Ltd. (BSE)	-0.533	-3.430	-2.860	-2.570	0.8854

Legend: *1 –1 % confidence level, *5 –5 % confidence level, *10 –10 % confidence level

Source: Results from STATA statistical software using stock price data from the BSE and the TTSE

Table 6: Results from Johansen’s co-integration tests for cross-listed stocks on the TTSE and the BSE

Name of security	Maximum rank	Johansen’s tests for co-integration				
		Eigenvalue	Trace Statistic	1% Critical	5% Critical	N
Two markets (TTSE, BSE)						

				Value	Value	
Barbados Shipping and Trading Co. Ltd.	0	-	21.4570	20.04	15.41	
	1	0.01180	0.6692	6.65	3.76	
	2	0.00038				
Life of Barbados Ltd.	0	-	16.1263	20.04	15.41	
	1	0.02637	1.3737	6.65	3.76	
	2	0.00249				
Neal and Massey Holdings Ltd.	0	-	54.1193	20.04	15.41	
	1	0.02916	4.4547	6.65	3.76	
	2	0.00265				
One Caribbean Media Ltd.	0	-	6.5626	20.04	15.41	
	1	0.00655	0.9521	6.65	3.76	
	2	0.00111				
Sagicor Financial Corporation Ltd.	0	-	71.9889	20.04	15.41	
	1	0.05861	0.4818	6.65	3.76	
	2	0.00041				

Source: Results from STATA statistical software using stock price data from the BSE and the TTSE

The second stage of analysis focused on the companies that were cross-listed on the TTSE and the JSE. As presented in Table 8, the Dickey-Fuller tests tended to suggest that the null hypothesis of the existence of a unit root could not be rejected for all of the companies listed except Supreme Ventures Limited. This is line with this author's assertions that the markets for Supreme Ventures Limited did not appear to be co-integrated based on the graphical evidence obtained during this study. If one was to look at the results for Supreme Ventures Limited, its results for the TTSE show that this is the case at the 5 % and 10 % confidence levels but not at the 1 % level. All of the other companies can be argued to possess a unit root. The Johansen's co-integration analysis results highlighted some interesting outcomes. The use of the Dickey-Fuller Test is usually performed as a prerequisite that must be satisfied before the Johansen's co-integration test is employed. The results outlined in Table 9 seem to suggest that one cannot reject the null hypothesis that there is at least one co-integrating relationship for all of the companies that were cross-listed on the TTSE and the JSE during the time period being studied, including Supreme Ventures Limited. This would seem to suggest a certain degree of co-integration occurring between the Jamaican and the Trinidad and

Tobago stock markets, which is congruent with the observations that were made from the graphical evidence earlier in Section 5.3 of this paper.

Table 7: Interpolated Dickey-Fuller Unit Root Analysis Results for cross-listed stocks on the TTSE and the JSE

<i>Two markets (TTSE, JSE)</i>	<i>Test Statistic</i>	<i>1% Critical Value</i>	<i>5% Critical Value</i>	<i>10% Critical Value</i>	<i>MacKinnon approximate p-value</i>
Capital and Credit Financial Group Ltd. (TTSE)	-0.416	-3.430	-2.860	-2.570	0.9074
Capital and Credit Financial Group Ltd. (JSE)	-0.851	-3.430	-2.860	-2.570	0.8037
Guardian Holdings Ltd. (TTSE)	-0.820	-3.430	-2.860	-2.570	0.8131
Guardian Holdings Ltd. (JSE)	-1.868	-3.430	-2.860	-2.570	0.3470
National Commercial Bank (Jamaica) Ltd. (TTSE)	-1.106	-3.430	-2.860	-2.570	0.7126
National Commercial Bank (Jamaica) Ltd. (JSE)	-1.608	-3.430	-2.860	-2.570	0.4798
Scotia Investments Jamaica Ltd. (TTSE)	-1.266	-3.430	-2.860	-2.570	0.6445
Scotia Investments Jamaica Ltd. (JSE)	-2.312	-3.430	-2.860	-2.570	0.1682
Supreme Ventures Ltd. (TTSE)	-3.256	-3.430	-2.860	-2.570	0.0170
Supreme Ventures Ltd. (JSE)	-4.240	-3.430	-2.860	-2.570	0.0006

Legend:*1 – 1 % confidence level, *5 – 5 % confidence level, *10 – 10 % confidence level

Source: Results from STATA statistical software using stock price data from the JSE and the TTSE

Table 8: Results from Johansen's co-integration tests for cross-listed stocks on the TTSE and the JSE

<i>Two markets (TTSE, JSE)</i>	<i>Maximum rank</i>	<i>Eigenvalue</i>	<i>Trace Statistic</i>	<i>1% Critical Value</i>	<i>5% Critical Value</i>	<i>Number of cointegrating vectors</i>
Capital and Credit Financial Group Ltd.	0	-	48.6397	20.04	15.41	
	1	0.03612	0.3050	6.65	3.76	
	2					
Guardian Holdings Ltd.	0	-	48.4274	20.04	15.41	

	1	0.02735	1.8950	6.65	3.76
	2	0.00113			
National Commercial Bank (Jamaica) Ltd.	0	-	68.2655	20.04	15.41
	1	0.06517	1.3477	6.65	3.76
	2	0.00136			
Scotia Investments Jamaica Ltd.	0	-	18.7116	20.04	15.41
	1	0.01322	3.5670	6.65	3.76
	2	0.00313			
Supreme Ventures Ltd.	0	-	27.6191	20.04	15.41
	1	0.03847	6.6691	6.65	3.76
	2	0.01241			

Source: Results from STATA statistical software using stock price data from the JSE and the TTSE

The final stage of this analysis centred on the six companies that are or have been cross-listed on all three of the major regional stock exchanges at one stage during the life of the region's cross-listing initiative. Based on the empirical results derived from the Dickey-Fuller tests (see Table 9), it leads one to not reject the null hypothesis of there being the existence of a unit root. This can be argued for most of the companies involved at all three levels of confidence. The only exception is FirstCaribbean International Bank Limited, for which this can only be argued at the 1 % and 5 % confidence levels. When one takes into account the results from the Johansen's test for co-integration (see Table 10), all of the companies can be argued to possess at least one co-integrating relationship as one cannot reject the null hypothesis for each of the companies studied within this grouping. Interestingly, two of these companies (GraceKennedy Limited and RBTT Financial Holdings Limited) were observed to possess at least two co-integrating relationships based on the results of the Johansen's test. Indeed, one could further postulate that all of the markets for these two companies were co-integrated with each other at a 5 % level of confidence. Yet, one cannot argue the case for full co-integration of the markets for these two companies as the results at the 1 % confidence level suggest

that there are only two co-integrating relationships for the aforementioned companies. Based on the empirical analysis outlined below, it can be argued that there is indeed some co-integration occurring for companies that are/were cross-listed on all three stock exchanges. However, the home jurisdiction of the company may be argued to be a factor in determining the strength of these relationships. One is led to this conclusion based on the observation that the TTSE-based companies each possessed at least two co-integrating relationships while only one of the two JSE-based and none of the BSE-based companies enjoyed this status. Nonetheless, the small population size being studied cannot lead this author to declare any authoritative statements on this matter, but there is evidence which suggests that may indeed be the case.

Table 9: Interpolated Dickey-Fuller Unit Root Analysis Results for cross-listed stocks listed on all three exchanges

<i>Three markets (BSE, JSE, TTSE)</i>	<i>Test Statistic</i>	<i>1% Critical Value</i>	<i>5% Critical Value</i>	<i>10% Critical Value</i>	<i>MacKinnon approximate p-value</i>
FirstCaribbean International Bank Ltd. (TTSE)	-0.928	-3.430	-2.860	-2.570	0.7785
FirstCaribbean International Bank Ltd. (BSE)	-1.537	-3.430	-2.860	-2.570	0.5150
FirstCaribbean International Bank Ltd. (JSE)	-2.733	-3.430	-2.860	-2.570	0.0685
Grace, Kennedy & Co. Ltd. (TTSE)	-0.875	-3.430	-2.860	-2.570	0.7962
Grace, Kennedy & Co. Ltd. (BSE)	-1.170	-3.430	-2.860	-2.570	0.6863
Grace, Kennedy & Co. Ltd. (JSE)	-1.203	-3.430	-2.860	-2.570	0.6723
Jamaican Money Market Brokers Ltd. (TTSE)	-0.819	-3.430	-2.860	-2.570	0.8136
Jamaican Money Market Brokers Ltd. (BSE)	-0.164	-3.430	-2.860	-2.570	0.9427
Jamaican Money Market Brokers Ltd. (JSE)	-1.341	-3.430	-2.860	-2.570	0.6101
RBTT Financial Holdings Ltd. (TTSE)	-2.199	-3.430	-2.860	-2.570	0.2068
RBTT Financial Holdings Ltd. (BSE)	-2.027	-3.430	-2.860	-2.570	0.2747
RBTT Financial Holdings Ltd. (JSE)	-1.984	-3.430	-2.860	-2.570	0.2935
Trinidad Cement Ltd. (TTSE)	-0.716	-3.430	-2.860	-2.570	0.8426
Trinidad Cement Ltd. (BSE)	-1.043	-3.430	-2.860	-2.570	0.7372
Trinidad Cement Ltd. (JSE)	-1.498	-3.430	-2.860	-2.570	0.5343

Source: Results from STATA statistical software using stock price data from the BSE, the JSE and the TTSE

Table 10: Johansen's co-integration test results for cross-listed stocks on the BSE, the JSE and the TTSE

<i>Three markets</i>	<i>Maximum</i>	<i>Eigenvalue</i>	<i>Trace Statistic</i>	<i>1% Critical</i>	<i>5%</i>
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<i>(BSE, JSE, TTSE)</i>	<i>rank</i>			<i>Value</i>	<i>Critical Value</i>
FirstCaribbean International Bank Ltd.	0	-	45.6119	35.65	29.68
	1	0.02438	11.4314	20.04	15.41
	2	0.00717	1.4669	6.65	3.76
	3	0.00106			
Grace, Kennedy & Co. Ltd.	0	-	153.4167	35.65	29.68
	1	0.08108	33.4242	20.04	15.41
	2	0.02044	4.1144	6.65	3.76
	3	0.00290			
Jamaican Money Market Brokers Ltd.	0	-	51.7275	35.65	29.68
	1	0.03759	14.1022	20.04	15.41
	2	0.01321	1.0402	6.65	3.76
	3	0.00106			
RBTT Financial Holdings Ltd.	0	-	101.2633	35.65	29.68
	1	0.06797	39.8103	20.04	15.41
	2	0.03959	4.5473	6.65	3.76
	3	0.00520			
Trinidad Cement Ltd.	0	-	80.5406	35.65	29.68
	1	0.03711	18.9075	20.04	15.41
	2	0.00927	3.7348	6.65	3.76
	3	0.00229			

Source: Results from STATA statistical software using stock price data from the BSE, the JSE and the TTSE

5.5 Price Discovery Analysis for the regional markets

As highlighted by Lien and Shresthra (2009), one of the fundamental questions in finance pertains to the question of whether price reflects the fundamental value of a security. It is generally accepted that the price of a security in a well-functioning and efficient market would be equal to its fundamental value, and that the only reason why new information would not be instantaneously impounded into the price would be due to the existence of market imperfections such as transaction costs, information asymmetry, and regulations. They further noted that the process in which the information gets reflected in the price becomes even more interesting if there are more than one market where the same security or very similar securities trade. As such, there would be considerable interest in determining which market reflected the new information first. Garbade and Silber (1983) and later Lien and Shresthra (2009) identified this interest as

the main driving force behind the concept of dominant and satellite markets. Lien and Shresthra (2009) further noted that in the case of multiple listing in multiple countries, it would be desirable to identify whether the price discovery occurred within the security's domestic or foreign markets. As such, it is based on this premise that this paper seeks to analyze the price discovery process for the three major regional stock exchanges in order to determine which of the three markets tended to reflect new market information first and whether any of these are dominant or satellite markets.

When one analyses the results of the tests conducted on the group of companies listed on the BSE and the TTSE (as seen in Table 11), it is easy to discern that the TTSE appears to be the first market in which new market information is incorporated into their respective prices. The results from the Hasbrouck measure would seem to indicate that the TTSE accounted for as little as sixty per cent (60.4 %) and as much as ninety seven per cent (96.6 %) of the price discovery process for each of the companies in this grouping, while the range for the BSE was between three to forty per cent. The evidence is even starker for the results from the Gonzalo-Granger test as it would seem to suggest that the TTSE accounted for anywhere between sixty nine per cent (69.2 %) to ninety per cent (90.2 %). It should be noted that two of the four companies in this group are based in Barbados, which means that the price discovery processes for these companies are not emanating from its home jurisdiction. Indeed, these results give the impression that the TTSE is the dominant market and the BSE is the satellite market when it comes to these companies' price discovery processes. One possible explanation for this phenomenon could be that these companies had a strong business presence within Trinidad and were consequentially well-known to the country's investor base. However, this cannot be substantiated unless one was to investigate the root causes of such a phenomenon within the financial markets themselves.

Table 11: Hasbrouck and Gonzalo-Granger Test Results for cross-listings on the BSE and the TTSE

Security	Origin	Hasbrouck (TTSE)	Hasbrouck (BSE)	Gonzalo-Granger	Gonzalo-Granger
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				(TTSE)	(BSE)
Barbados Shipping and Trading Co. Ltd.	BSE	0.876	0.123	0.853	0.147
Life of Barbados Ltd.	BSE	0.930	0.069	0.902	0.098
Neal and Massey Holdings Ltd.	TTSE	0.966	0.034	0.871	0.129
One Caribbean Media Ltd.	TTSE	0.604	0.395	0.692	0.308
Sagicor Financial Corporation Ltd.	BSE	0.873	0.127	0.716	0.284

Source: Results from MATLAB statistical software using stock price data from the BSE and the TTSE

In terms of analyzing the companies that are listed on the JSE and the TTSE (see Table 12 for details); the results of the two measures seem to be indicative of the dominance of the home market in their price discovery processes. The lone TTSE-based representative (Guardian Holdings Limited) was observed to have a Hasbrouck measure of 0.968 for the TTSE and 0.032 for the JSE. This meant that the TTSE accounted for nearly ninety seven per cent of the process. In this event, the TTSE is clearly the dominant market when it comes to price discovery for this security. When one looks at the results for the JSE-based companies, a large percentage of the process appears to be accounted for by the JSE. For instance, the JSE accounted for approximately sixty four per cent of the discovery process for Capital & Credit Financial Group Limited according to the Hasbrouck measure. These figures are substantially larger for the National Commercial Bank of Jamaica Limited and Scotia Investments Jamaica Limited, which has the JSE accounting for approximately eighty nine and ninety four per cent respectively. Supreme Ventures Limited, however, maintains its reputation of being an anomaly as its Hasbrouck estimation has the TTSE accounting for approximately ninety one per cent of its price discovery process. The results from the Gonzalo-Granger estimations also yielded some intriguing observations. It also highlighted the anomalous nature of Supreme Ventures Limited with an even stronger measure of 0.924, which meant that the TTSE was clearly the dominant market. The essence of the processes for Guardian Holdings Limited, National Commercial Bank of Jamaica Limited and Scotia Investments Jamaica Limited were maintained as the home markets were observed to be the major source of the price discovery. However, the strengths of the processes were observed to be not as robust as they were when the Hasbrouck estimation was utilized as each security experienced declines of 2.8 per cent (GHL), 19.1 per cent (NCBJ) and 21.4

per cent (SIJL) respectively. Furthermore, there was a reversal in the price discovery process for Capital & Credit Financial Group Limited under Gonzalo-Granger as the TTSE was observed to explain about 52 per cent of the process. This represents an increase of sixteen per cent from its corresponding Hasbrouck measure. The reason for this reversal could be partially due to the difference in methodologies between these measures. However, the difference is substantial and may more likely be as a result of unsubstantiated market factors which were undetectable in one of the methodologies.

Table 12: Hasbrouck and Gonzalo-Granger Test Results for Stocks on the JSE and the TTSE

Security	Origin	Hasbrouck (TTSE)	Hasbrouck (JSE)	Gonzalo-Granger (TTSE)	G
Capital & Credit Financial Group Ltd.	JSE	0.358	0.642	0.515	
Guardian Holdings Ltd.	TTSE	0.968	0.032	0.936	
National Commercial Bank of Jamaica Ltd.	JSE	0.114	0.885	0.306	
Scotia Investments Jamaica Ltd.	JSE	0.056	0.944	0.270	
Supreme Ventures Ltd.	JSE	0.909	0.091	0.924	

Source: Results from MATLAB statistical software using stock price data from the JSE and the TTSE

The Hasbrouck and Gonzalo-Granger measures for many of the securities cross-listed on the three major regional exchanges seem to suggest that the JSE and the TTSE appear to be the dominant markets in terms of leading the regional price discovery process. However, there are some anomalies which have proven to be difficult to explain. There is no clear cut trend which denotes the dominance of the home market in the process. This could be due to the multifaceted operations and customer bases of these companies, which enables them to operate in many of the regional territories. The revenues are not solely dependent on its home market. The main surprise was the results derived for FirstCaribbean International Bank Limited. According to these observations, it can be inferred that its home jurisdiction had very little influence in its price discovery process. Furthermore, there were differences between the estimates derived from the Hasbrouck and the Gonzalo-Granger measures. Indeed, there is a significant variance (of 35 per cent) between the Hasbrouck estimate for the TTSE and its corresponding Gonzalo-Granger estimate. The bulk of this variance seemed to be transferred to the GG

measure for the JSE. This highlighted the influence of the JSE in this company's process, which seems to be congruent with the historical context of the security. Despite being based in Barbados, its earlier incarnation (C.I.B.C. Holdings Limited) was the first company to cross-list in the region with the JSE being its first choice of destination. Thus, it can be argued that Jamaican investors have become well acquainted with this security. However, one cannot say that this is the definitive reason for this result.

A further look at Table 13 would detail a similar occurrence for Jamaica Money Market Brokers Limited to the scenario for FirstCaribbean International Bank Limited. Additionally, the TTSE apparently played a significant role in the price discovery processes of GraceKennedy Limited, RBTT Financial Holdings Limited as well as Trinidad Cement Limited. The Hasbrouck measure had the TTSE accounting for thirty nine per cent (9 %) of GraceKennedy's process, forty one per cent (41 %) for RBTT Financial Holdings, and forty per cent (40 %) for Trinidad Cement Limited. Meanwhile, the Gonzalo-Granger estimates for the aforementioned three companies were fifty eight (58 %), thirty six (36 %) and seventy one per cent (71 %) respectively. What is evident from these figures was the importance of the BSE in the process for GraceKennedy Limited and RBTT Financial Holdings Limited. These were the only two cross-listed companies which possessed estimations of over twenty per cent (20 %) for both tests, although Trinidad Cement Limited had the highest Hasbrouck measure for the BSE among any of the companies being studied.

Table 13: Hasbrouck and Gonzalo-Granger Test Results for Stocks on all three markets

Security	Origin	Hasbrouck (TTSE)	Hasbrouck (BSE)	Hasbrouck (JSE)	Gonzalo-Granger (TTSE)	Gonzalo-Granger (BSE)
FirstCaribbean International Bank Ltd.	BSE	0.470	0.067	0.462	0.120	0.111
GraceKennedy Ltd.	JSE	0.387	0.439	0.173	0.577	0.201
Jamaica Money Market Brokers Ltd.	JSE	0.492	0.020	0.486	0.108	0.104
RBTT Financial Holdings Ltd.	TTSE	0.410	0.375	0.213	0.359	0.252
Trinidad Cement Ltd.	TTSE	0.450	0.504	0.045	0.713	0.096

Source: Results from MATLAB statistical software using stock price data from the BSE, the JSE and the TTSE

5.6 Overall Impact

The overall assessment of the cross-listing initiative can be surmised in stark detail by perusing the results of Table 14. The average annual percentage changes in many of the region's vital market statistics denoted a significant number of negative trends during the period of the region's cross-listing initiative on the three major regional stock exchanges. The BSE were observed to possess positive average annual percentage changes for only two of its market indicators (i.e. volume and value of shares sold), and this was directly attributable to the heightened trading activities that characterized the acquisition of Barbados Shipping and Trading Limited by Neal and Massey Holdings Limited during this time frame. However, the impact of the BSE's cross-listed securities on its overall performance can be argued to be minimalistic in nature due to relatively low average annual proportion figures as seen in the aforementioned Table 14. The same can be hypothesized for the JSE as its market data paint a relatively similar scenario. Indeed, the only positive aspect that can be reasoned in favour of the initiative's success in these two countries is that each of these markets' capitalizations would have posted significantly lower losses than what was recorded. The TTSE represents a paradox due to its relative success (albeit modest) in attracting cross-listings from companies across the region. It was the only exchange that had evidence of gains in the average annual percentage change in its year end market capitalization, which should occur due to the number of cross-listings that have entered this market. However, other vital market indicators such as the number of transactions, the volume and value of shares sold all experienced declines in its percentage changes over the time frame of the cross-listing initiative unlike the CARICOM counterparts. Indeed, the TTSE suffered double digit regressions in each of these categories is significant in terms of evaluating whether the initiative can be definitively categorized as a success or a failure. Based on the evidence gathered, one may be forced to argue that the cross-listing initiative has not performed to expectations.

Table 14: Table of Vital Market Statistics (Average Annual Percentage Change)

Market Data (BSE) (1987 – 2010)	Pre-Grand Anse Declaration (Inception – 1988) Average Annual Percentage Change (%)	Transition Period (1989 – 1993) Average Annual Percentage Change (%)	Tim listi (19 Ave Perce
a) No. of Transactions	6.14%	(17.98%)	(
<i>Proportion (Cross-listings)</i>	N/A	N/A	
b) Volume of Shares Sold (000)	52.28%	12.14%	
<i>Proportion (Cross-listings)</i>	N/A	N/A	
c) Value of shares traded (in Millions of U.S. dollars)	24.50%	(5.58 %)	
<i>Proportion (Cross-listings)</i>	N/A	N/A	
d) Year-end Market Capitalization as at December 31 (in Millions of U.S. dollars)	14.13%	(6.93%)	(
<i>Proportion (Cross-listings)</i>	N/A	N/A	
e) No. of companies listed	(0.51 %)	(2.03 %)	(
<i>Proportion (Cross-listings)</i>	N/A	N/A	
Market Data (JSE) (1969 – 2010)	Pre-Grand Anse Declaration (Inception – 1988) Average Annual Percentage Change (%)	Transition Period (1989 – 1993) Average Annual Percentage Change (%)	Tim listi (19 Ave Perce
a) No. of Transactions	12.17 %	74.68%	(
<i>Proportion (Cross-listings)</i>	N/A	N/A	
b) Volume of Shares Sold (000)	49.13 %	89.24%	
<i>Proportion (Cross-listings)</i>	N/A	N/A	
c) Value of shares traded (in Millions of U.S. dollars)	50.79 %	129.94%	(
<i>Proportion (Cross-listings)</i>	N/A	N/A	
d) Year-end Market Capitalization as at December 31 (in Millions of U.S. dollars)	14.72 %	40.98%	(
<i>Proportion (Cross-listings)</i>	N/A	N/A	
e) No. of companies listed	1.67 %	1.82 %	
<i>Proportion (Cross-listings)</i>	N/A	N/A	
Market Data (TTSE) (1981 – 2010)	Pre-Grand Anse Declaration (Inception – 1988) Average Annual Percentage Change (%)	Transition Period (1989 – 1993) Average Annual Percentage Change (%)	Tim listi (19 Ave Perce
a) No. of Transactions	57.62 %	(29.55 %)	(

Proportion (Cross-listings)	N/A	N/A	.
b) Volume of shares sold (000)	34.61 %	(19.07 %)	(
Proportion (Cross-listings)	N/A	N/A	
c) Value of shares traded (in Millions of U.S. dollars)	32.50 %	(33.63 %)	(
Proportion (Cross-listings)	N/A	N/A	.
d) Year-end Market Capitalization as at December 31 (in Millions of U.S. dollars)	(11.30%)	(1.51 %)	
Proportion (Cross-listings)	N/A	N/A	.
e) No. of companies listed	0.48 %	(1.72 %)	(
Proportion (Cross-listings)	N/A	N/A	

Source: Author's calculations based on market data from all three stock exchanges

5. *Limitations of Study*

One of the obvious limitations with this study was the unavailability of relevant data in order to perform the necessary analysis. In certain instances, the data was not able to be accessed because, when contacted, the relevant authorities would often state that data was available only for a specified time frame such as in the case of Trinidad and Tobago. This usually resulted in a shorter time frame for which analysis could have been done, thereby affecting the richness of the analysis that could have been conducted. An additional limitation that is related to the scarcity of data problem is the relatively nascent nature of the region's cross-listed securities. With company cross-listing only becoming operational from 1994, this in itself had already limited the potential size of the dataset, which was further exacerbated by the relative paucity of companies that are seeking to cross-list as well as the aforementioned unavailability of data. Additionally, while the relevant market data was converted to the U.S. currency for ease of comparison, these were not adjusted for inflation. Consequently, one would not get a sense of how the markets have changed over the years in "real terms." However, the lack of inflation accounting does not detract from the study and does present a fairly robust depiction of key areas of analysis such as its impact on market liquidity.

⁴⁹ This was calculated for the period 2005 – 2010 due to unavailability of data.

⁵⁰ This was calculated for the period 2003 – 2010 due to unavailability of data.

One of the other limitations that this paper may be argued to contain is that the development indicators from Yartey and Adjasi (2007) were arbitrarily altered to fit the parameters of this study. However, the rationale behind the alterations of these indicators can be argued to be in line with accepted academic literature on the topic. Each of the respective indicators serves a specific role in explaining how cross-listed securities have impacted the development of the region's stock markets. The issues of market size and liquidity have special significance in the evaluation of stock markets. Moreover and as a consequence, this discussion can and will add a new dimension to the previous empirical studies. On another dimension, one would argue that this paper suffers from the limitation that there is no discussion on the rate of return earned from investment in these cross-listed securities. However, this was done by design as the return analysis conducted in the previous chapter of this thesis seemed to summarize the risk and return profile of the three regional equity markets. As a consequence, it was concluded that the results that would have been gathered while attempting to perform this type of analysis for the cross-listed securities would not vary much from what was previously done in the chapter on stock market development within the region. Despite these shortcomings, it seems possible to fashion a sense of how successful or not the cross-listing initiative was in the three territories based on the data interpretations made in the paper.

6. *Policy Recommendations / Conclusions*

The focus of this paper is to empirically analyse the impact of cross-listed securities on the three major CARICOM equity markets: Jamaica, Trinidad and Tobago, and Barbados. This will be accomplished through the use of a set of "market indicators" which are similar to those used in the chapter pertaining to regional stock market development. There shall also be discussion on the degree to which market information is reflected in the prices of the cross-listed securities through the use of the Gonzalo-Granger (1995) Permanent-Transitory Decomposition and the Hasbrouck Estimation (1995) methodologies. Additionally, this paper looked at the stock price data for cross-listed securities on each of the three aforementioned markets in order to determine whether there is arbitrage occurring within the region. The evidence from the data

collected seems to suggest that the cross-listing of securities has not produced the desired effects in the three major CARICOM equity markets, particularly in Jamaica and Barbados where little interest has been shown by its investors when measured in terms of market demand such as the volumes of shares sold. Market liquidity has not seen any improvement as a result of the initiative. Interestingly, the market capitalisations of these cross-listed companies represent a significant portion of Jamaica's total capitalisation, which may allude to a bias against these securities. There is an argument for the case that the markets for the cross-listed securities do exhibit a degree of co-integration with each other, even though there were substantial opportunities for arbitrage. In addition, the JSE and the TTSE appeared to be the dominant markets in the price discovery process for most of the cross-listed securities in the region. Furthermore, there appears to be no conclusive evidence to suggest that the price discovery process always emanated from the home markets of the respective cross-listed company as there were instances where the home market were among those which had the lowest measure.

However, the crux of the matter lies in the inability of the regional cross-listed securities to generate any meaningful gains in terms of the various measures of stock market development. Market liquidity has not seen any improvements as a result of the cross-listing initiative. It can be argued to an extent that only the TTSE has experienced relatively significant growth in the number of cross-listings thereby positively impacting upon its market size. Yet the number of cross-listings represent less than a fifth of total market listings as of December 2009. There are fundamental inadequacies that are adversely affecting the fortunes of the regional stock markets which need to be addressed. The fact that the global financial system suffered through wide-scale fallout further exacerbated the problems faced by the CARICOM stock markets. The implementation of the Caribbean Exchange Network should provide an impetus for deepening ties among the Caribbean financial markets, though its impact on attracting future cross-listings to the markets will be difficult to gauge. The Network is seen as a means of bringing about the implementation of a regional capital market. This would necessarily entail harmonisation of listing requirements, trading regulations and fees, all important steps

towards strengthening the Caribbean capital markets. Indeed, steps have already been taken towards the achievement of this objective. There may also be a need to explore the possibility of developing a regional regulatory authority to oversee the next stage of development. A harmonised regulatory framework coupled with a regional body would lay the foundation for sustainable growth. It can be argued that there may eventually not be a need for cross-listing if and when the Regional Stock Exchange finally becomes operational. Until then, the relevant authorities should explore additional sources for cross-listed companies, such as in the case of the listing of BCB Holdings Limited on the Trinidad and Tobago Stock Exchange. Additionally, while this paper mainly focused on the primary markets, one could explore the option of developing the respective stock exchanges' Junior Markets by attracting capital-seeking small and medium enterprises from around the region. Once they have been listed on the Junior Market, the management boards of these companies should have access to expertise that would encourage future growth. Essentially, the directorates of the respective stock exchanges should place these companies on paths that would eventually conclude with company listings on the Primary Market. This could possibly be a very viable option for Trinidad and Tobago based on its reputation as being a major source for financial capital within the region.

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