Measuring Regional Financial Interconnectedness and Contagion Risks in the Caribbean:
A Data Template

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Outline

- The CRFP Work Program
- Interconnectedness Analysis
- Data Requirements
- The CRFP Data Templates
- Key Issues for Discussion

I. The Caribbean Regional Financial Project (CRFP) Work Program

- March 2013 – Initial Request to IMF
- May 2013 – The Terms of Engagement
  - IMF/CARICOM Governors
  - CBTT to Coordinate
- Phase I – Analysis
  - Late summer/fall 2013 – Analytical Considerations
  - Oct. – Jan. 2013 – Development of Draft Data Template
  - Data Collection and Analysis
- Phase II – Policy Phase

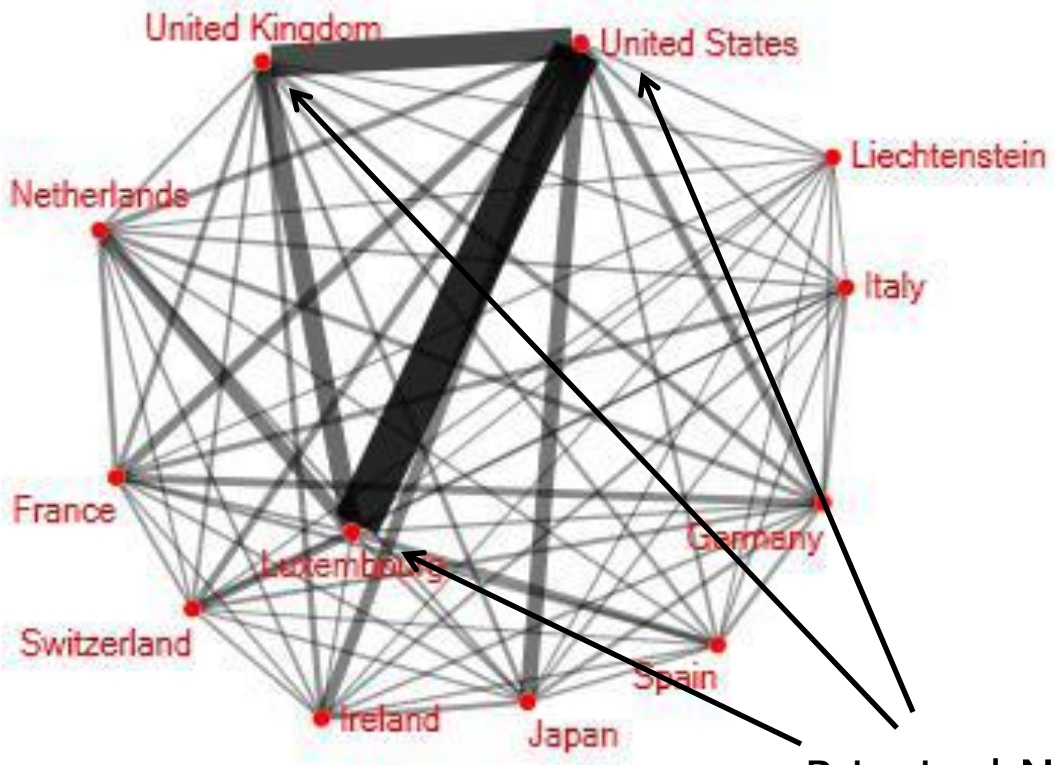
The Data Collection Process

- National Authorities:
  - Collect Institutional Data and Aggregate
- Central Bank of Trinidad and Tobago (CBTT):
  - Data Repository
- IMF:
  - Receives Aggregated Data for Analysis

II. Interconnectedness Analysis

Interconnectedness Map

Example: Cross-Border Funds



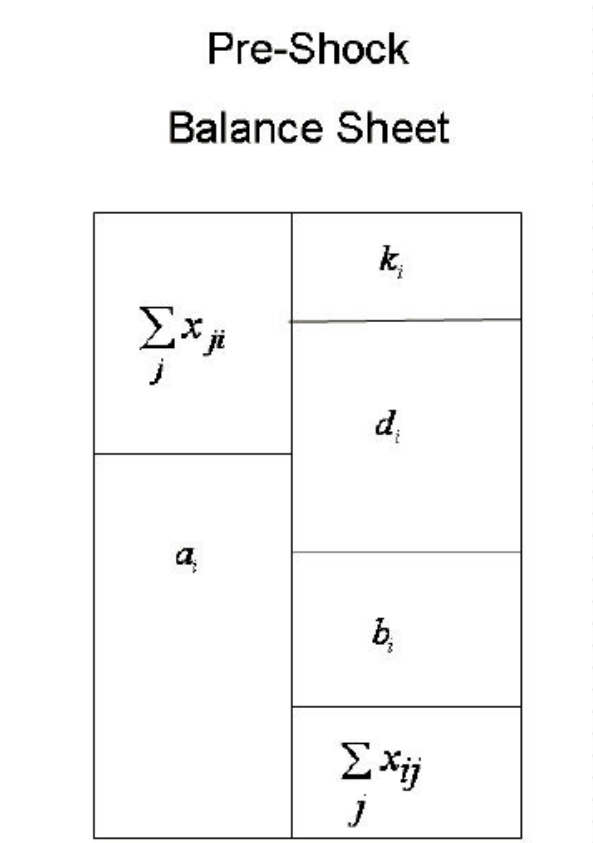
Principal **Nodes** (Most Interconnections) – Note Luxembourg's Importance as a Conduit

Source: "Understanding Financial Interconnectedness", IMF, 10/4/10, Data from Lipper.

Analytical Constructs

- Centrality Analysis
  - Find “central” nodes in a financial network
- Cluster Analysis
  - Identify subgroups of interconnected nodes
- Systemic Importance
  - What are the consequences of an institution’s failure?

Espinosa and Sole Model: Network Simulations*



Assets = Bilateral Claims on Other Banks i to j plus other assets (a)
Capital = Each bank i has capita k_i
Liabilities = Deposits, Bonds and interbank borrowings.

*Espinosa, Marco and Juan Sole, "Cross-Border Financial Surveillance: A Network Perspective, IMF WP/10/105, April 2010, See also IMF Global Financial Stability Report, April 2009, "Assessing the Systemic Implications of Financial Linkages"

Post-Shock

Balance Sheet

λx_{hi}	λx_{hi}
$\sum_j x_{ji}$	k_i
	d_i
a_i	b_i
	$\sum_j x_{ij}$

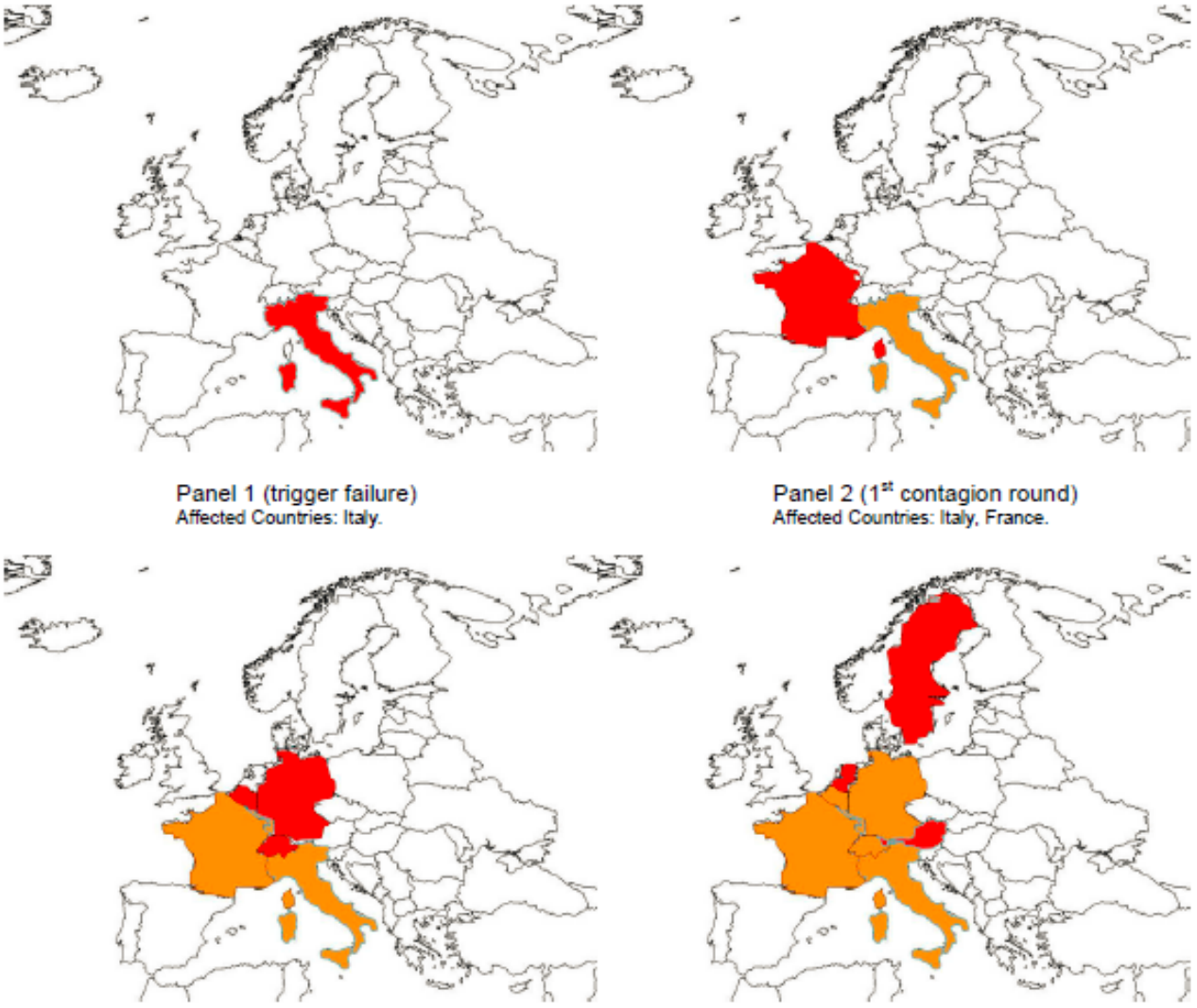
Assume bank h defaults. Each bank exposed to it loses λ (the loss-given-default rate) times its exposure to bank h. This reduces assets and, by assumption, capital by that amount.

Algorithm

- First Round
  - Which banks become insolvent (capital wiped out) from initial shock?
- Second Round
  - Which banks become insolvent from the first round shock
- End the Loop
  - Keep doing rounds until no more banks become insolvent

Example: Contagion Path Triggered by Failure of Italian Banks

Figure 7: Contagion Path Triggered by the Italian Failure under the Credit Shock Scenario



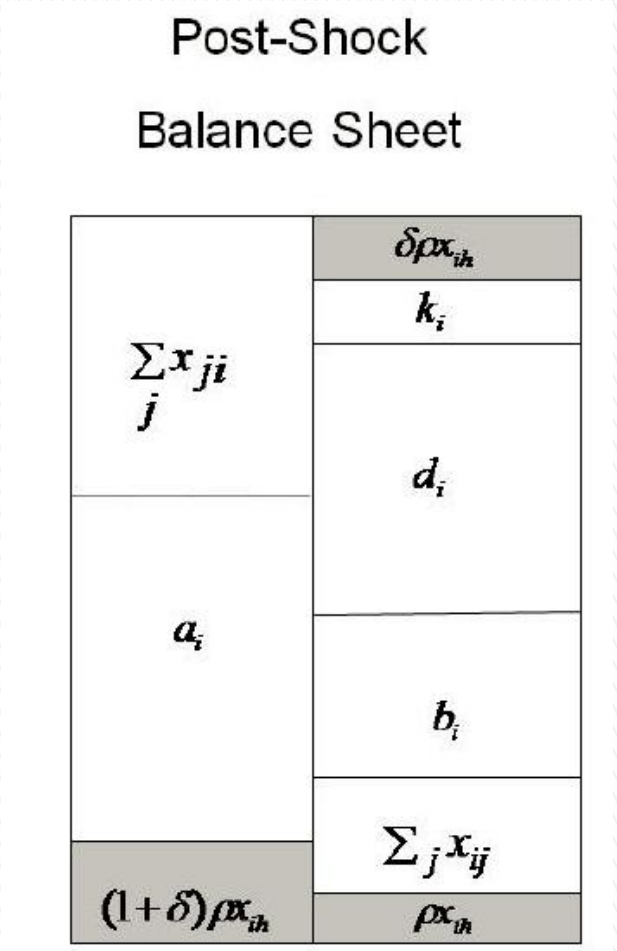
Panel 1 (trigger failure)
Affected Countries: Italy.

Panel 2 (1st contagion round)
Affected Countries: Italy, France.

Panel 3 (2nd contagion round)
Affected Countries: Italy, France, Belgium, Germany, Switzerland.

Panel 4 (final round)
Affected Countries: Italy, France, Belgium, Germany, Switzerland, Austria, Sweden, Netherlands.

Source: Authors



Liquidity Extension: Credit+Funding Shock

Bank h defaults, bank i can only replace (1−ρ) of its funding. So interbank lending falls by ρ times its funding from that bank. It is assumed it then as to liquidate that amount of assets, but must sell them at a discount, δ. Thus, it's asset losses are greater than its loss of liquidity, and this hits capital.

Outputs From Network Simulations

- Measuring Systemic Importance
  - *Assume* an institution in system defaults
  - Obtain total number of other institutions that fail
  - Obtain total loss of capital (even without domino failures)
  - Use as measures of institutions' systemic importance
- Economic Stress Tests
  - Rather than *assume* a failure's institution, apply an economic stress to *ascertain* which ones fail

III. Data Requirements

- For Network Mapping
  - Matrix of inter-institution exposures
- For Determining Systemic Importance
  - Matrix of inter-institution exposures +
  - Capital by Institution
- For Economic Stress Tests
  - Matrix of inter-institution exposures +
  - Capital by Institution +
  - Sectoral Exposures by Institution

Data Considerations:

- Level of Aggregation?
  - Institution-to-Institution
  - Institution-to-Aggregate
  - Aggregate-to-Aggregate
- Perimeter of Coverage – Which Nodes?
- Crossings?
  - Country, Sector, Currency, Maturity, Instrument*
- Risk Concept: Immediate or Final Risk Basis?
  - Hedges, Collateral, Reinsurance, Government Guarantees

A 5-way crossing with x categories in each would require x^5 separate data entries per institution

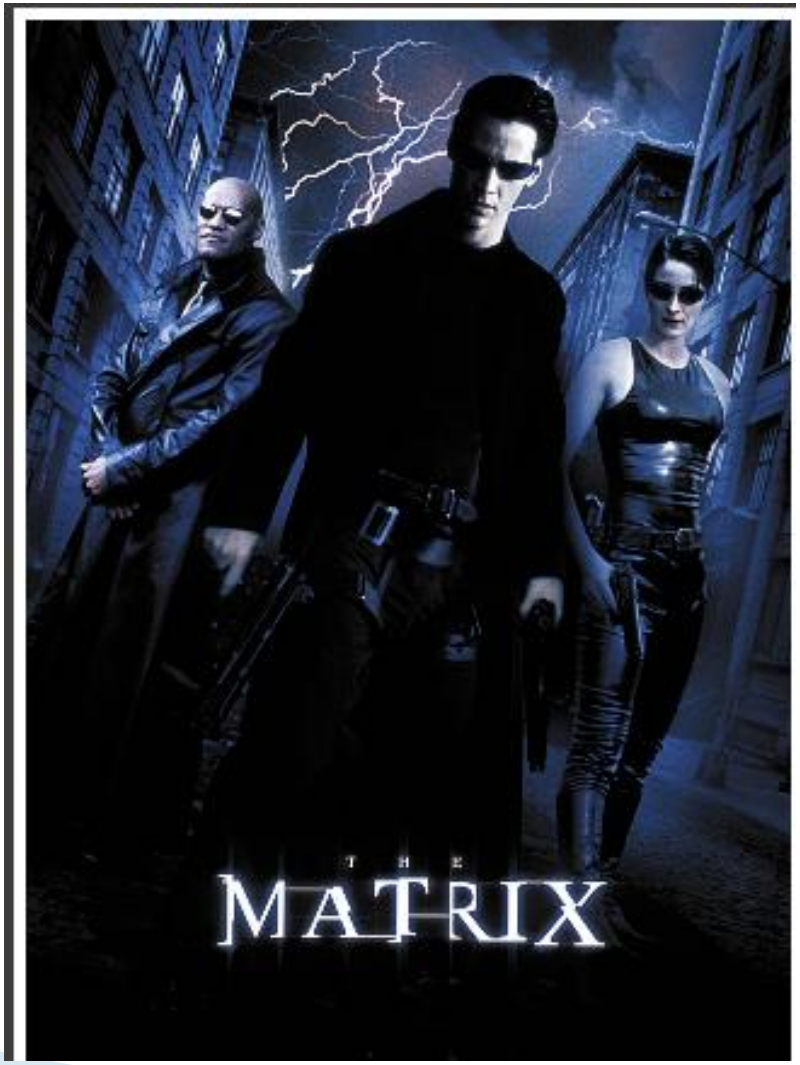
Building the Matrix for the CRFP – An Interim Way Forward

- Level of Aggregation?
  - Confidentiality Concerns => Aggregated Data
  - Definition of a Node is a Specific Sector in a Specific Country

- Perimeter of Coverage?
  - Choose Nodes Likely to Play Role in Shock Transmission
  - For All Countries: Banks, Insurers, Sovereigns, Central Banks
  - For Some Countries: Credit Unions, Offshore Banks
  - Must have commonly shared definitions of nodes (i.e. common lists of institutions in each node)
- Crossings
  - Only country and sector
- Risk Concept?
  - Immediate Risk, but…
  - Try to collect data on government guarantees

Introducing the CRFP Templates

The Matrix



The Matrix

Claims of Row on Column		ANTIGUA AND BARBUDA			BARBADOS			DOMINICA			GRENADA		
		Banks	Insurers	credit unions	Banks	Insurers	credit unions	Banks	Insurers	credit unions	Banks	Insurers	credit unions
ANTIGUA AND BARBUDA	Banks	xxxxxxxxxxxx											
	Insurers		xxxxxxxxxxxx										
	credit unions			xxxxxxxxxxxx									
BARBADOS	Banks				xxxxxxxxxxxx								
	Insurers					xxxxxxxxxxxx							
	credit unions						xxxxxxxxxxxx						
DOMINICA	Banks							xxxxxxxxxxxx					
	Insurers								xxxxxxxxxxxx				
	credit unions									xxxxxxxxxxxx			
GRENADA	Banks										xxxxxxxxxxxx		
	Insurers											xxxxxxxxxxxx	
	credit unions												xxxxxxxxxxxx

Institutional Templates

FIRM INFORMATION:	
as of	Date 12/31/2012
Institution type	
Domestic or Foreign-Owned	
If Foreign: Name of Parent	
Country of Foreign Parent	
Currency (local currency per US dollar)	0

Institutional Templates: Balance Sheet

BALANCE SHEET		
(in millions of local currency)		
ASSETS		
1	CASH	
2	TANGIBLE / FIXED ASSETS	
3	INTANGIBLE ASSETS	
4	LOANS INCL. SECURITIES LENDING AND REPO	
4.a	SPECIFIC PROVISIONS and allowances for credit losses ON LOANS	
4.b	GENERAL PROVISIONS and allowances for credit losses ON LOANS	
5	DEPOSITS	
6	HOLDINGS OF DEBT SECURITIES	
6.a	SPECIFIC PROVISIONS and allowances for credit losses ON DEBT SECURITIES	
6.b	GENERAL PROVISIONS and allowances for credit losses ON DEBT SECURITIES	
7	HOLDINGS OF EQUITY INSTRUMENTS	
8	OTHER ASSETS	
LIABILITIES		
9	LOANS INCL. SECURITIES LENDING AND REPO	
10	DEPOSITS	
11	DEBT SECURITIES ISSUED	
12	OTHER LIABILITIES	
CAPITAL - Basel I definition		
13	Tier 1	
14	Tier 2	
15	Total (13+14)	

Institutional Templates: Node Exposures

Exposure to Network Nodes (COMMERCIAL BANKS) in Millions of Local Currency		ANTIGUA AND BARBUDA	BARBADOS	CANADA	DOMINICA	EUROPE	GRENADA	GUYANA	HAITI	JAMAICA
	TOTAL CLAIMS ON:									
IA1	SOVEREIGN (INCLUDING CENTRAL AND LOCAL GOVERNMENT)									
IA2	CENTRAL BANK									
IA3	BANKS									
	of which: GUARANTEED BY GOVERNMENT 1/									
IA4	OFFSHORE BANKS									
	of which: GUARANTEED BY GOVERNMENT 1/									
IA5	INSURANCE COMPANIES									
	of which: GUARANTEED BY GOVERNMENT 1/									
IA6	CREDIT UNIONS									
	of which: GUARANTEED BY GOVERNMENT 1/									
	TOTAL LIABILITIES TO:									
IA7	SOVEREIGN (INCLUDING CENTRAL AND LOCAL GOVERNMENT)									
IA8	CENTRAL BANK									
IA9	BANKS									
IA10	OFFSHORE BANKS									
IA11	INSURANCE COMPANIES									
IA12	CREDIT UNIONS									

1/ "of which: GUARANTEED BY GOVERNMENT" refers to sector exposures that are guaranteed by the government of the country in which the institution is located.

Institutional Templates: Exposures to Other Sectors

Exposures to Other Sectors (COMMERCIAL BANKS) in Millions of Local Currency			Total
	TOTAL CLAIMS ON:		
IA1	TOURISM		
	of which: GUARANTEED BY GOVERNMENT 1/		
IA2	REAL ESTATE		
	RESIDENTIAL REAL ESTATE		
	of which: GUARANTEED BY GOVERNMENT 1/		
	COMMERCIAL REAL ESTATE		
	of which: GUARANTEED BY GOVERNMENT 1/		
IA3	HOUSEHOLDS(EXCLUDING RESIDENTIAL MORTGAGE LOANS, WHICH ARE INCLUDED IN RESIDENTIAL REAL ESTATE)		
	of which: GUARANTEED BY GOVERNMENT 1/		
IA4	BROKER-DEALERS		
	of which: GUARANTEED BY GOVERNMENT 1/		
IA5	OTHER NBFI (INCLUDING PENSION FUNDS, MUTUAL FUNDS,ETC.)		
	of which: GUARANTEED BY GOVERNMENT 1/		
	TOTAL LIABILITIES TO:		
IA6	TOURISM		
IA7	REAL ESTATE		
IA8	HOUSEHOLDS		
IA9	BROKERS-DEALERS		
IA10	OTHER NBFI (INCLUDING PENSION FUNDS, MUTUAL FUNDS,ETC.)		
1/ "of which: GUARANTEED BY GOVERNMENT" refers to sector exposures that are guaranteed by the government of the country in which the institution is located.			

Ultimate Objective

- Institution-to-Institution Data Will Remain Critical
  - Sectoral Aggregates Mask Critical Information
  - Financial Crises Begin as Crises of Institutions
  - Network Simulations Misleading with Aggregates
    - Require Huge Shocks for a Sector to Become Collectively Insolvent
- Continue to Work on Legal Frameworks for Information Sharing

Data Considerations
Confidentiality Issues

- Do Legal Frameworks Vary Across Jurisdictions?
- Can Supervisors Share Individual Institution Data?
  - With IMF
    - Yes, Given IMF's Confidentiality Framework (data may need to be coded)
- Can Supervisors Share Counterparty Information
  - With Other Supervisors?
  - With IMF?
- Use of Coding Systems
  - Can an Independent Party Assign Codes
  - Could IMF Do Analysis Without Data Retention?

Key Issues for Discussion

- Do we have the right nodes?
- Do we have the right economic exposures?
  - Country-specific economic exposures?
- Is the data collectible?
  - Authority to Compel Responses?
  - Minimum Institution Size Limits?
- Issues with Definitions of Claims?
  - Risk Basis?
- Timing
- Moving to Institution-to-Institution Data: Reviewing Confidentiality Frameworks


Beverly Hills
THIS IS
THE END

Extra Slides

Data Considerations: Level of Aggregation

- Level of Aggregation
  - Institution-to-Institution
  - Institution-to-Aggregate
  - Aggregate-to-Aggregate
- Note, Thacker et. al. mapped interconnectedness using:*
  - Public Information on banks (Bankscope)
    - Information on assets and ownership
    - No interconnectedness data
  - BIS aggregate data on banking systems
    - Bilateral connections of BIS reporting banks in 25 reporting countries to Caribbean destinations
    - A-A data
    - Misses direct links of Caribbean destinations to each other
    - Misses non-banks
  - CPIS – only 2 Caribbean jurisdictions (Bahamas and Barbados) report

*"Financial Interconnectedness and Financial Sector Reforms in the Caribbean", IMF WP/13/175

Data Considerations:
Perimeter of Coverage

- Type of Institution
  - Banks
  - Insurers
  - Credit Unions
  - Securities Firms
- Size of Institution
- Size of Counterparties

Data Considerations: Crossings

- Crossings
  - Country
  - Sector
  - Instrument
  - Currency
  - Maturity
- More Crossings Imply
  - Richer "What-If" Experiments…
  - … but Exponential Increase in Data Requirements

A 5-way crossing with x categories in each would require x^5 separate data entries per institution

Data Considerations:
Risk Concept

- Immediate Risk Basis
  - Data Easier to Collect
  - But May Give Misleading Understanding of Economic Risks
- Final Risk Basis
  - Nets out Collateral
  - Nets out “Risk Transfers”
    - Guarantees
    - Hedges (Financial, not Garden)
  - Extremely Difficult to Measure
    - Degree of Risk Transfer May Be Contingent on Circumstances