Measuring Systemic Risk in the Caribbean: a Preliminary Analysis

D. Tracy Polius

& DeLisle Worrell

Outline of Presentation

- Introduction
- Systemic Risk – The Concept
- Review on Systemic Risk Models
- Overview of Caribbean Financial Systems
- Measuring Systemic Risk in the Caribbean
- Towards a Framework for Monitoring Systemic Risk in the Caribbean
- Conclusions

Introduction

- The widespread impact of the CL Financial collapse has demonstrated the importance examining systemic risks within the financial sector of the Caribbean.
- Failure of a large financial institution or financial group may signal negative solvency outturns for other institutions within the regional financial system
- Much of the research for the region has focused on the causes of financial sector difficulties, but not on systemic or contagion risk

Systemic Risk – The concept

- Systemic risk had largely been defined according to the perceived source of risk such as;

  - The presence of information asymmetries (Bandt and Hartman, 2000)
  - Payment and settlement failure within the large value payment system (Chakravorti, 1996)
  - Co-movements, connections and correlations among financial institutions (Kaufman and Scott, 2003)

Systemic Risk : The Concept

"Systemic financial risk is the risk that an event will trigger a loss of economic value or confidence in, and attendant increases in uncertainly [sic] about, a substantial portion of the financial system that is serious enough to quite probably have significant adverse effects on the real economy."

G10 Report on Consolidation of the Financial Sector

Systemic Financial Risks in the Caribbean

- Financial integration in the Caribbean is increasing through:
  - complex ownership structures
  - increasing prevalence of financial conglomerates

- Caribbean countries all operate as separate financial jurisdictions, each within its own legal framework and regulatory bodies
- The study of systemic risk in the Caribbean must focus on inter-institution exposures, ownership structures, and payment arrangements within the region.
- The main source of systemic risk in the Caribbean is the interconnection among financial institutions in the region.

The Notion of Systemically Important Financial Institutions

- *An institution, market or instrument is systemic if its failure or malfunction causes widespread distress, either as a direct impact or as a trigger for broader contagion."*

G20 definition (FSB, IMF, BIS - 2009)

Key Considerations for Defining Systemically Important Institutions, Markets or Instruments

G20 – Guidance Report

- Functions (settlement and liquidity provision)
- Size (value of financial assets or market activity)
- Connection and complexity in ownership structure

Thompson (2009)

- Contagion
- Correlation
- Concentration
- Conditions (context)

Models of Systemic Risk

- Models with seek to explain bank runs
  - Waldo (1985), Diamond and Dybvig (1983)
- Models with seek to explain contagion
  - Chen (1999), Bikhchandani, Hirshelifer and Welch (1992), Allen and Gale (2000).
- Empirical models of systemic risk
  - Sheldon and Maurer ( ), Hasan and Dwyer (1994), Schoenmaker (1996) Ĉihák, Muňoz and Scuzzarella (2011)

Empirical models of systemic risk

Sheldon and Maurer ( )

- Constructed an interbank loan matrix through network analysis using marginal loan distributions for Switzerland

Hasan and Dwyer (1994)

- Utilized historical analysis and probit models to examine the presence of contagious bank runs during the free banking era.

Schoenmaker (1996)

- Developed a framework using a Poisson regression model to test for contagion risk using data from the US National Banking System.

Empirical models of systemic risk

Čihák, Muňoz and Scuzzarella (2011)

- Examine the implications of increasing cross border banking linkages through network analysis.

- They derive measures of upstream and downstream interconnectedness of a financial system with the rest of the network. The measures of interconnectedness were mapped against measures of a probability of occurrence of a banking crisis

- The results show M shaped relationship between the probability of banking crisis for a country and its level of interconnectedness with the rest of the world.

Overview of Caribbean Financial Systems

- The financial system of Caribbean countries are in varied stages of development;
- Financial systems in Caribbean countries are typically bank centric
- However non bank financial institutions have gained prominence with assets of pension funds and mutual funds accounting for a significant share of total financial assets in Trinidad and Tobago and to a lesser extent Jamaica

Overview of Caribbean Financial Systems

- There are four regional stock exchanges – Jamaica, Trinidad and Tobago, Barbados, ECCU
- A number of the large regional financial firms are cross listed on those exchanges.
- The financial conglomerate model is gaining prominence within the region
- The financial conglomerates typically feature cross border ownership arrangements or complex linkages across countries

The Conglomerate Model in the Caribbean

"any group of companies under common control whose exclusive or predominant activities consist of providing significant services in at least two different financial sectors (banking, securities, insurance)"

BIS – Supervision of financial conglomerates

- Strict financial conglomerate

  - Interests and activities are primarily within the financial sector

- Mixed conglomerate

  - predominantly commercially oriented, but contain at least one regulated financial entity within the structure

Financial Conglomerates in the Caribbean with Cross Border Activity

	Assets (US$ M) (2010)	No. of C'bean countries	Extra Reg operation	Listed on Regional Exchanges	Headquarted
RBC Financial Caribbean	11685.29	19			Trinidad and Tobago
Republic Bank	7217.311	6		Trinidad	Trinidad and Tobago
Sagicor Financial Corporation	4,867.30	22	Latin Amercia, UK and US	Barbados, Trinidad	Barbados
First Citizens	4014.836				Trinidad and Tobago
Guardian Holdings Limited	3280.67	4	UK	Jamaica & Trinidad	Trinidad and Tobago
Jamaica Money Market Brokers	1318.006	4		Jamaica & Trinidad	Jamaica
Eastern Caribbean Financial Holdings	1228.835	2	Latin Amercia	ECSE	Saint Lucia

Measuring Systemic Risk in the Caribbean: Preliminary Analysis

We will be on the Thompson (2009) and the G20 (FSB,IMF, BIS 2009) approaches where the focus is on the following;

- Connection
- Complexity
- Conditions

Connections

- We utilize the methodology of Ĉihák, Muňoz and Scuzzarella (2011);

  - Upstream interconnectedness - *Measure of interconnectedness of asset exposures of the banking system to that of other countries*

  - Downstream interconnectedness – *Measure of interconnectedness of liability exposures of the banking system to that of other countries*

Connections

- This measure is essentially the sum of country's link with the financial system of every other country in the network

$$a_i = \sum_j a_{ij}$$

- The network is defined as member countries of CARICOM, the US and British Virgin Islands, the Netherland Antilles, Cayman Islands and Turks and Caicos Islands
- Data is derived from IMF Consolidated Portfolio Investment Survey (CPIS) 1997, 2001-2009

Measures of Connectedness for Select Caribbean Countries

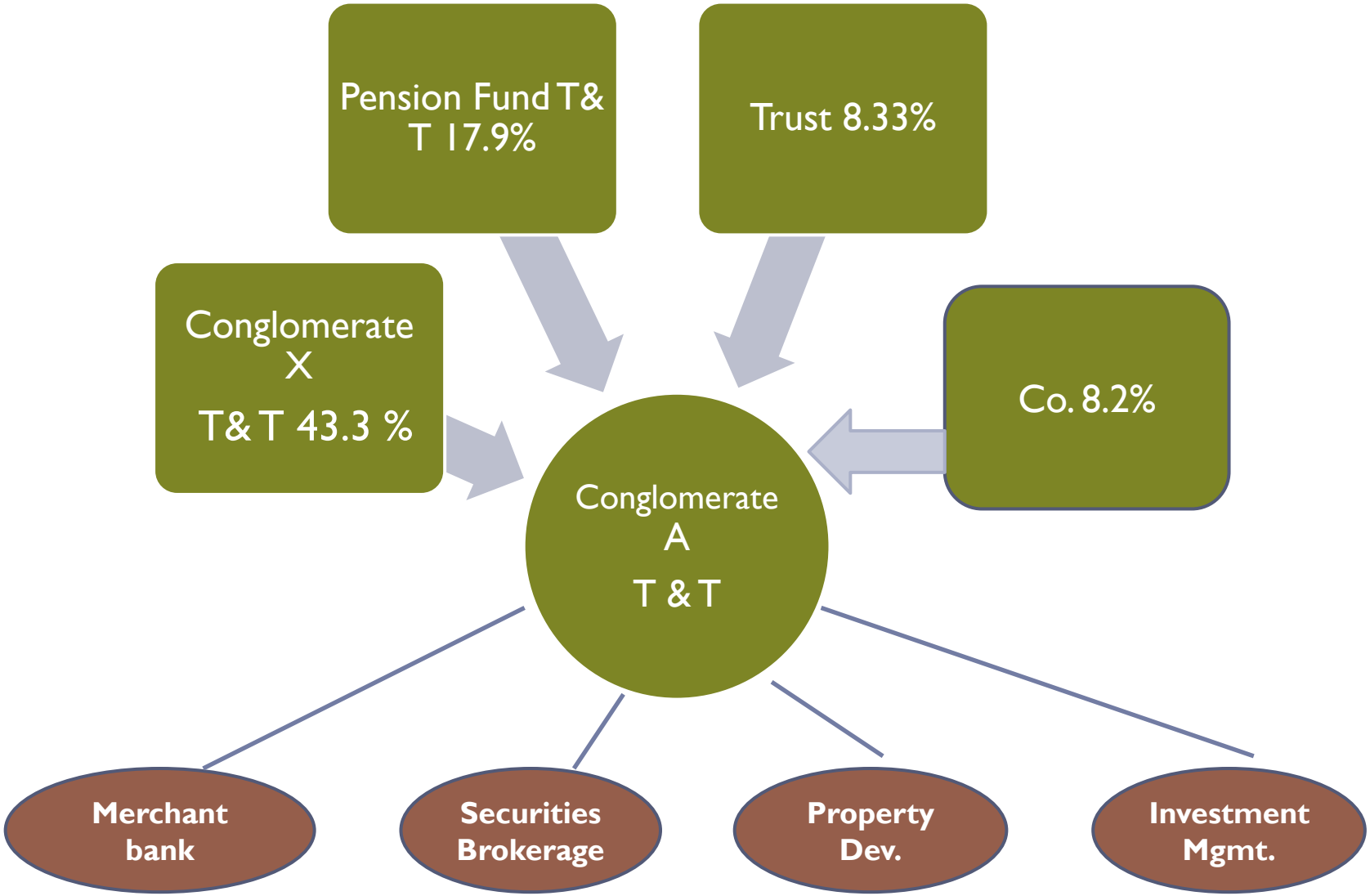
	1997	2001	2002	2003	2004	2005	2006	2007	2008	2009
Aruba										
Assets Centrality			0.03	0.07	0.06	0.07	0.07	0.04	0.11	0.16
Liabilities Centrality	0.21	0.30	0.06	0.04	0.05	0.07	0.07	0.05	0.04	0.11
Barbados										
Assets Centrality				0.15	0.05	0.02	0.04	0.02	0.02	0.02
Liabilities Centrality	0.06	0.48	0.44	0.27	0.05	0.04	0.02	0.01	0.01	0.03
The Bahamas										
Assets Centrality		0.03	0.04	0.03	0.02	0.03	0.02	0.01	0.03	0.03
Liabilities Centrality	0.00	0.12	0.11	0.14	0.15	0.23	0.12	0.10	0.08	0.15
Bermuda										
Assets Centrality	0.01	0.05	0.05	0.07	0.07	0.05	0.03	0.03	0.03	0.09
Liabilities Centrality	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cayman Islands										
Assets Centrality		0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
Liabilities Centrality	0.01	0.04	0.04	0.04	0.04	0.03	0.03	0.04	0.03	0.05
Netherland Antilles										
Assets Centrality		0.35	0.41	0.46	0.65	0.50	0.66	0.62	0.34	0.11
Liabilities Centrality		0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00

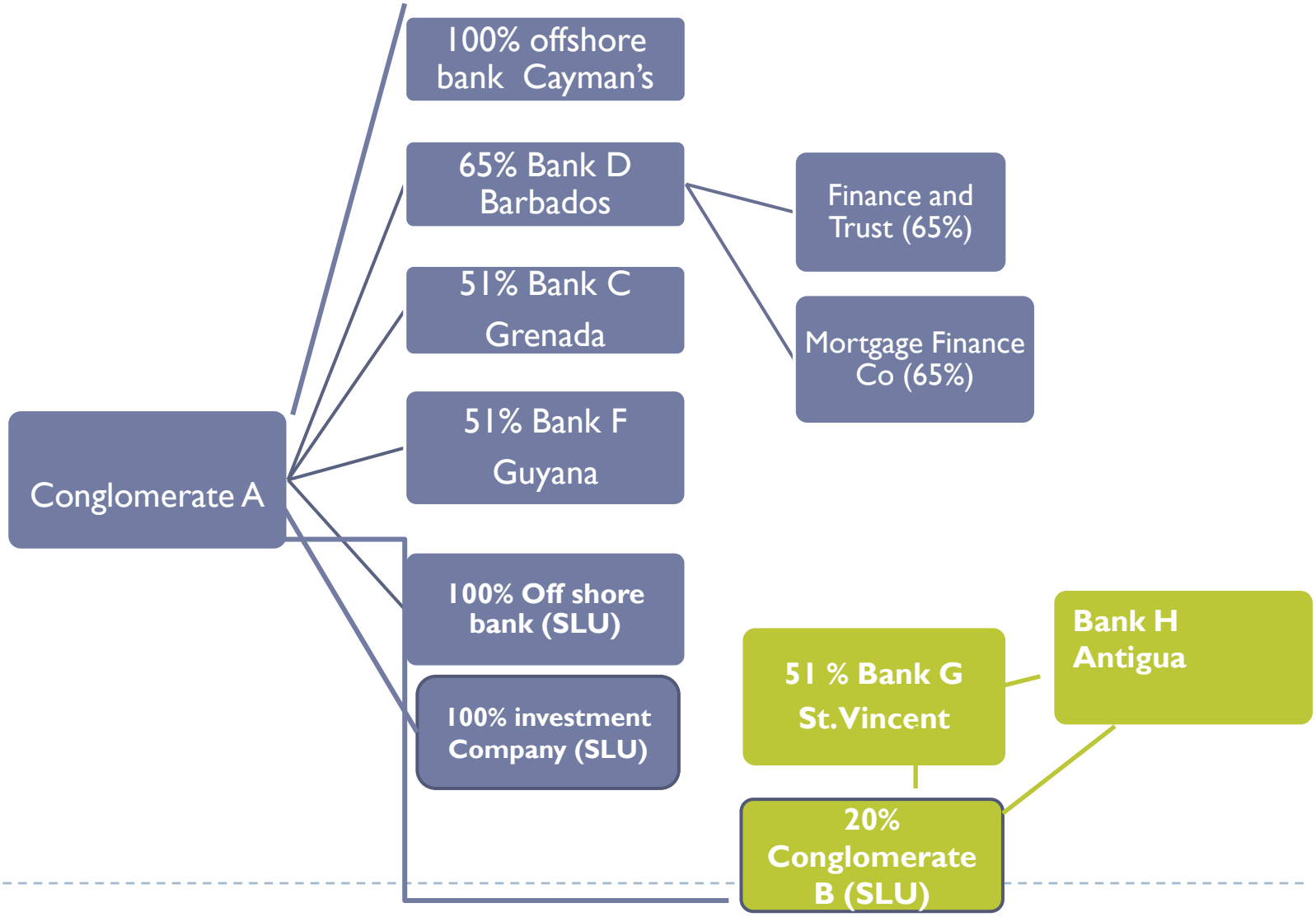
Measures of Interconnectedness(C'bean and USA

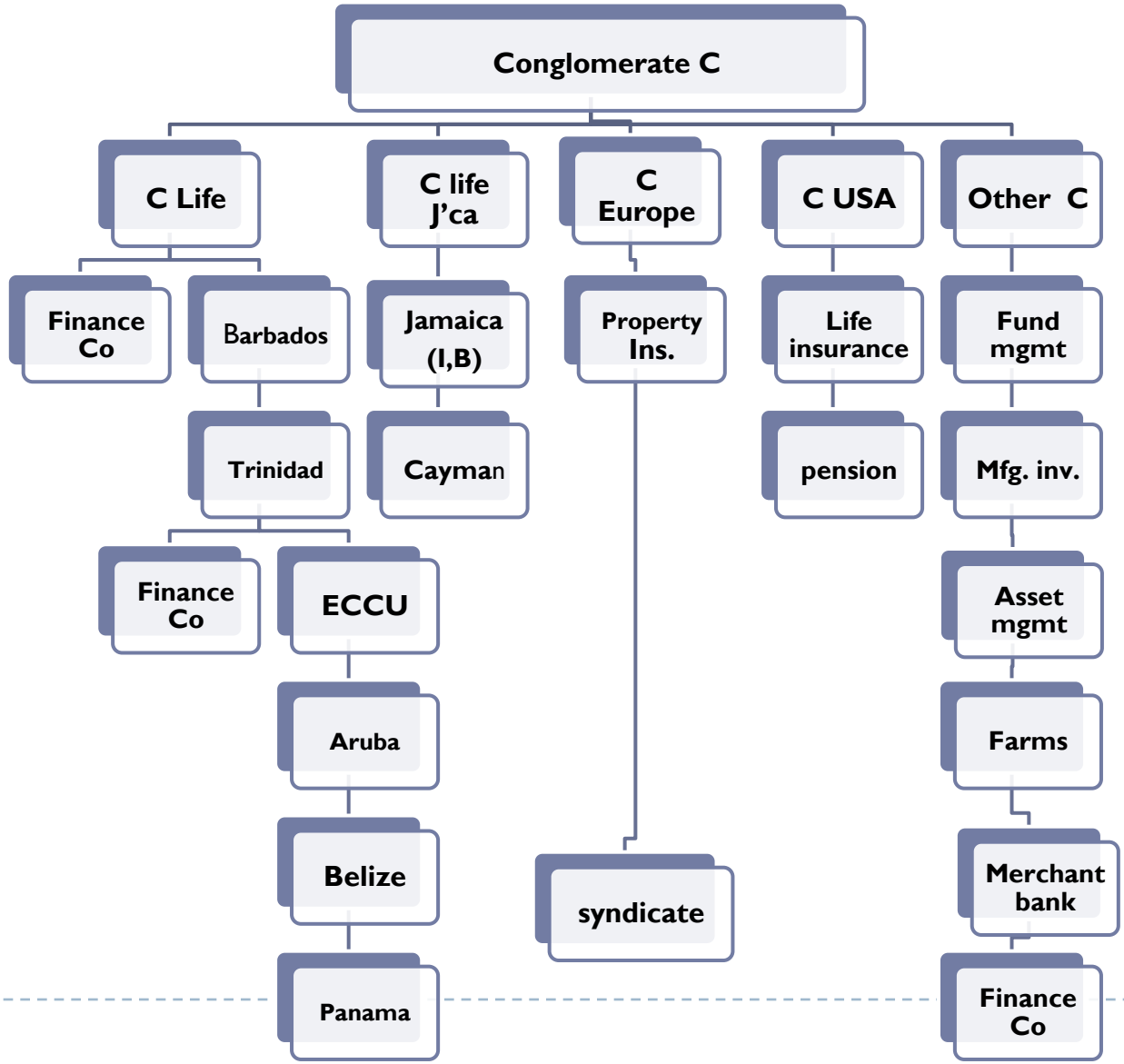
	1997	2001	2002	2003	2004	2005	2006	2007	2008	2009
Aruba										
Asset centrality		0.76	0.74	0.82	0.75	0.73	0.58	0.64	0.59	0.63
Liabilities centrality	0.42	0.67	0.94	0.57	0.51	0.48	0.56	0.38	0.21	0.36
Bahamas										
Asset centrality		0.35	0.43	0.44	0.14	0.46	0.55	0.07	0.09	0.04
Liabilities centrality	0.43	0.20	0.14	0.17	0.16	0.20	0.09	0.08	0.10	0.15
Barbados										
Asset centrality				0.37	0.51	0.69	0.49	0.42	0.62	0.41
Liabilities centrality	0.15	0.14	0.31	0.48	0.47	0.32	0.38	0.30	0.22	0.74
Bermuda										
Asset centrality	0.55	0.73	0.68	0.63	0.65	0.65	0.63	0.64	0.65	0.64
Liabilities centrality	0.82	0.73	0.70	0.60	0.60	0.59	0.55	0.53	0.56	0.42
Cayman Islands										
Asset centrality		0.65	0.68	0.63	0.68	0.65	0.72	0.64	0.62	0.52
Liabilities centrality	0.18	0.17	0.16	0.18	0.21	0.23	0.26	0.30	0.25	0.25
Netherland Antilles										
Asset centrality		0.65	0.68	0.63	0.68	0.65	0.72	0.64	0.62	0.52
Liabilities centrality	0.37	0.25	0.19	0.28	0.30	0.38	0.36	0.70	0.30	0.41

Complexity

We examine the ownership footprint of financial conglomerates across the region to demonstrate the complex ownership arrangements


Pension Fund T& T 17.9%
Trust 8.33%
Conglomerate X
T& T 43.3 %
Co. 8.2%
Conglomerate A
T & T
Merchant bank
Securities Brokerage
Property Dev.
Investment Mgmt.


Conglomerate A
100% offshore bank Cayman's
65% Bank D Barbados
51% Bank C Grenada
51% Bank F Guyana
100% Off shore bank (SLU)
100% investment Company (SLU)
Finance and Trust (65%)
Mortgage Finance Co (65%)
51 % Bank G St.Vincent
Bank H Antigua
20% Conglomerate B (SLU)


Conglomerate C
C Life
C life J'ca
C Europe
C USA
Other C
Finance Co
Barbados
Jamaica (I,B)
Property Ins.
Life insurance
Fund mgmt
Trinidad
Cayman
pension
Mfg. inv.
Finance Co
ECCU
Asset mgmt
Aruba
Farms
Belize
syndicate
Merchant bank
Panama
Finance Co

Conditions

Recall from previous section that systemic risk may result from;

- asymmetric information

Indicators of greater asymmetric information :

- higher real interest rates
- falling stock market values
- real estate prices
- high inflation

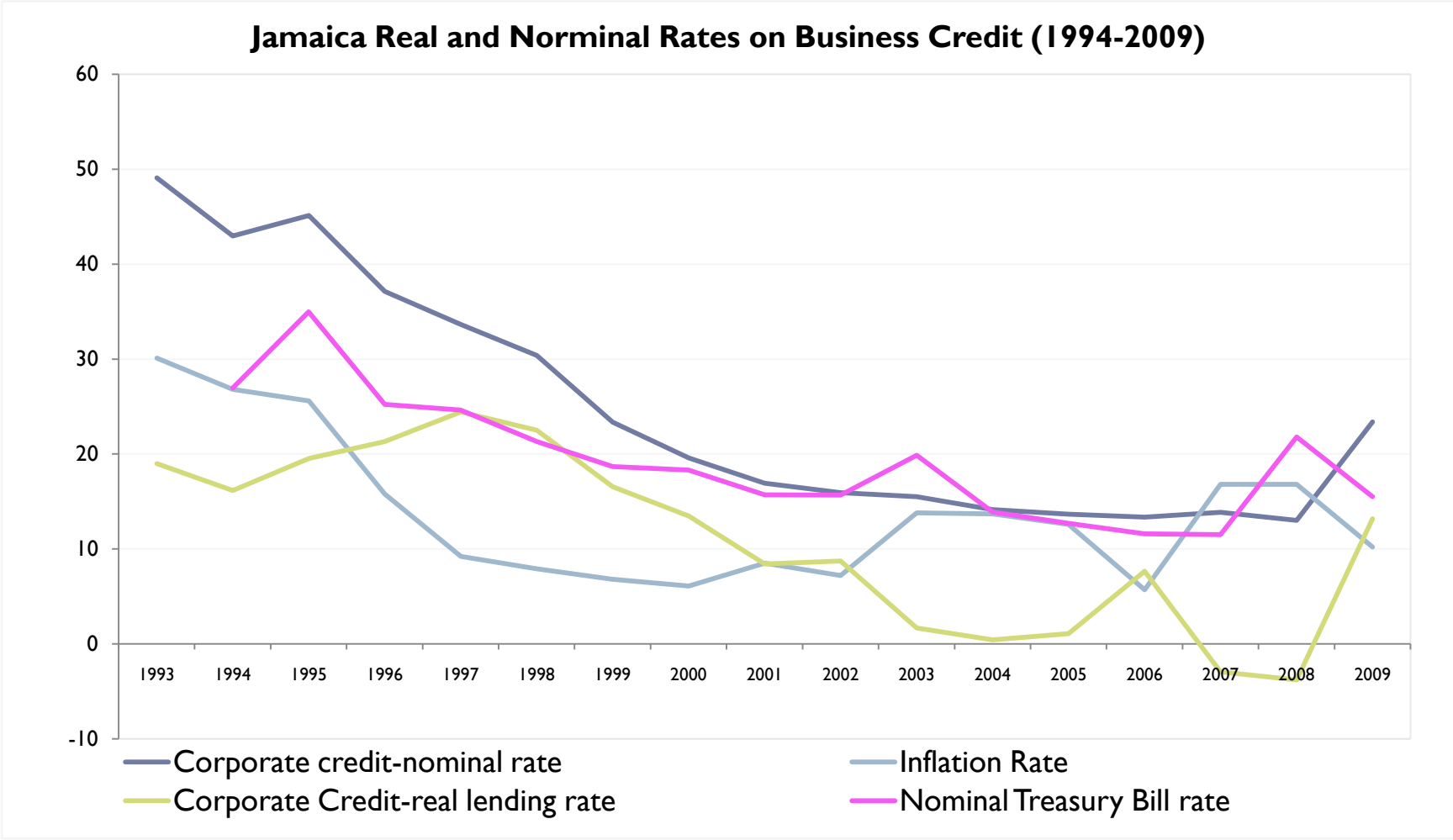
Conditions (con't)

While asymmetric information will lead to higher systemic risk, full scale crisis may only result if the financial sector is vulnerable.

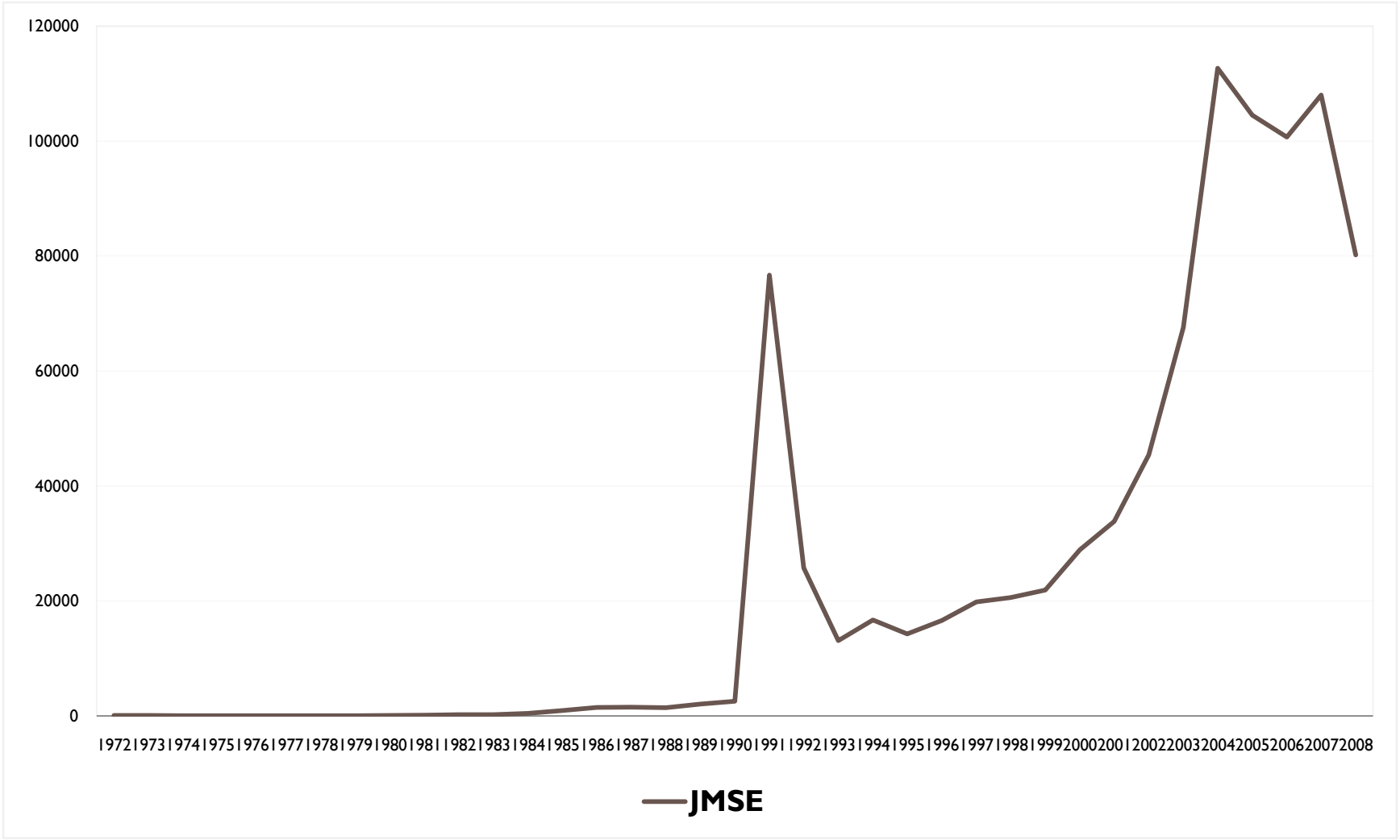
One Indicator of vulnerability;

- *Growth in credit relative to growth in output*

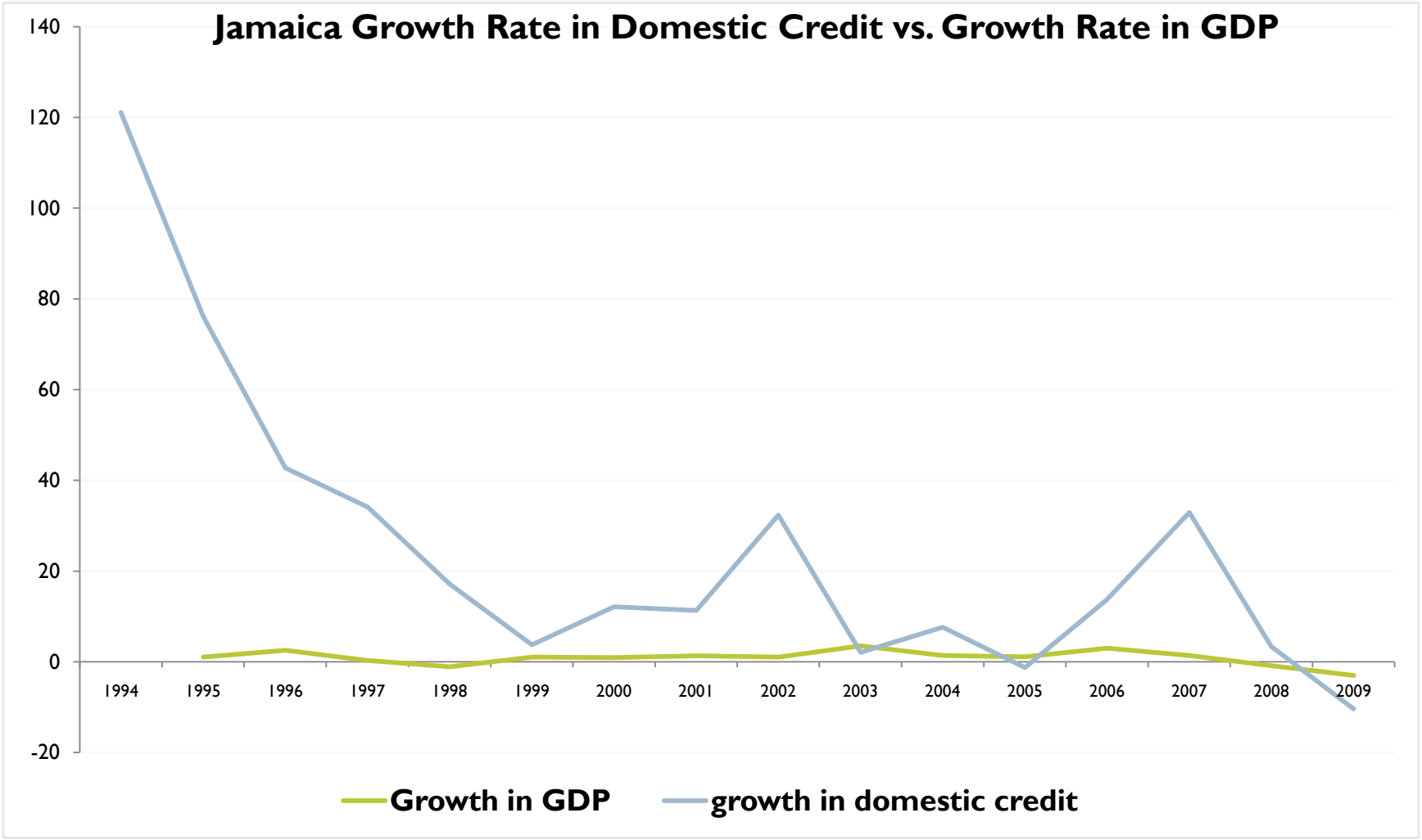
Jamaica


Jamaica Real and Norminal Rates on Business Credit (1994-2009)
60
50
40
30
20
10
0
-10
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
Corporate credit-nominal rate
Inflation Rate
Corporate Credit-real lending rate
Nominal Treasury Bill rate

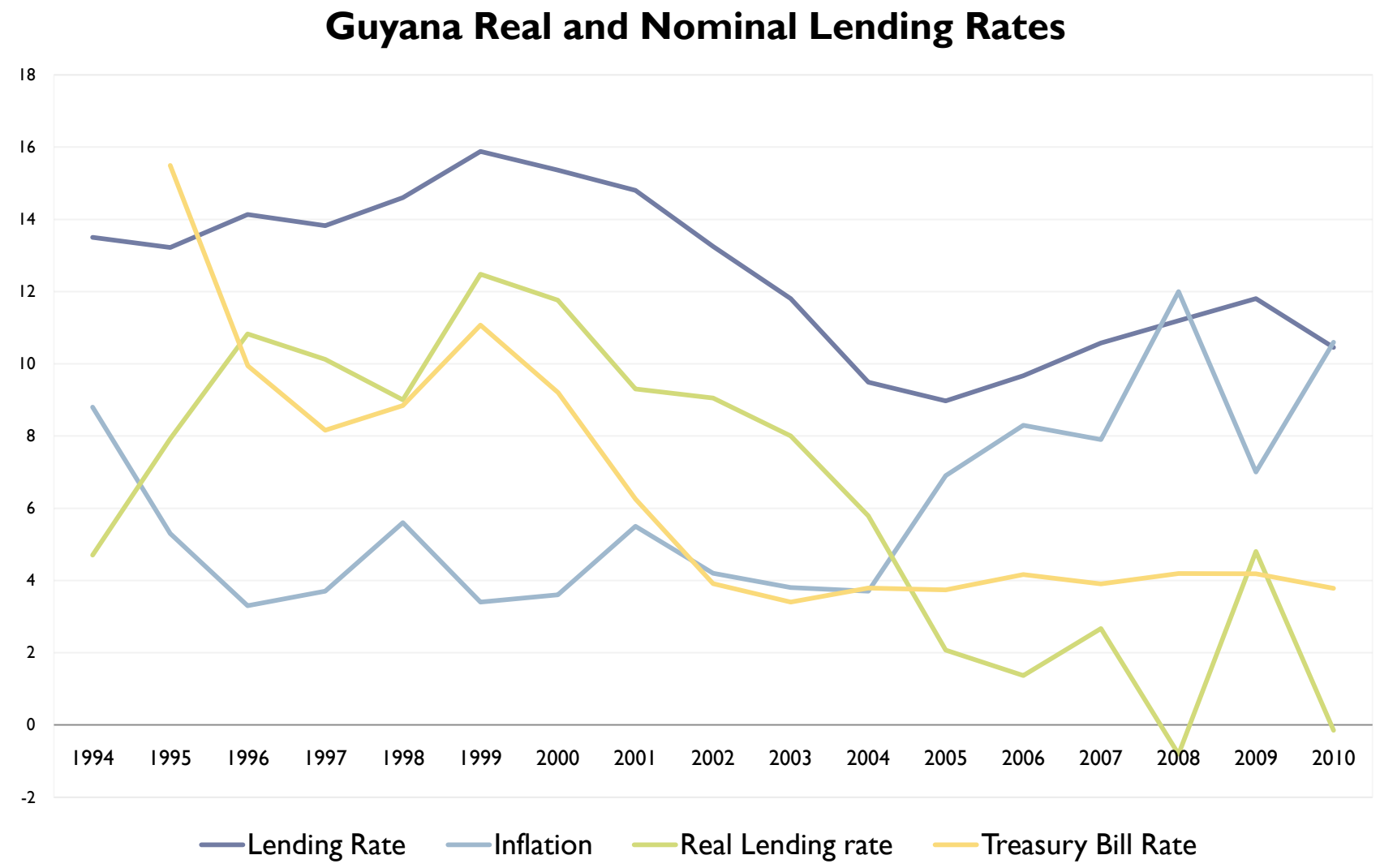
Jamaica Con't



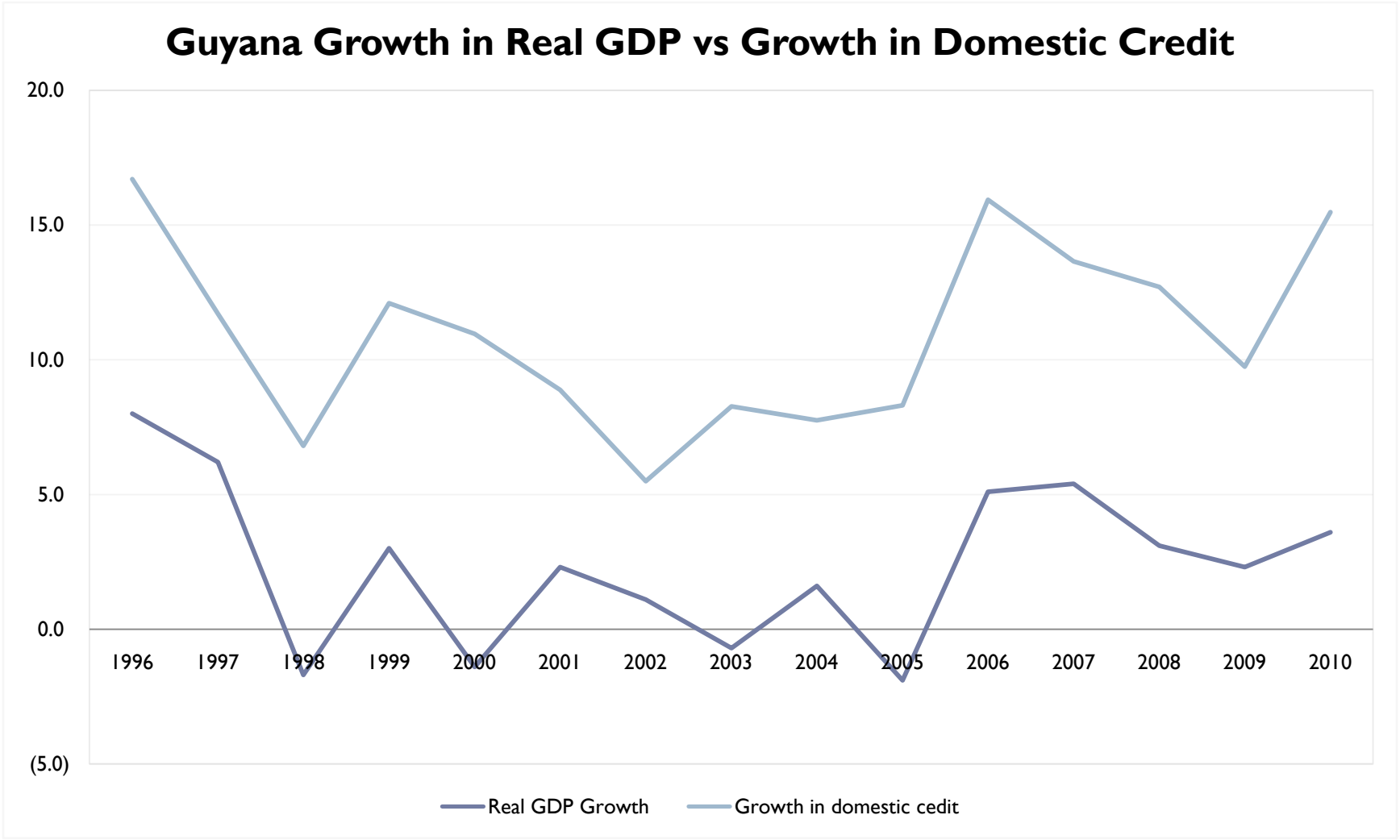
Jamaica Con't



Guyana


Guyana Real and Nominal Lending Rates
18
16
14
12
10
8
6
4
2
0
-2
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Lending Rate
Inflation
Real Lending rate
Treasury Bill Rate

Guyana


Guyana Growth in Real GDP vs Growth in Domestic Credit
20.0
15.0
10.0
5.0
0.0
(5.0)
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Real GDP Growth
Growth in domestic cedit

Towards a Framework for Monitoring Systemic Risk in the Caribbean

Measuring Systemic requires significant data input:

- Financial soundness indicators
- Cross border payment and exposure data
- Understanding of cross border liquidity and financing arrangements both inter and intra institution.
- Indicators of business confidence and uncertainty
- Measures of banking sector vulnerability
- Data on ownership and governance arrangements

Towards a Framework for Monitoring Systemic Risk in the Caribbean

Assessing Systemic risk also requires different types of analyses;

- Analysis of extent of interconnections across jurisdictions – Connection/Correlation
- Analysis of the complexity of ownership structures and finance and liquidity arrangements across financial groups -Complexity
- Analysis of possible second round effects should another major financial conglomerate fail within the region – Contagion
- Monitoring of the macroeconomic and financial environment - Conditions
- Monitoring the relative market share or role of conglomerates and their subsidiaries in key financial service sectors - Concentration

Towards a Framework for Monitoring Systemic Risk in the Caribbean

An effective monitoring framework can only be

Developed with;

- Significant cooperation among regulators
- Massive data gathering exercise –a lot remains unknown about how some of these conglomerates function and finance their operations
- Need for regulators to understand liquidity arrangements, financing of operations of conglomerates.
- *A good start:* The CCMF just commenced implementation of an IDB funded financial sector risk assessment project

Conclusion

- Preliminary analysis suggests the following:

- Existence of financial conglomerates within the region with cross border operation and complex ownership structures
- Macroeconomic indicators of systemic risk may be useful in signaling financial sector difficulties
- Analysis for some countries reveals low interconnection among countries of the region

Further Work

- Interconnection measures for ECCU and other CARICOM member states (data permitting)
- Extension of research on ownership footprint of financial conglomerates
- Development of measures of "regional" concentration,
- Additional measures of banking sector vulnerability eg.
  - Ratio of corporate profit to corporate debt