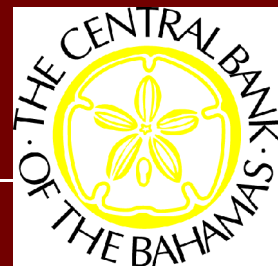


Regional Integration and Correlation Among Stock Markets in the Caribbean

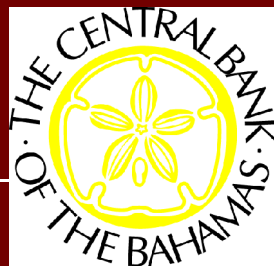
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and
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The Central Bank of The Bahamas
Prepared for the CCMS Annual Monetary
Studies Conference 2005
Nassau, Bahamas



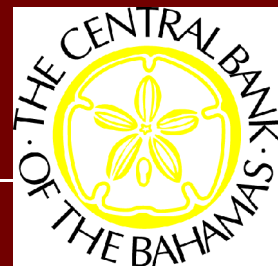
Agenda

- Introduction
- Review of Literature and Econometric Techniques
- Major Stock Exchanges in The Caribbean
- Data
- Findings
- Conclusions



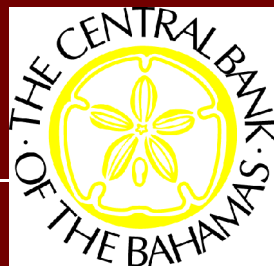
Introduction

- We investigated the level of integration between the major stock indices in the Caribbean in an attempt to clarify the
 - Potential benefits borne by diversification; and
 - Flow of shocks among the markets



Selected Literature Review

- Kim and Langrin (1996)
- Bennet (1997)
- Leon, Nicholls and Sergeant (2000)
- Leon and Nicholls (2001)

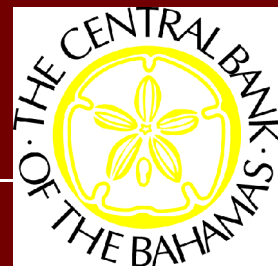


Econometric Tests

- ADF Tests
 - Order of Integration of Series

- Long Run
 - Schwartz Bayesian Criteria: Optimal lag length and Rank of Cointegrating Vector
 - Vector Autoregressive (VAR)

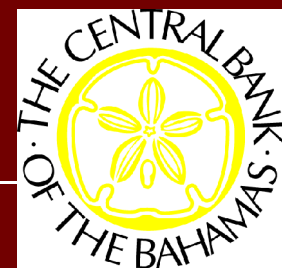
- Short Run
 - Impulse Response Functions
 - Variance Decomposition



Overview of Major Stock Markets in the Caribbean

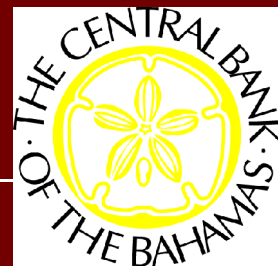
Table 1.

Exchange	Est. Year	Market Cap(\$b)	# of listings
BISX	2000	2.01	19
SEB	1987	11.01	27
JSE	1968	14.23	42
TTSE	1981	8.14	41
BSX	1971	148.0	350
CSX	1997	52.50	900
ECSE	2001	0.25	20



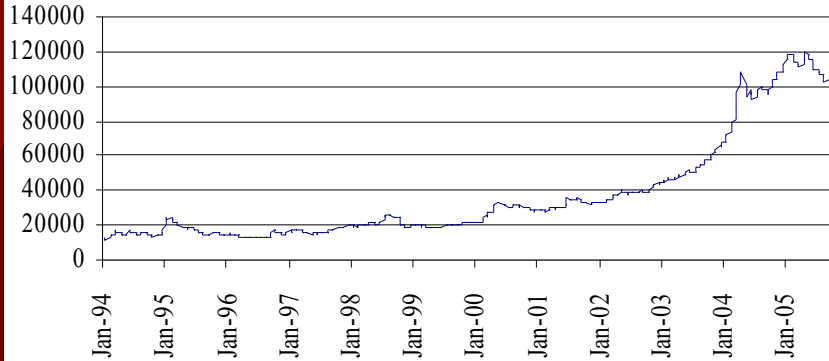
Data: Stock Exchanges Under Review

The Bahamas BISX All Share Index	Barbados Composite Index
Jamaica JMSM Composite	Trinidad & Tobago TTSM Composite



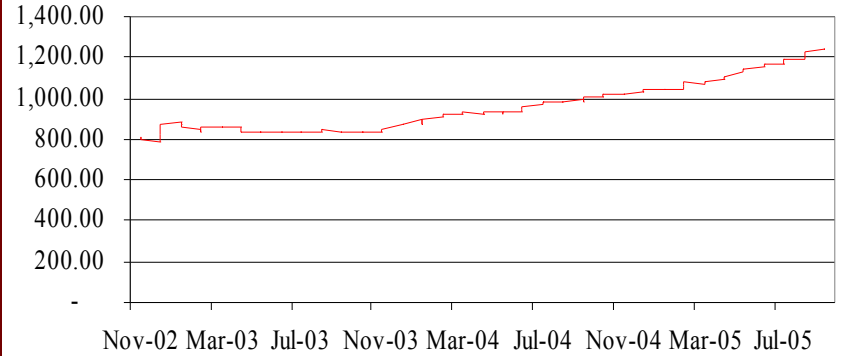
Market Trends

Graph 1: Jamaica Stock Exchange (1994-Sept. 05)



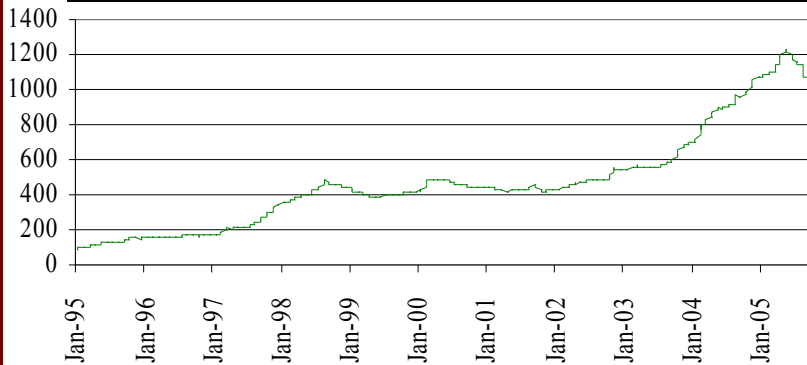
Source: Bloomberg

Graph 2: Bahamas International Securities Exchange



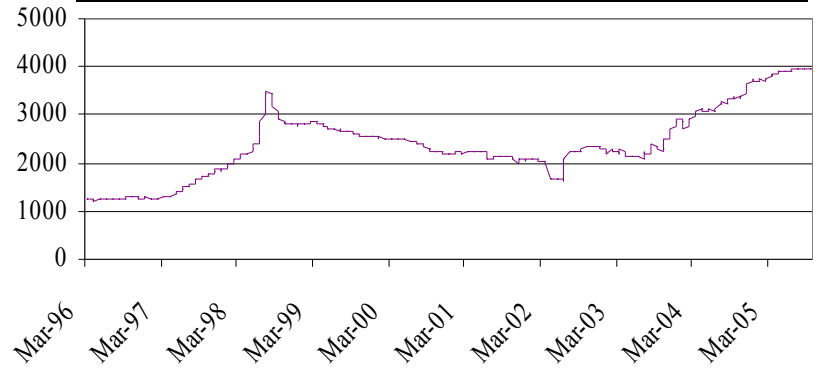
Source: Bahamas International Securities Exchange

Graph 3: T&T Stock Exchange

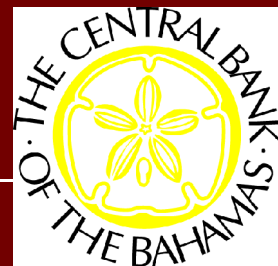


Source: Bloomberg

Graph 4: Barbados Stock Exchange

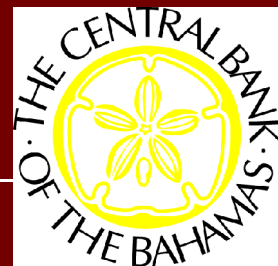


Source: Stock Exchange of Barbados



Models

- Both Jamaican and Trinidad markets had liberalized capital account during period of analysis
- Models based on key periods of liberalization of Barbados Market
 - September 1, 1998: first Trinidadian company listed on the BSE;
 - July 1, 2003: Limit for transactions allowed by CB to be approved by BSE increased from \$3million to \$5 million; and
 - January 15, 2004: BSE allowed to approve all equity transactions of cross-listed and cross-traded securities without limit



Models



Table 2

Model 1	VAR of BDOS Composite TTSM Composite and JMSM Composite for period 3/01/1996 to 9/16/2005
Model 2	VAR of BISX Index BDOS Composite TTSM Composite and JMSM Composite for period 3/11/22/2002 to 9/16/2005
Models 3 & 4	VAR of BDOS Composite TTSM Composite and JMSM Composite for period 3/011996 to 8/28/1998 and 8/28/1998 to 9/16/2005
Models 5 & 6	VAR of BDOS Composite TTSM Composite and JMSM Composite for period 3/01/1996 to 7/01/2003 and 07/01/2003 to 9/16/2005
Models 7 & 8	VAR of BDOS Composite TTSM Composite and JMSM Composite for period 3/011996 to 1/16/2004 and 1/16/2004 to 9/16/2005

Results

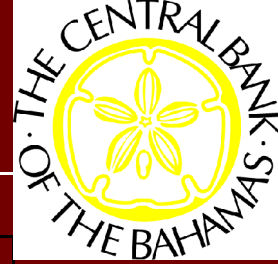


Table 3
ADF Tests for Stationarity#

<i>Variables</i>	<i>Test Statistic (Levels)</i>	<i>Test Statistic (First Differences)</i>
JMSM Composite	0.378	-7.513*
TTSM Composite	0.704	-7.180*
BDOS Composite Index	-0.812	-8.090*
BISX All Share Index	1.585	-5.349*

Results shown for test equation which includes an intercept, however similar results were obtained for tests conducted using test equations with both an intercept and trend and no intercept or trend

* Indicates significance at the 5% level

Results

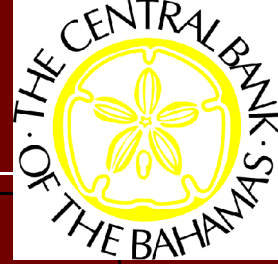


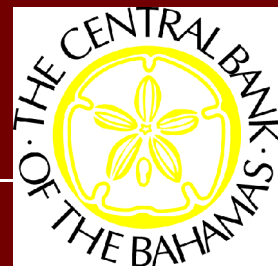
Table 3
Johansen Tests For Cointegration Among the Caribbean Markets

Schwarz Bayesian Criteria (SBC) by Rank and Model (Columns)

<i>Data Trend</i>	<i>None</i>	<i>None</i>	<i>Linear</i>	<i>Linear</i>	<i>Quadratic</i>
<i>Model</i>	<i>No Intercept No Trend</i>	<i>Intercept No Trend</i>	<i>Intercept No Trend</i>	<i>Intercept Trend</i>	<i>Intercept Trend</i>
<i>Model 1</i>	33.78682* (<i>r = 0</i>)	33.78682* (<i>r = 0</i>)	33.80465	33.80465	33.83702
<i>Model 2</i>	43.14030* (<i>r = 0</i>)	43.14030* (<i>r = 0</i>)	43.15944	43.15944	43.25886
<i>Model 3</i>	30.93607	30.93607	30.93078* (<i>r=0</i>)	30.93078* (<i>r = 0</i>)	30.93221
<i>Model 4</i>	34.32811* (<i>r = 0</i>)	34.32811* (<i>r=0</i>)	34.36152	34.36152	34.38077
<i>Model 5</i>	31.92651* (<i>r=0</i>)	31.92651* (<i>r=0</i>)	31.94295	31.94295	31.97417
<i>Model 6</i>	36.09886* (<i>r=0</i>)	36.09886* (<i>r=0</i>)	36.12049	36.12049	36.18853
<i>Model 7</i>	32.04326* (<i>r=0</i>)	32.04326* (<i>r=0</i>)	32.04610	32.04610	32.06300
<i>Model 8</i>	36.36943	36.40982	36.30101	36.21038* (<i>r=1</i>)	36.23104

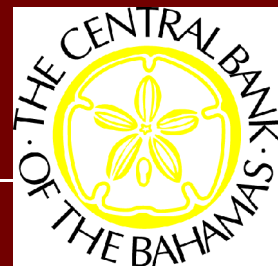
Results I

- Models 1 -7 failed to reject the Null Hypothesis of no cointegration
 - Therefore no long-run equilibrium relationship exists and VAR model estimated in first differences (Roca 1999)
- Model 8 indicated that there was one cointegrating vector in VAR
 - Cointegration among Bdos, Tdad and Jam markets from 2004 to 2005. Error correction model estimated.



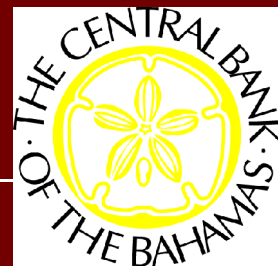
Results II

- **Impulse Response Functions Model 1 to 7**
 - Responses to innovations are instantaneous
 - Generally, each series only affected slightly by innovations to other series
 - BISX virtually unaffected by shocks to other markets and vice versa.
 - Series generally return to equilibrium after only a few weeks.



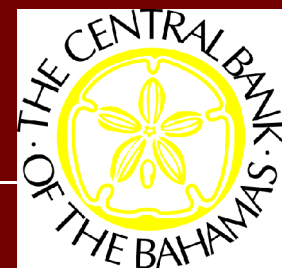
Results III

- Impulse Response Functions Model 8
 - Responses to innovations generally increase over time then establish a new equilibrium;
 - Each series affected significantly by innovations to other series;
 - Some series fail to establish new equilibrium after shocks to the Barbados market after several weeks



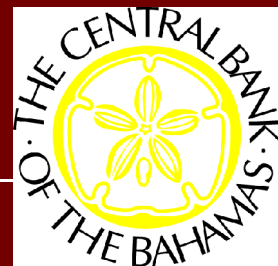
Results III

- Variance Decompositions show that for models 1 to 7, all of the series' forecast variance were due to their own random shocks. Avg. 95% of forecast variance
 - Bahamas approx 99%
- For model 8 forecast error variance due own shock significantly reduced and decreases rapidly over time
 - Forecast variance decomposition for T&T due to random shocks from itself.



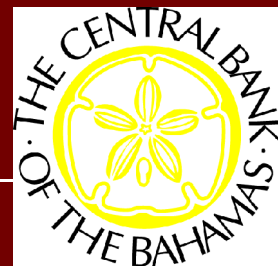
Conclusion

- Findings suggest that from 1996 to 2004 Caribbean stock markets were not integrated which indicated
 - portfolio diversification was attractive
 - Relatively minor chance of contagion



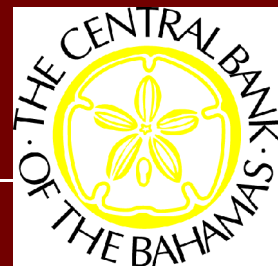
Conclusion (cont'd)

- Since 2004 Barbados, Trinidad and Jamaican markets appear to have long run relationship, hence:
 - Benefits of portfolio diversification diminished;
 - Threat of Contagion has increased



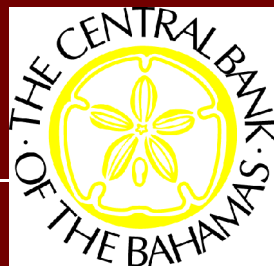
Conclusion (cont'd)

- BISX market still seems to be relatively uncorrelated with other Caribbean markets over period 2002 to 2005.
- Moves to liberalize capital markets further may however increase degree of integration in future



Limitations

- Study does not take into account
 - Statutory limitations;
 - Transaction costs;
 - Investors' risk tolerances which are generally relatively low in the Caribbean ;
 - Sophistication of investors.



Thank You