



Monitoring Banking Sector Soundness in the Eastern Caribbean Currency Union: A Multivariate Data Analysis Approach

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Outline of Presentation

- Introduction
- Overview of ECCU Banking system
- Literature Review
- Data and Methodology
- Results
- Conclusion



Introduction

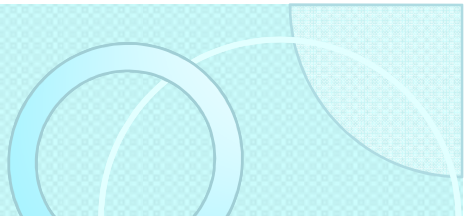
- Significant portions of research on the financial sector in recent times has focused on the etiology of financial sector distress and crisis
- Emphasis has been on the development of early warning systems
- However EWS were not successful in predicting a number of financial crises including the more recent US subprime financial crisis.
- Given the above and the fact that EWS are data hungry; we seek to develop a system where enhance monitoring of the sector can allow for remedial measures to be implemented; thus reducing the probability of a crisis.



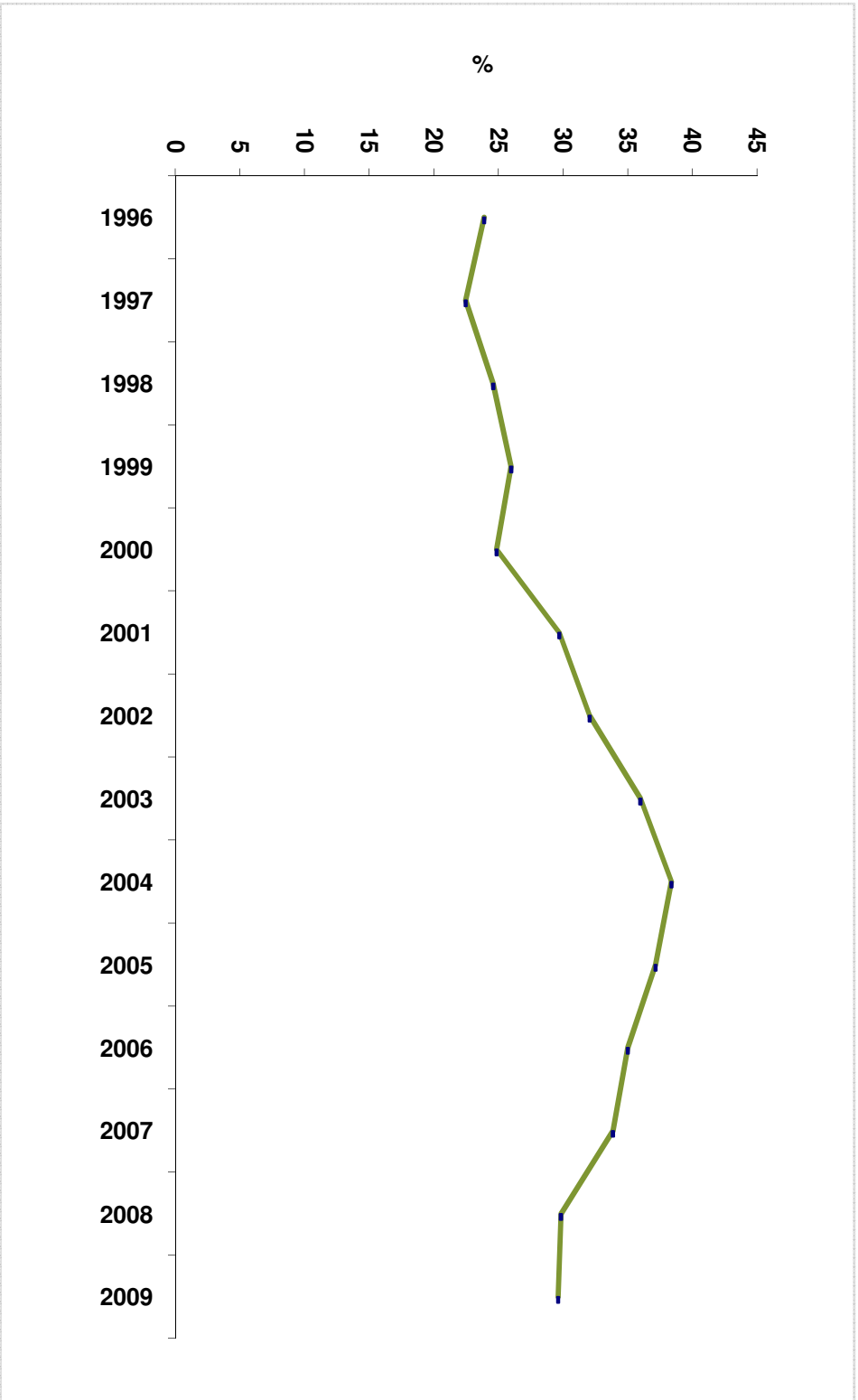
Overview of ECCU Financial System

Number of Institutions	ANG	ANU	DOM	GDA	MON	SKN	SLU	SVG	Total
Commercial Banks 1	4	8	4	5	2	7	6	4	40
ODCs	0	7	18	20	1	4	21	9	80
Credit Unions 3	0	5	17	19	1	3	16	7	68
Mortgage & Finance 2	0	2	1	1	0	1	5	2	12
Finance Co	1	1	2	3	1	1	3	2	14
Finance/Microfinance 2	0	0	0	1	0	0	2	0	3
Building and Loan 3	0	0	1	1	1	0	0	1	4
Development Banks 3	1	1	1	1	0	1	1	1	7
Insurance Co 3	22	26	19	24	7	17	26	23	164
Total	27	42	43	52	11	29	56	38	298
Regulators									
¹ ECCB: Banks	4	8	4	5	2	7	6	4	40
² ECCB: NBF1	0	2	1	2	0	1	7	2	15
³ SRUs*	23	32	38	45	9	21	43	32	243

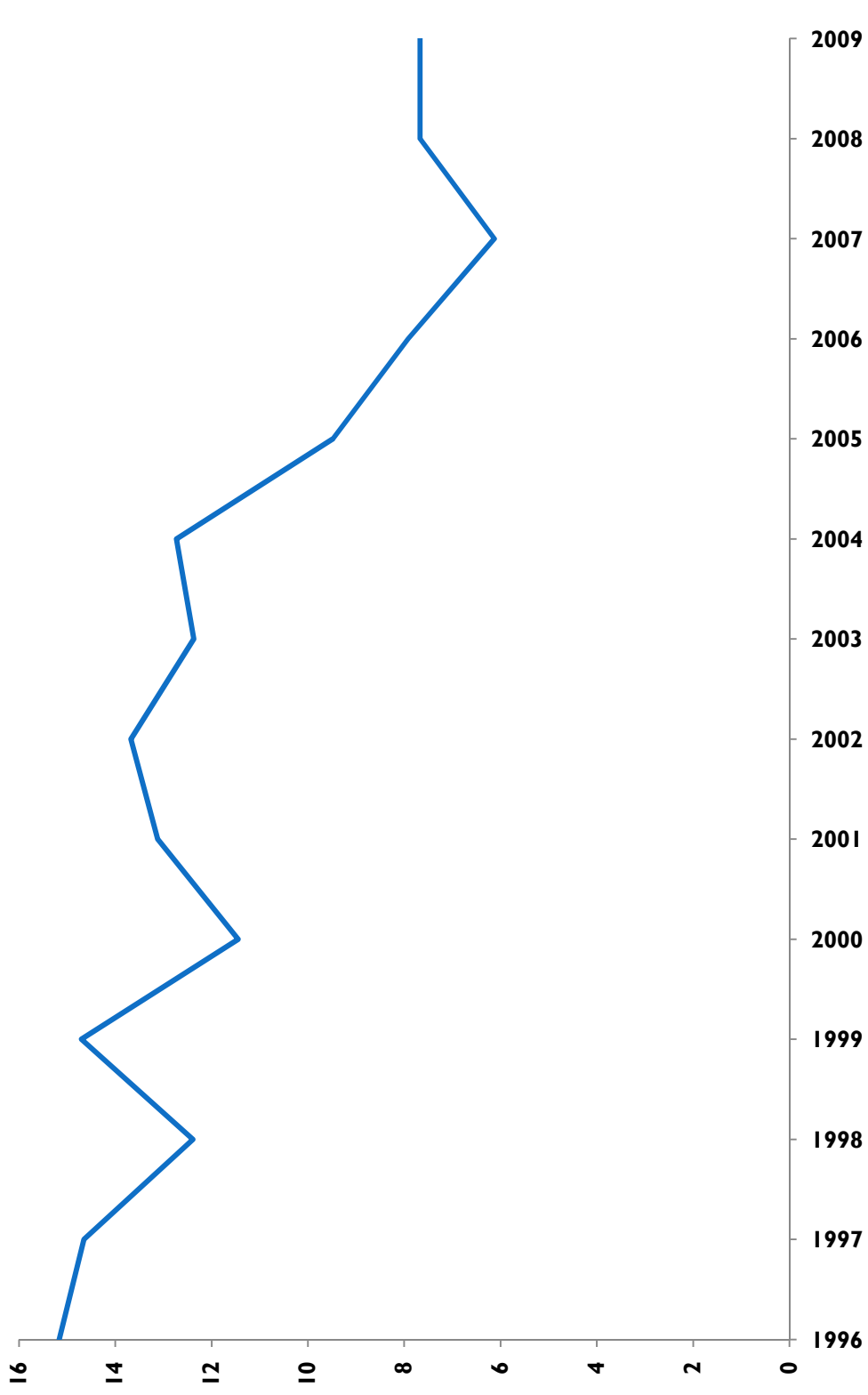




Liquidity

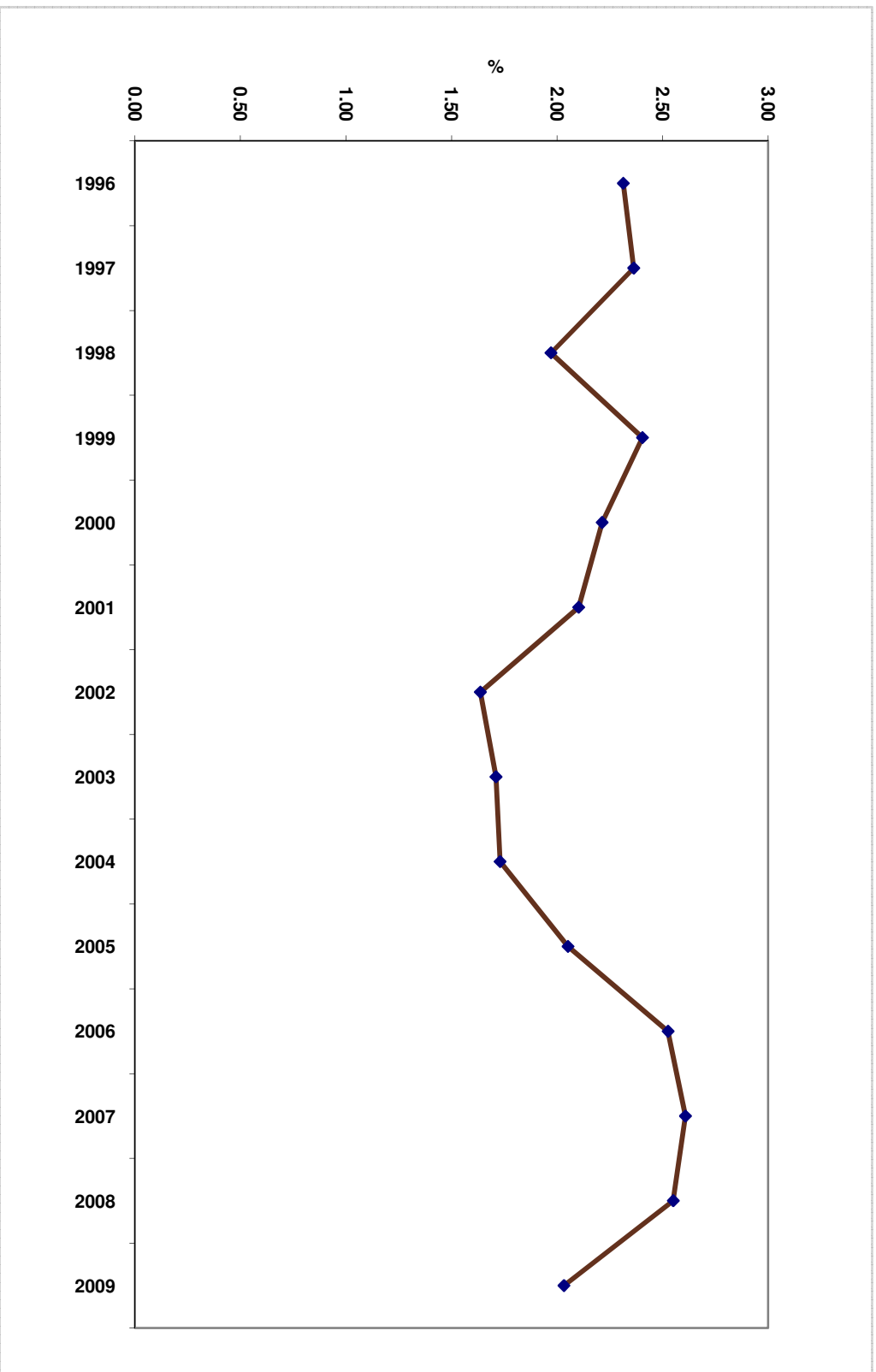


Credit Quality

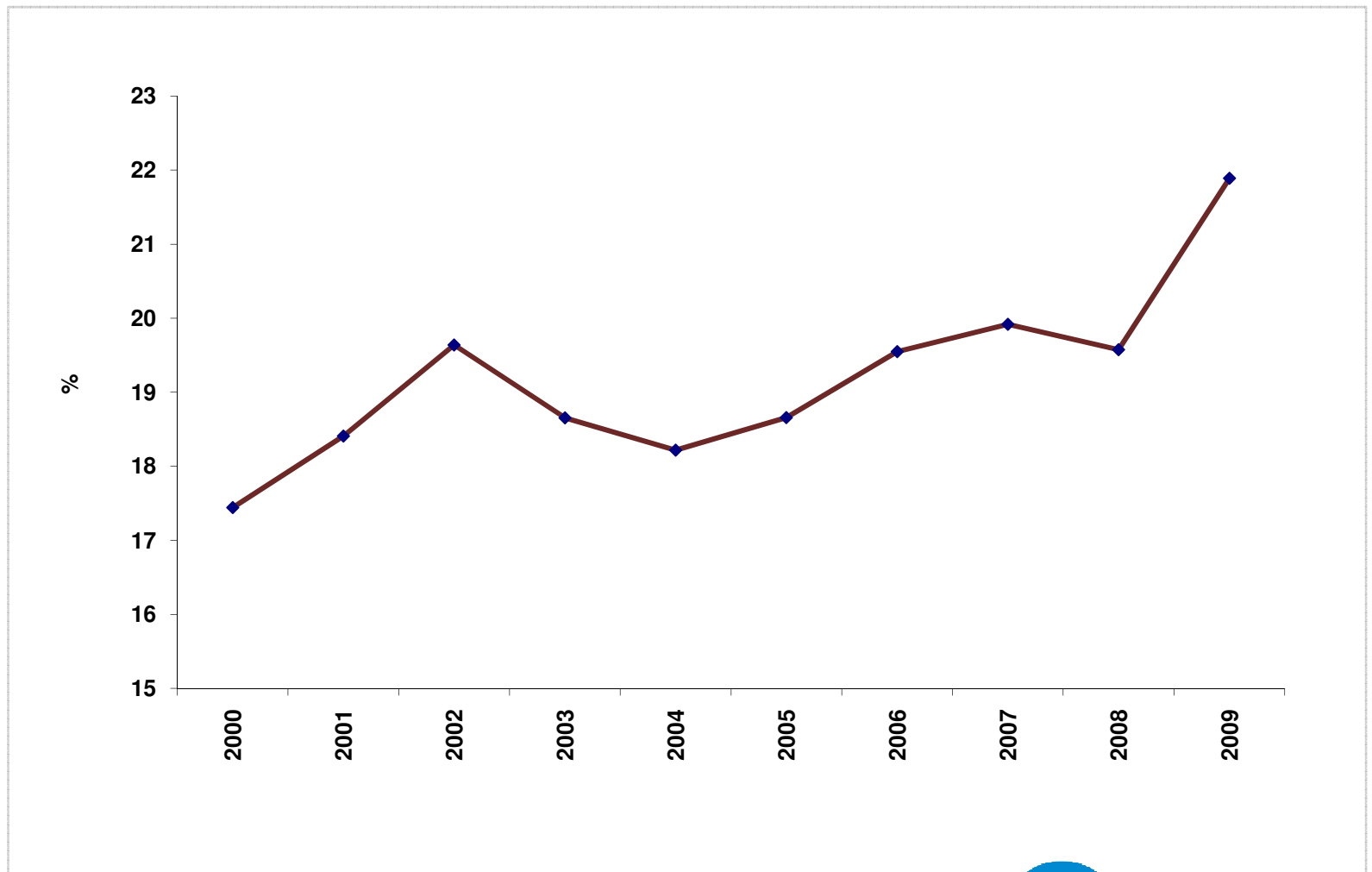




Profitability



Capital Adequacy



Indicator Approaches

- Demerguc-Kunt and Detragiache (1998)
- Hardy and Pazarbasioglu (1998)
- Kaminsky and Reinhart (1999)
- Garvin and Hausmann (1996) and Lindgren (1996)

C'bean

- Craigwell and Polius (1997)
- Polius (1998)
- Duttagupta and Cashin (2008)

Early Warning systems(EWS)

- Reinhart, Goldstein and Kaminsky (2000)
- Kaminsky and Reinhart (1999)

Trip wire and Speed Bump approach

- Grabel (2004)

Literature Review



Data

- Quarterly banking sector and macroeconomic data from 1996 to 2008
- Sample covers 38 commercial banks
- Dependent variable watch list (where applicable) is based on the ECCB Bank Supervision criteria
- Choice of independent variables informed by empirical literature, as well as the experience of supervision staff
- Two samples are used for analysis; (1) A full sample and (2) Sample of local banks
- We utilize three multivariate data analysis techniques;
 - cluster analysis
 - classification trees
 - discriminant analysis



Results: Discriminant Analysis

Table 2: Canonical Discriminant Function for Full Sample of Banks

Function	Eigen value	% Var.	Cum%	Canonical correlation	Wilks L	Chi Square	DF	Significance
1	.355	100	100	0.512	.738	68.94	6	0.000

Table 6: Canonical Discriminant Function for Local Banks

Function	Eigen value	% Var.	Cum%	Canonical correlation	Wilks L	Chi Square	DF	Significance
1	.442	100	100	0.554	0.693	82.975	7	0.000



Table 3: Full Sample Standardized Canonical Discriminant Function

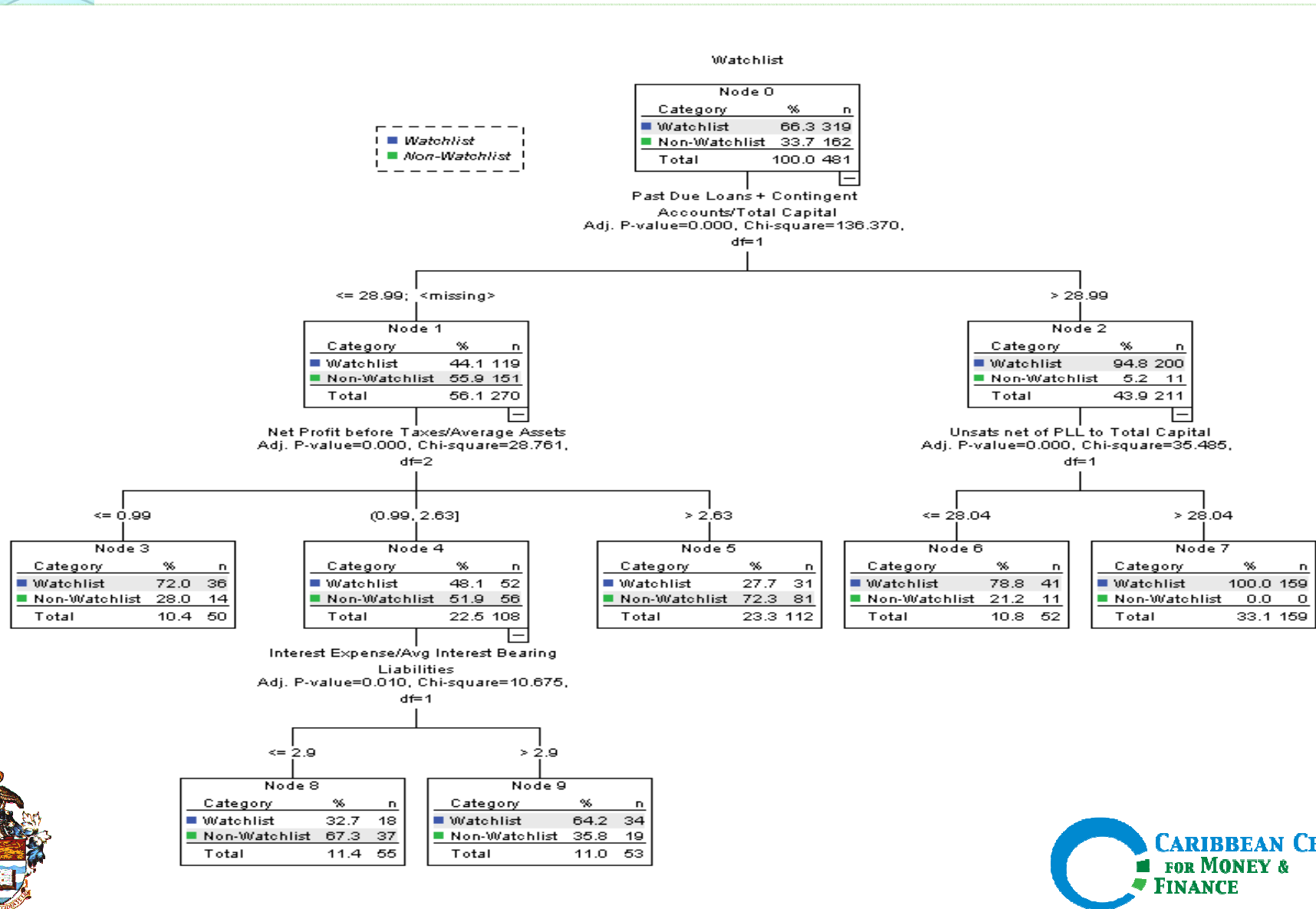
Total loans/ Total deposits	0.587
Net Interest Income to total income	-.350
Growth rate in Imports	-.373
Unsatisfactory assets/total loans	.503
Domestic Credit to GDP	.502
Operating expenses/total expenses	-.386

Table 7: Standardized Canonical Discriminant Function for Local Banks

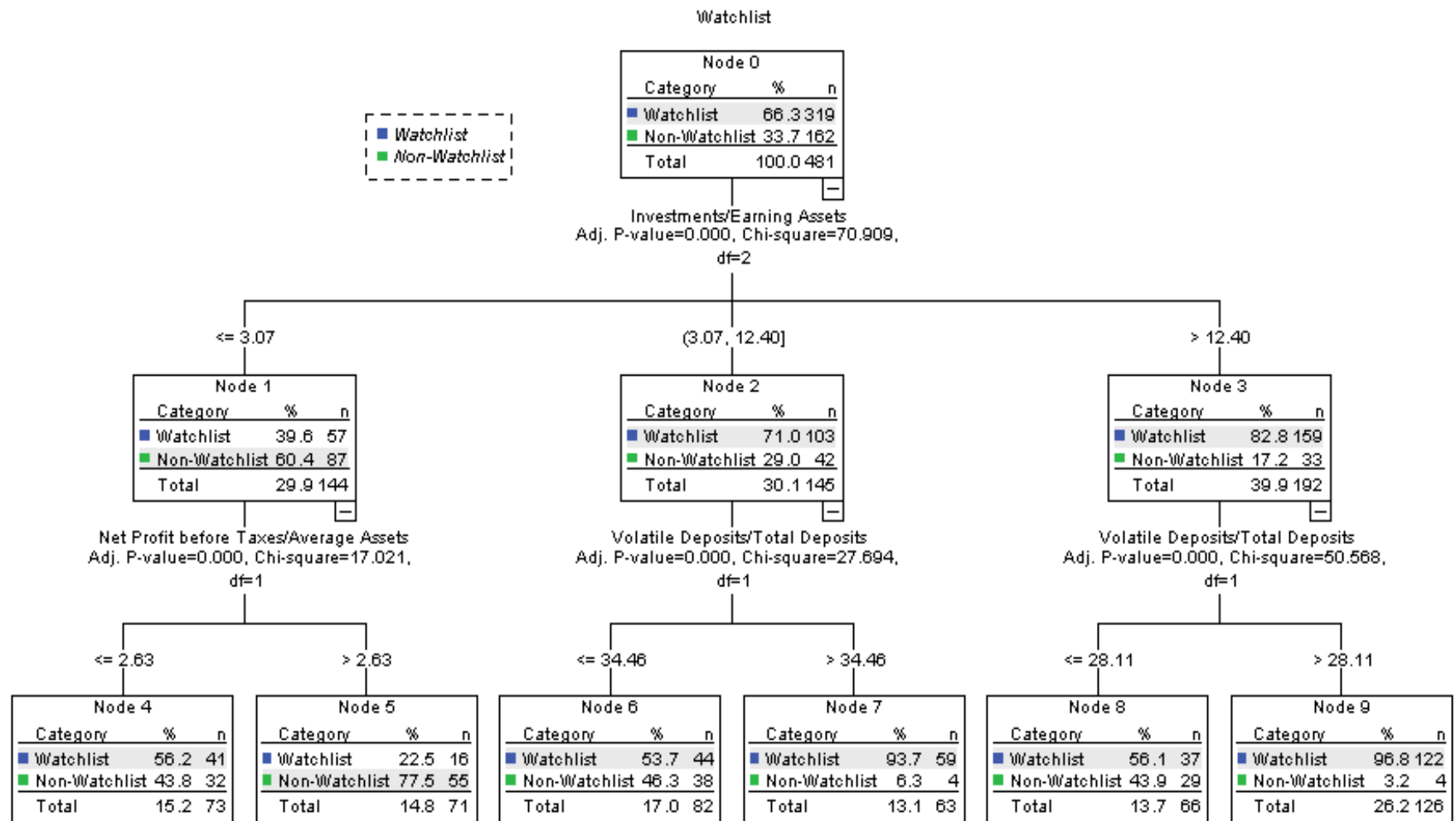
Total loans/ Total deposits	0.864
Net Interest Income to total income	-0.338
Growth rate in Imports	-0.296
Unsatisfactory assets/total loans	1.236
Domestic Credit to GDP	0.470
Tier I Capital to Total Deposits (solvency ratio)	0.640
Unsats net of PLL to Total Capital	-0.948



Results: Classification Tree for Full Sample



Classification Tree for Local Banks



Results: Cluster Analysis for Full Sample

	ANOVA				F	Sig.
	Cluster		Error			
	Mean	df	Mean	df		
Long Term Loans/Core Deposits	364.719	1	1203.314	476	303.10	0.00
Liquid Assets/Total Assets	53.928	1	194.6689	476	277.03	0.00
Liquid Assets/Total Deposits + Total Liabilities	71.437	1	276.4385	476	258.42	0.00
Total Loans/Total Assets	53.341	1	209.0675	476	255.14	0.00
Total Loans/Total Deposits	82.673	1	404.9656	476	204.15	0.00
Volatile Deposits/Total Deposits	43.841	1	267.8329	476	163.69	0.00
Interest Earned on Loans/Total Income	23.295	1	184.6183	476	126.18	0.00
Cash Reserves/Total Deposits	1.032	1	19.0501	476	54.15	0.00
Provision for Loans Losses/Unsatisfactory Assets	72.406	1	1824.641	476	39.68	0.00
Cash and Liquid Investments/Current Liabilities	6.810	1	180.8803	476	37.65	0.00
M2/Imputed Reserves	733	1	22.21541	476	33.01	0.00
Investments/Earning Assets	5.195	1	178.3193	476	29.13	0.00
Domestic Credit/GDP	22,637	1	909.4292	476	24.89	0.00
Net Profit before Taxes/Average Assets	53	1	3.294442	476	16.09	0.00
General Govt Loan/Total Loans	773	1	185.4714	476	4.17	0.04
Interest Expense/Interest Income	353	1	96.53469	476	3.66	0.06
Unsatisfactory Assets/Total Loans	254	1	100.3999	476	2.53	0.11
Operating Expenses/Total Expenses	313	1	199.2474	476	1.57	0.21
Growth rate in Imports	209	1	173.568	476	1.20	0.27
Net Interest Income to Total Income	0	1	90.01646	476	0.00	0.97

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.



Results: Cluster Analysis for Local Banks

	ANOVA					
	Cluster		Error		F	Sig.
	Mean	df	Mean	df		
Unsatisfactory Loans net of Specific Provisions to Total Capital	354,789	1	1,783	231	198.98	0.00
Total Loans/Total Assets	12,859	1	172	231	74.94	0.00
Long Term Loans/Core Deposits	120,283	1	1,656	231	72.64	0.00
Interest Earned on Loans/Total Income	11,529	1	185	231	62.19	0.00
Unsatisfactory Assets/Total Loans	4,699	1	78	231	60.63	0.00
Volatile Deposits/Total Deposits	12,363	1	209	231	59.22	0.00
Liquid Assets/Total Assets	10,091	1	177	231	56.91	0.00
Liquid Assets/Total Deposits + Total Liabilities	17,373	1	316	231	54.93	0.00
Total Loans/Total Deposits	12,603	1	286	231	44.00	0.00
Investments/Earning Assets	5,072	1	183	231	27.78	0.00
Provision for Loans Losses/Unsatisfactory Assets	39,131	1	1,640	231	23.85	0.00
Cash and Liquid Investments/Current Liabilities	5,305	1	234	231	22.68	0.00
Interest Expense/Interest Income	1,953	1	91	231	21.53	0.00
Total Capital/Risk Weighted Assets	2,135	1	106	231	20.07	0.00
Tier 1 Capital to Total Deposits (Solvency Ratio) 1:	244	1	14	231	17.90	0.00
M2/Imputed Reserves	377	1	24	231	15.73	0.00
Net Profit before Taxes/Average Assets	17	1	1	231	14.16	0.00
Net Interest Income to Total Income	720	1	113	231	6.35	0.01
Operating Expenses/Total Expenses	777	1	143	231	5.44	0.02
Domestic Credit/GDP	3,164	1	1,124	231	2.81	0.09
General Govt Loan/Total Loans	628	1	305	231	2.06	0.15
Growth rate in Imports	400	1	200	231	2.01	0.16
Cash Reserves/Total Deposits	12	1	7	231	1.78	0.18

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.



Summary of Results Across Methods

	Discriminant Analysis	Cluster Analysis	Classification Trees
Unsatisfactory assets/total assets			
Past due loans +contingent accounts/total capital			*
Unsats assets/total loans	*	*	*
Domestic Credit/GDP	*	*	
Unsats. net of PLL to total capital	*	*	*
Provision for loan losses/Unsats		*	
Investments/Earning Assets		*	*
Net interest income to total income	*	*	
Operating Expenses/Total expenses	*	*	
Interest expenses/avg. interest bearing liabilities		*	*
Net Profit before taxes/Average Assets		*	*
Volatile Deposits/total Deposits		*	*
Liquid Assets/total assets			*
Long term loans/Core deposits			
Total loans/total deposits	*	*	*
Tier 1 Capital/Total deposits	*	*	



Benchmarking the Indicators

	Discriminant Benchmark	Watch list center Cluster centers	Classification Tree node Splits
Total Loans/Total Deposits	< 55.2	90.93	<=72.36
Net Interest Income to Total Income	<=51.9	47.54	
Growth rate in Imports	<=15.9	7.36	
Unsatisfactory Assets/Total Loans	>=5.5	12	> 8.66
Domestic Credit/GDP	>=71.9	84.41	
Operating Expenses/Total Expenses	>=94.7	92.81	
Unsats net of PLL to total capital			> 28.04
Volatile deposits to total deposits		43.85	> 28.11
Net profit before taxes/average assets		2.36	> 2.63
Investments/earning assets		10.02	3.07-12.40



Conclusion

- We find that asset quality, liquidity, the degree of movement away from traditional banking business and profitability are all indicators which can be used for the purposes of monitoring soundness of the ECCU banking sector
- We established benchmarks that can be integrated into the monitoring framework for the regulator
- Further work will involve the development of a scoring model for banks using discriminant function coefficients to develop weights in the establishment of a scoring model for banks- this can be used as an additional monitoring tool.
- Extension of this kind of work where data permits to other sub sectors in the financial system such as insurance companies etc.

