

Developing Macro-Prudential and Systemic Risk Indicators for the Caribbean

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Structure of Presentation

1. Defining Systemic Risk
2. Systemic Risk and Financial Stability: Theoretical Issues
3. Key Systemic Risk and Macro-Prudential Measures
4. Systemic Risk Measurement in the Caribbean
5. Challenges
6. Systemic Risk Measurement: An Agenda for Central Banks

1.0 Defining Systemic Risk

1.1 Main Elements of a Robust Financial Stability Risk Architecture for the Caribbean

Financial Sector Components	Sources of Risk	Risk Assessment	Major Risks	Risk Metrics	Risk Mitigation
Financial Institutions <ul style="list-style-type: none"> • Banks • Insurance/Pension Funds • Credit Unions • Securities Firms 	Endogenous Risks	Systemic and Macro-Prudential	<ul style="list-style-type: none"> •Credit •Liquidity •Reputational 	<ul style="list-style-type: none"> •FSIs •EWIs •Stress Tests •Flow of Funds Matrix •MPIs & SRIs 	<ul style="list-style-type: none"> •Financial Safety Nets •Crisis Management •Regulatory System (Single, Multiple)
Financial Markets <ul style="list-style-type: none"> • Interbank Mkt • Forex Mkt. • Capital Mkts (Equity, Debt) 			<ul style="list-style-type: none"> •Counterparty •Asset Price Misalignment •Market •Reputational 	<ul style="list-style-type: none"> •Interdependency Matrix •Interconnectness Map 	
Financial Infra-Structure <ul style="list-style-type: none"> • Legal/Regulatory Systems • Payments Systems • Clearance Systems • Deposit Insurance 	Exogenous Risks	Micro-Prudential	<ul style="list-style-type: none"> •Payment •Operational •Regulatory •Reputational 	<ul style="list-style-type: none"> •Financial Models (Macro, DSGE) •Network Analysis 	<ul style="list-style-type: none"> •Business Continuity •Robust Network and ICT Platform

Source: Nicholls (2014)

1.2 Macro-Prudential Policy Elements

KEY AREAS	ACTIONS
1. Establish Legal Regulatory/Mandate for Financial Stability and Macro-Prudential Policy.	Need to Ensure Legal Mandate for Financial Stability/Macro-Prudential Policy is established.
2. Setting up Organisational/Institutional Arrangements	Need for a System-wide Oversight Committee or Regulatory Policy Council that is focused on macro-prudential policy and financial stability.
3. Designing Macro-Prudential Policy Objectives.	Need to establish a macro-prudential policy framework with <u>clear objectives</u> . <ul style="list-style-type: none">• Building capital buffers• Contain build-up of vulnerabilities over time, in sectors and across the system.

1.2 (cont'd) Macro-Prudential Policy Elements

KEY AREAS	ACTIONS
4. Designing Operating Framework for Financial Stability	<ul style="list-style-type: none">• Assessing Systemic Risk (Assess imbalances, Map out linkages in the system)• Design Macro-prudential tools to contain systemic risks (countercyclical capital buffers and provisions, sectoral capital requirements, Loan-to-value limits, Debt-to-income limits, risk-weighting of highly connected sectors, liquidity coverage ratios, net stable funding ratios, reserve requirements,)
5. Establishing Financial Safety Net/Crisis Preparedness Plans	<ul style="list-style-type: none">• Design appropriate financial safety net (deposit insurance, financial stability fund or levy)• Preparation of national crisis preparedness plans.

1.3 Some Issues regarding Systemic Risk in Financial and Economic Systems

- It is important to state upfront that a **commonly accepted definition of systemic risk** is still lacking although work on both the academic and policy fronts is proceeding apace to synthesise the myriad of views that exist on systemic risk (De Bandt et al 2000)
- Systemic risk is therefore still not a well understood concept given its many dimensions.
- Important to distinguish between **systematic risks** and **systemic risk** although both are related .

1.4 Defining Systemic Risk

RISK	DEFINITIONS
Systematic Risk (Investment and Finance Literature)	Macroeconomic and aggregate risks that cannot be avoided through diversification (Larson 2013).
Systemic Risk (Macro-financial literature)	The likelihood of experiencing a systemic failure, a broad-based breakdown of the financial system that is triggered by a strong systemic event in the financial system which severely and negatively impacts financial institutions, markets and the economy (Patrio, Qi and Sun 2013).

1.5 Dimensions of Systemic Risk

Time-Series Dimension (Time-Varying)

- Risks caused by credit cycles and the pro-cyclicality of the financial system.
- (Progressive build-up of aggregate risk over time).

Cross- Sectional Dimension

- Interconnectedness risks through spillovers to financial system from SIFIs or through common exposures.

2.0

**Systemic Risk and
Financial Stability:
Theoretical Foundations**

2.1 Systemic Risk and Financial Stability: Theoretical Foundations

Categories	Risk Areas	Authors	
Systemic Risk Taking	•Correlation Risk	Acharya (2001)	Financial Institutions take bets that are large and correlated.
	•Liquidity Risk	Brunnermeier and Oehmke (2013)	
	•Tail Risk	Freixas and Rochet (2013)	
	•Leverage Cycles	Bernanke and Gertler (1989)	
Contagion	•Balance Sheet Contagion	Allen and Gale (2000)	Losses spillover from one part of the financial system to another
	•Payment/Clearing Infrastructure	Duffie and Zhu (2011)	
	Informational Contagion	Dasgupta (2004)	

2.1 Systemic Risk and Financial Stability: Theoretical Foundations

Amplification	•Liquidity Crises	Brunnermeier and Pederson(2009)	Small Shocks have very large impacts.
	•Market Freezes	Heider, Hoerova and Halthausen (2009)	
	•Bank Runs	Martin, Skeie and Von Thadden (2014)	

Source: Benoit et al (2015) “Where the Risks Lie: A Survey of Systemic Risk”
HEC Paris Research Paper No. FIN-2015-1088 , 57 pages.

3.0

Measuring Systemic Risk

3.0 Measuring Systemic Risk

- Given its multidimensional aspects, there is no straight forward classificatory taxonomy for the measurement of systemic risk.
- Useful surveys on measurement of Systemic Risk:
 - **Giglio, Kelly and Qiao (2015)**
 - **Wolken (2013)**
 - **Bisias, Flood, Lo Valavanis (2012)**
- **For tractability:** Two broad categories of indicators/ measures: **Time Domain and Cross-sectional.**

DIMENSION	CATEGORY	MEASURE/INDICATOR
Time Dimension Indicators	<u>A. Build-Up of Risks</u> <i>(Build-up in Credit, Ability to repay debt, Inflated Asset Prices, Falling Lending standards)</i>	<ul style="list-style-type: none"> • Credit-to-GDP Measures (level, Gap). • Household Debt to GDP Measures (Level, Gap). • Early Warning Indicators (EWIs) – Non-parametric signal extraction (Kaminsky et al) • Banking Stability Index (BSI). • Aggregate Financial Stability Index (AFSI). • Debt Sustainability ratios (HH and Corporates). • Loan to Value (LTV) and Debt Service to Income Ratios (DSI).

DIMENSION	CATEGORY	MEASURE/ INDICATOR
Time Dimension Indicators	<u>B. UnWinding of Risks.</u> <i>(Unraveling of leverage, maturity mismatches, market and financial stresses)</i>	<ul style="list-style-type: none"> • Yield Spreads and Implied Volatilities (Interbank Mkt., Forex Mkt., Sovereign Bonds, Corporate Bonds) • Financial Stress Index. • IIP (International Investment position). • Systemic Liquidity Indicator Risk (SLRI).
	<u>C. Risk Absorption Capacity.</u> <i>(Adequacy of Liquidity and capital buffers).</i>	<ul style="list-style-type: none"> • Liquidity Coverage ratio. • Net Stable Funding ratio.

3.2 Key Macro-Prudential and Systemic Risk Measures Cross-Sectional Dimension (Cont'd)

- Cross-sectional Dimension examines:
 - (a) how shocks propagate through the system; and
 - (b) the extent to which failure of a specific institution can jeopardize the system.
- Several different approaches and models have been proposed to capture **contagion and systemic risk**.
- No firm consensus on preferable measures and models.

DIMENSION	CATEGORY	MEASURE/INDICATOR
Cross-sectional Dimension Indicators	<u>A. Common Exposures</u> (Exposure to common risks and shocks)	<ul style="list-style-type: none">•Composite Indicator of Systemic Stress (CISS).•Principal Component Risk Measures.•Co-Risk
	<u>B. Interconnection, Spillovers, Interdependency</u>	<ul style="list-style-type: none">•Conditional Value at Risk (CoVar and ΔCoVar).•Joint probability of Default (JPoD).•Distress Dependence Matrices(DDM).

DIMENSION	CATEGORY	MEASURE/INDICATOR
Cross-sectional Dimension Indicators	<u>B. Interconnection, Spillovers, Interdependency</u>	Contingent Claims Analysis (CCA). Marginal and Systemic Expected Shortfall (MES).
	<u>C. Other Interdependency models.</u>	•Stress Tests. •DSGE Models. •Macro-Financial Linkage Models. •Network Models

3.4 Recent Toolkits on Systemic Risk Measures

- A number of toolkits have begun to emerge re implementation of systemic risk measures.
- **International:**
 - **Systemic Risk Analytics** [US Treasury Office of Financial Research(OFR) and MIT)].
 - **“SYSMO” ToolKit** (IMF).
- **Regional**
 - Bank of Jamaica (Manual of MPIs (2015)).

4.0

**Systemic Risk
Measurement in the
Caribbean**

4.1a Properties of Good MPI and Systemic Indicators

- **Relevance** – Pick up risks relevant to the characteristics and structure of a country's financial system;
- **Measurable** – Indicators should be measurable;
- **Comprehensive and Dynamic** – Cover the financial system comprehensively and set of indicators should evolve over time as the system evolves;
- **Forward-Looking** – Provide an early warning of financial stress/imbbalances in sufficient time for policy action;
- **Accurate** – Signal from the Indicator should minimise the likelihood of false calls.

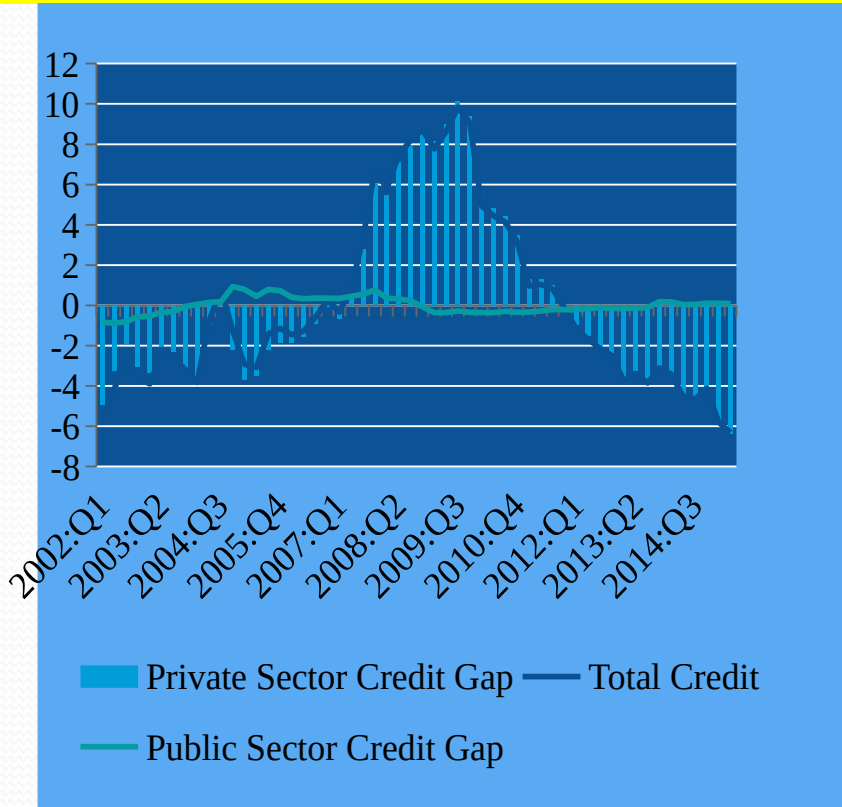
4.2(i) Time Domain Indicators (cont'd):

- **(i) Credit-to-GDP Gaps**

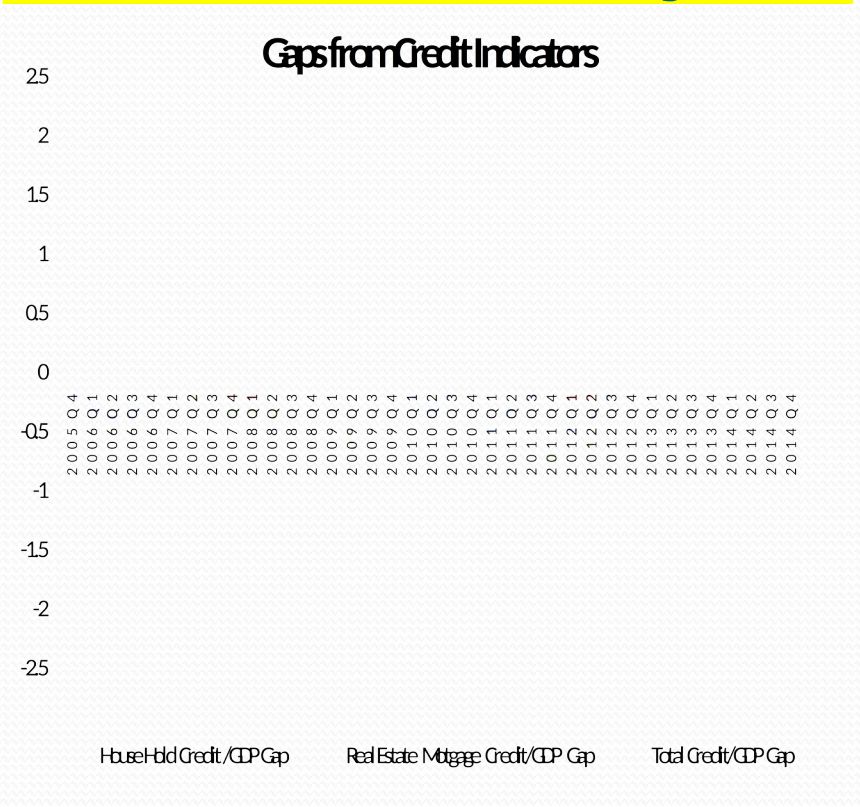
- **Credit-to-GDP gap** measures shows the deviation of the ratio of credit-to-GDP from trend and provides a signal about future imbalances.
- Indices indicate rising deviations from long-run trend during peak of the global financial crisis and in last two years in some countries.

4.2 a Credit-to-GDP Gap Measures: Belize and Guyana

Gaps from long-term trend: Credit Indicators- Belize*



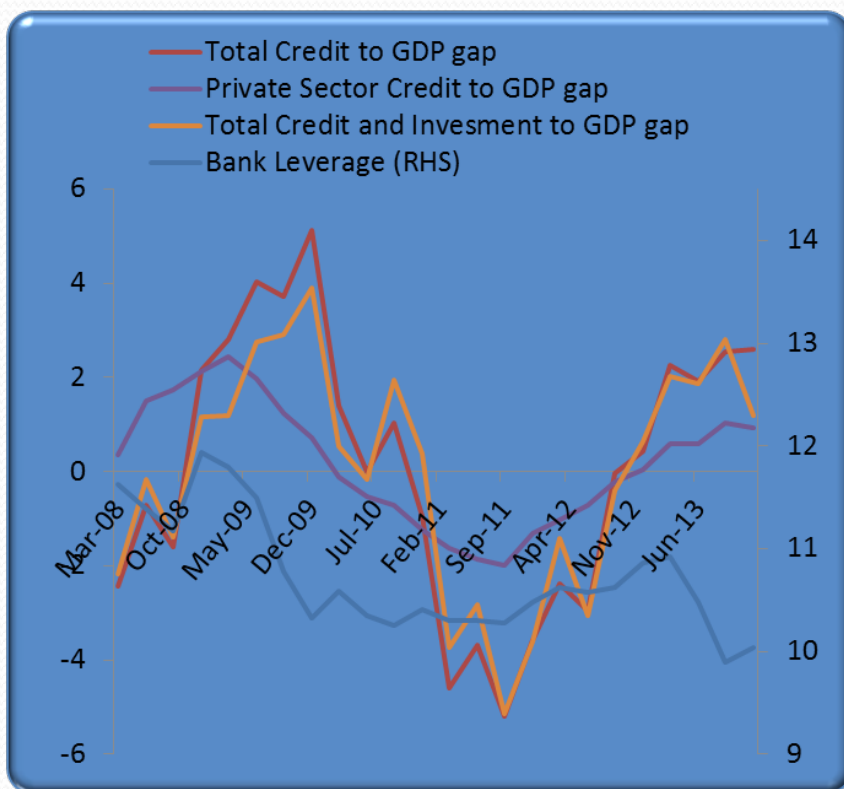
Gaps from long-term trend: Credit Indicators- Guyana*



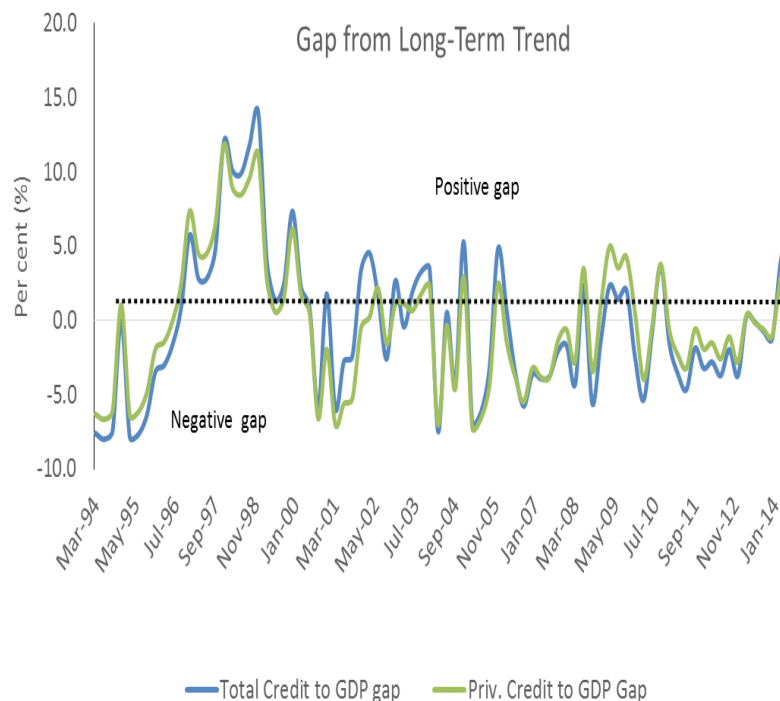
Source: *Brian Langrin (Bank of Jamaica)

4.2b Credit-to-GDP Gap Measures: Jamaica and Suriname

Gaps from long-term trend: Credit Indicators- Jamaica*



Gaps from long-term trend: Credit Indicators- Suriname*



Source: *Brian Langrin (Bank of Jamaica)

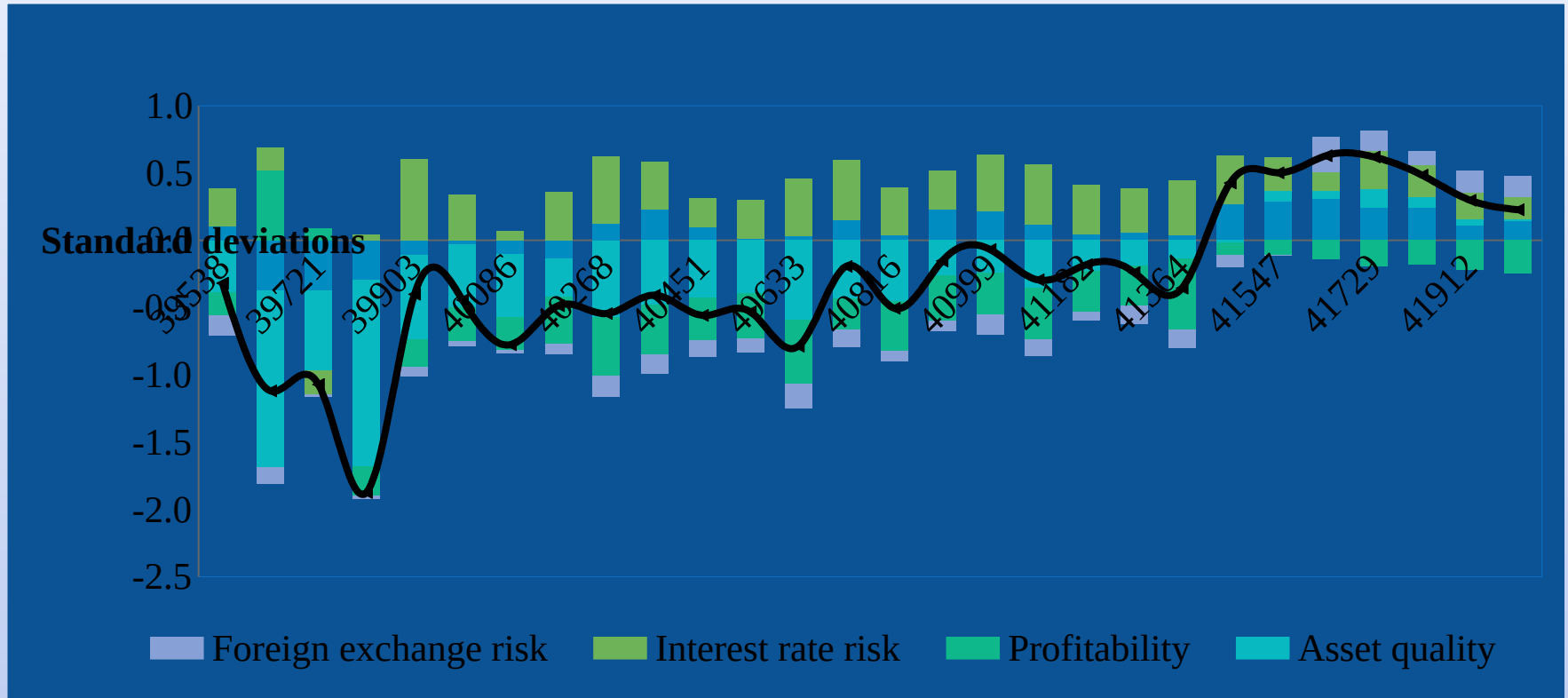
4.2(ii) Time Domain Indicators:

- **(ii) Banking Stability Index**

- Banking Stability Index (BSI) is a **weighted average of normalized banking sector partial indicators** of capital adequacy, profitability, asset quality, balance sheet liquidity, and sensitivity to market risk to indicate the level of stability of the banking sector.
- Indices computed for Belize, Guyana, Jamaica, Suriname.
- **Normalized such that higher values indicate an improvement in financial stability.**
- **Improvement noticed in banking sector stability indices in a few countries implementing reforms following the financial sector crisis.**

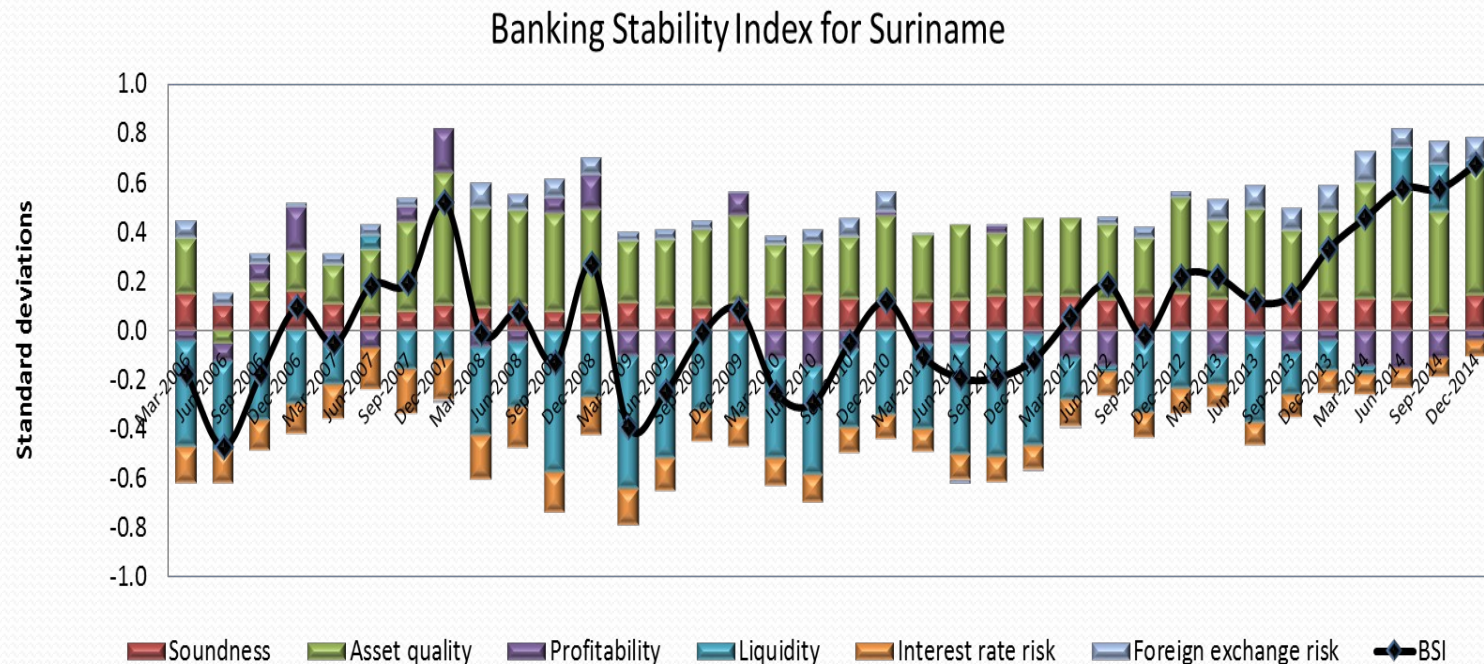
4.2c Banking Stability Index: Belize

Banking Stability Index for Belize



4.2d Banking Stability Index: Suriname

Banking Stability Index for Suriname



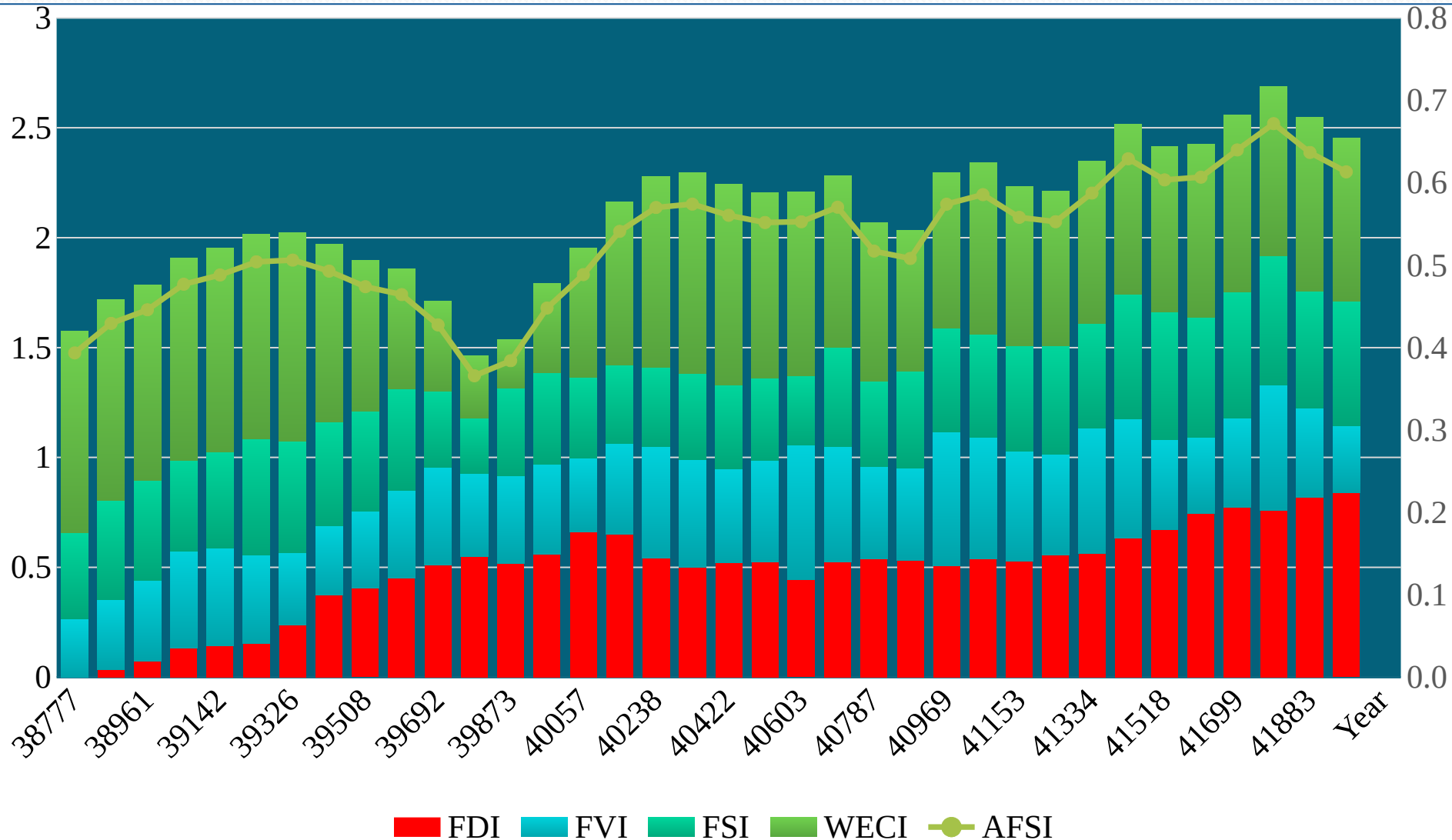
4.2(iii) Time Domain Indicators:

- **(ii) Aggregate Financial Stability Index**

- The Aggregate Financial Stability Index (AFSI) is computed as a weighted average of normalized balance sheet and macroeconomic partial indicators (including international factors) to indicate the level of stability of the financial system.
- Indices computed for Belize, Guyana, Jamaica and Suriname.
- **Normalized such that higher values indicate an improvement in financial stability.**
- **Aggregate Financial Stability indices also improving in a few countries implementing financial sector reforms, following the financial sector crisis .**

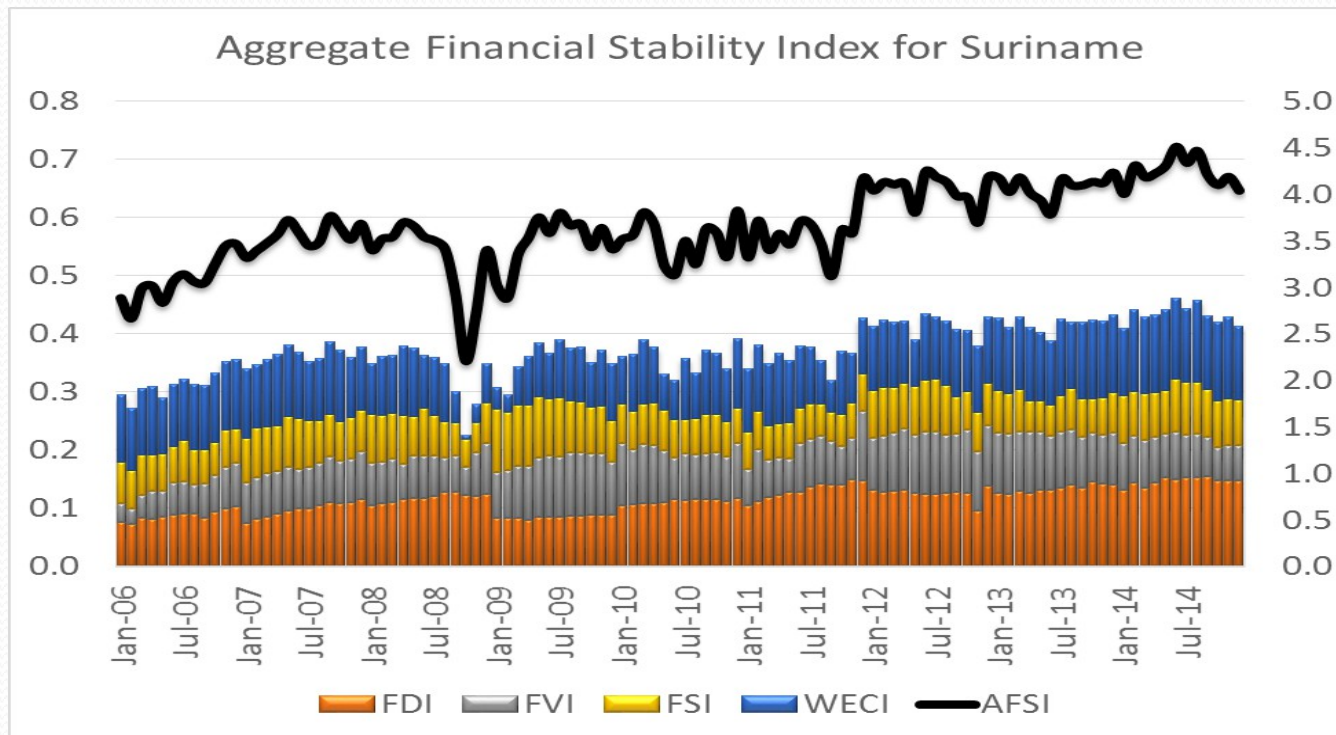
4.2e Aggregate Stability Index: Belize

Aggregate Financial Stability Index: Belize



4.2f Aggregate Stability Index: Suriname

Aggregate Financial Stability Index: Suriname



4.3 Cross-Sectional Dimension :

USEFUL AND POPULAR INDICATORS (Work in Progress)

- **Conditional Value at Risk (CoVar)** : Measures the degree of risk externalities that a single institution can place on the financial system.
- **Systemic Expected Shortfall (SES)**: Measures potential for an institution to be under-capitalised when the system is under-capitalised.
- **Contingent Claims Approach (CCA)**: Computes the likelihood of default (distance to default) for a financial institution using balance sheet data (leverage ratio) and the volatility of returns.

4.4 Systemic Risk Measurement: Caribbean Experience

- Some countries in the Caribbean have begun to make progress with developing selected systemic risk indicators but data intensive requirements are making progress somewhat slow.
- Most of the progress being made is in the area of the time-dimension indicators.
- Development of cross-sectional indicators is still at an embryonic stage in most countries, save Jamaica.

4.4a Status of Time-Dimension Indicators: Improving

Time-Dimension Indicators	BELIZE	GUYANA	JAMAICA	SURINAME
Credit-to-GDP Gap	√	√	√	√
EWI –Signal Extraction	√	In Progress	√	√
Banking Stability Index	√	√	√	√
Aggregate Financial Stability Index	√	√	√	√

4.4b Status of Cross-Sectional Dimension: Some Way to Go

Time-Dimension Indicators	BELIZE	GUYANA	JAMAICA	SURINAME
CISS	√	-	√	√
Co-Risk	-	-	√	-
CoVaR	-	-	√	-
SES	√	√	√	√
CCA	-	-	√	-

5.0

**Challenges for Systemic
Risk Measurement in the
Caribbean**

5.1 Challenges for Systemic Risk Measurement

- Key challenge is of course how to gauge when the potential for systemic risk is rising **with this smorgasbord (heterogeneous mixture) of indicators especially if some give conflicting signals?**
 - One solution is to determine the proportion of potential indices in each of the sub-categories and in aggregate that are highlighting increased stress.
 - If a significant proportion of these indicators are moving in the same direction, then the potential for systemic risk is on the increase.

5.1(cont'd) Challenges for Systemic Risk Measurement

- **Broad Information Gaps:**

- Limited Data on household Indebtedness;
- Limited Information on Exposures and Funding Links within financial system;
- Weak data on financial activity in the Residential and Commercial Real Estate Segments of the market in some countries;
- Weak financial data in non-banking sector;
- Limited and Unorganised Information on funding linkages between financial and real sector (FOF) .

6.0

Systemic Risk

**Measurement: An Agenda
for Central Banks**

5. AGENDA FOR CCMF AND CARIBBEAN Central Banks

- Central banks need to **intensify their efforts** towards producing an organised suite of macro-prudential and systemic indicators to better inform macro-prudential supervision, regulation and even monetary policy implementation.
- Need for a greater collaborative effort especially in the production of cross-sectional indicators and interconnectedness matrices.
 - Enhance transparency, improve effectiveness and strengthen financial integration.
 - Help to maintain and sustain the production of national and regional financial stability reports
- Collaboration on macro-prudential and systemic risk indicators and macro-financial linkage models and flow-of-funds accounting and analysis should form a central part of any future CCMF agenda.

LET'S GET MOVING!!



END OF PRESENTATION