



IMF Working Paper

Financial System Soundness in the Caribbean: An Initial Assessment

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Monetary and Exchange Affairs Department

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Abstract

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A survey of the financial systems of Caribbean countries reveals systems dominated by banks, with services widely available. Jamaica is the only country to have experienced a financial crisis. The paper describes recent improvements in the regulatory framework, and examines factors, which affect the soundness of the financial system, using both intuitive and econometric methodologies. The study identifies regulatory improvements that are needed, as well as additional data and analysis required to complete the assessment, which revealed no new threats to the financial system.

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FINANCIAL SYSTEM SOUNDNESS IN THE CARIBBEAN

I. INTRODUCTION

The Caribbean has a range of financial services for corporations and households, provided mainly by depository and credit institutions and insurance companies, with relatively small proportions of securities, traded equity and novel financial instruments.² Although experience varies somewhat, commercial banks are the dominant institutions everywhere, with finance companies, mortgage banks, national pension schemes, development banks, insurance companies, and credit unions having small shares. Commercial banks accept term deposits and current accounts, and lend at short- and medium-term to households and corporations. They do mortgage lending, often via subsidiaries or related companies to which funds are channeled for this purpose. Much of their income comes from margins on foreign exchange transactions, which often rival loan income in magnitude. Some banks also have large volumes of government securities, either because government has a history of high borrowing requirements or because there has been restructuring in the financial sector. Banks also offer credit card services, ATMs and trust management services. Finance companies provide equipment financing for the most part, often via leases.

The ratios of financial assets/liabilities to GDP are relatively high, except for the Dominican Republic, Haiti and Suriname, but financial institutions play a minor role in financing corporate investment; they mainly finance working capital and household expenditures. Most corporate investment is financed from retained earnings, direct foreign investment, corporate partnerships (regional and international) and international loan

²This survey covers Aruba, the Netherlands Antilles, the Dominican Republic, and the countries of Caricom (Antigua and Barbuda, the Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago). In addition, in dealing with the offshore financial sector, references are made to the British Virgin Islands, Bermuda, and the Caymans.

syndication. Securities exchanges exist in the Bahamas,³ Barbados, Jamaica, and Trinidad-Tobago,⁴ but new issues are rare, and their contribution to the financing of aggregate investment is insignificant.

A sub-set of smaller Caribbean countries has significant numbers of offshore banks and other financial institutions, offering financial services exclusively to non-residents: the major ones are the Bahamas, Bermuda, Cayman, the Netherlands Antilles, Barbados, and the British Virgin Islands, in descending order of importance. Many other countries have legislative provisions for offshore banking, or are in the process of devising such legislation, but they have no significant volume of offshore business in the financial sector.⁵ The volume of assets in offshore financial institutions is of an order of magnitude greater than for the domestic financial market. Typically financial institutions licensed for offshore activity are forbidden to undertake transactions with residents, except with the approval of the exchange control authority; only in the Bahamas is a license for domestic and offshore activities available, and there are only 20 of 400 offshore banks that have such a license.⁶

Jamaica is the only Caribbean country to have witnessed a full-blown financial crisis. Jamaica's crisis is of recent vintage, coming to a head in 1996/97. The process of restructuring is ongoing. There have been major failures and intervention of financial institutions accounting for 10 percent or more of banking system assets everywhere except in the Bahamas, Belize, and some countries of the Organization of Eastern Caribbean States (OECS).⁷ In a number of countries development banks have failed, and a majority of state-owned commercial banks have had to be intervened.

³Established in May 2000.

⁴The opening of a securities exchange for the Eastern Caribbean Central Bank countries (Antigua and Barbuda, Dominica, Grenada, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines), scheduled for November 2000, has been postponed.

⁵Some 15 of the countries mentioned in footnote 2 have some form of international business services legislation. Although no data is published on this activity, there is sufficient evidence from balance of payments outcomes, government revenues and employment data to establish that the sector's contribution is very small.

⁶Banks with a joint license operate separate divisions for domestic and international banking services, and report the activities of these divisions separately to the Central Bank of the Bahamas.

⁷The members of the OECS are Antigua and Barbuda, Dominica, Grenada, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines. The British Virgin Islands was admitted as an Associate Member in November 1984, and Anguilla in 1995. The OECS countries constitute a monetary union, with the Eastern Caribbean Central Bank as the common central bank.

Caribbean financial systems have been remarkably free of contagion from the rest of the world. Financial flows, interest rates, and exchange rates have been unaffected by the Mexican, East Asian, Russian, and Brazilian crises. A few countries have experienced periods of instability, but they were associated with domestic economic instability and the domestic market for foreign exchange, and did not coincide with financial instability in international markets.

The regulatory framework for financial systems in the Caribbean was documented by the Caricom Regional Supervision Harmonization Project from 1992 to 1994 (see Cherebin, 1994). It recorded legislation and bank supervision practices, and made recommendations for reform. Progress with regulatory reform is reported in Section III of the present report. The legislation for domestic financial activity has been upgraded everywhere, though more remains to be done in light of the continuous changes that characterize the financial system. Upgrades of the legislation governing offshore financial institutions have also been undertaken in some countries, and the process is underway in others.

Each year since 1983, bank supervisors of the Caribbean region have met to discuss developments and critical issues affecting the region's financial systems and to organize training for supervisors from the region.⁸ Throughout the 1980s and 1990s Caribbean bank supervisors have received training through English-language courses in supervision techniques organized by the Centro de Estudios Monetarios Latinoamericanos (CEMLA), using resource personnel from the U.S. and Canadian regulatory agencies, as well as regional specialists. This training continues under the auspices of the Association of Supervisors of Banks of the Americas (ASBA), which was established in 1998. In addition, supervisors have attended courses for bank supervisors in the U.S., Canada, the U.K., and elsewhere in Europe. There has been a significant improvement in the quality of supervision, tempered in some institutions by a high turnover of trained staff.

This paper offers an overview of the Caribbean financial sector, the extent of commercial bank dominance, the role of banks in domestic finance, financial sector concentration and similar issues, in Section II. Section III is a survey of the regulatory framework and the supervision of financial institutions. Section IV reports on the health of the financial sector in selected Caribbean countries, drawing on a variety of secondary sources. Section V consists of a quantitative estimate of indicators of Caribbean financial fragility, using pooled data from a selection of countries. Section VI suggests an agenda for building on this base towards a fuller appreciation of the strengths and weaknesses of the Caribbean financial sector.

⁸A list of conference themes, for the meetings from 1997 to 2000, appears as Appendix I.

II. OVERVIEW OF THE FINANCIAL SECTOR IN THE CARIBBEAN

Financial systems in the Caribbean are bank based, providing credit for households and for working capital needs of firms. They have not suffered major crises except for Jamaica, which remains in banking crisis. In Haiti, the Dominican Republic and Suriname financial intermediation is still underdeveloped, relative to other Caribbean countries. In all countries financial institutions and financial markets provide a relatively small proportion of investment capital, compared with other sources of funding such as retained earnings and international finance. New financial products and services have been introduced in the Caribbean, but, apart from ATMs, they are not widely used.

The average ratio of domestic bank liabilities to GDP for the Caribbean is much higher than the average for Latin America and the Caribbean (LAC), but much lower than for the Asian Newly Industrializing Countries (NICs) and for OECD countries. (Table 1 presents a summary of the Caribbean financial sector, and Table 2 presents data from LAC, the NICs, and OECD for comparison.) The range for the Caribbean is very wide, from 14 percent (for Suriname) to 74 percent (for Barbados).⁹ Haiti, the Dominican Republic, and Suriname were below 20 percent, indicating relatively low penetration of financial services in those economies. Elsewhere banking services are widely available, and the proportion of economic transactions conducted on the basis of barter or cash outside the banking system is negligible.

Banks are the dominant financial institutions everywhere, accounting for between 46 percent and 74 percent of all financial assets. Financial companies, mortgage banks, and other depository institutions have a share ranging from less than one percent to 28 percent. Near-banks are of importance in Jamaica, Trinidad and Tobago, the Dominican Republic, and Guyana, in descending order. Development banks have a share in total financial assets greater than 5 percent in Belize, the Dominican Republic, and Jamaica. Insurance companies are relatively large in the Netherlands Antilles, Trinidad and Tobago, the Bahamas, and Barbados. Social security systems account for a sizeable share of financial assets in Aruba, the Bahamas, the OECS countries, and Barbados.

Banks are the only source of finance for working capital for domestic firms in most countries. Only in Jamaica is there a small market for short-term commercial paper issued by large corporate entities.¹⁰ Banks also provide finance to government, mainly by way of treasury bills with maturity of one year or less. In some countries there is significant lending

⁹The data for this section is largely drawn from the World Bank and the Caribbean Centre for Monetary Studies (1998). See also Clarke and Danna (1997). Updates were supplied by regional central banks.

¹⁰In Barbados a few corporate entities borrow directly from individuals using deposit certificates, an antiquated practice which is being phased out. The amounts remaining are insignificant.

to government through securities of long maturity, and short-term treasury bills are often rolled over indefinitely. Financial institutions contribute a very small proportion of finance for private fixed capital formation. In Barbados, the only Caribbean country for which an estimate has been attempted, the average contribution to capital formation by financial institutions was 16 percent for the period 1974-1989 (see Worrell, 1990).

For the Caribbean in 1995 stock exchange capitalization as a percentage of GDP was higher than for Latin America, but lower than the average for OECD countries and much lower than for the Asian NICs. Turnover in Caribbean stock exchanges was lower than the averages for the three regions just cited. Significant for the financing of investment is the dearth of new issues on the Caribbean exchanges. There have been very few new issues in the history of the Barbados stock exchange, which celebrated its tenth anniversary in 1997, and in no year was the amount equivalent to as much as 5 percent of gross capital formation. New issues are also rare on the other exchanges, and there are few years in which they made a significant contribution to capital formation.

Banks are the main repository of household savings, and the principal source of finance for household expenditures. Although there exists a variety of alternatives to bank deposits—credit union participation, deposits with non-bank financial institutions, government savings bonds, mutual funds, term life insurance and real property, with the options varying from country to country—they represent a small proportion of household wealth, except for ownership of property. The only estimate available for real value of real property in a Caribbean country (see Boamah, 1984) suggests that the value of household savings held in the form of real property is comparable to the amount of household bank deposits outstanding.

Household deposits at banks do not all represent saving in an economic sense, because they are mostly re-lent for the purchase of household goods and services. In Barbados, a comparison of the change in household deposits during 1999 and the change in credit to households reveals net household saving via the banking system equivalent to only 1 percent of GDP. Of outstanding bank credit to households at end-1999, 23 percent was for investment in housing.¹¹

Nonbank financial institutions made a relatively small contribution to the financing of fixed capital formation. Development banks focussed on the needs of small business (including retailing, light manufacturing, agriculture, and fishing), and their contribution to total financial assets is less than 5 percent, except for Belize, the Dominican Republic, and Guyana, which are all less than 10 percent. Finance companies made a small contribution to the financing of machinery and equipment in most countries, often by way of lease agreements.

¹¹Calculations using data from Central Bank of Barbados, *Annual Statistical Digest 2000*, Tables B6, B11, B17, and I3.

Table 1. Caribbean Financial Sector, Summary Data 1/

	Aruba	Bahamas	Barbados	Belize	Dom. Rep.	Guyana	Haiti	Jamaica	Neth. Ant.	OECS	Suriname	Trinidad and Tobago
GDP, US\$m.	1,822	4,497	2,490	687	14,100	577	2,900	6,788	2,447		1,129	6,789
GDP per capita, US\$	19,136	15,070	9,500	2,827	1,750	746	380	2,660	12,294 3/		2,660	5,281
Quasi-liquid Liab/GDP, %	na	55	74	61	16	54	18	35	66	70	14	54
Mkt. Share, %												
Banks	47	53	62	74	68	71	n.a.	65	65	72	n.a.	46
Near-banks	14	9	8	n.a.	22	21	n.a.	28	8	-	n.a.	25 4/
Dev. banks	-	1	-	8	9	n.a.	n.a.	5	2	3	n.a.	1
Credit unions	-	2	5	12	n.a.	8	n.a.	2	1	5	n.a.	5
Insurance com.	8	12	11	5	n.a.	n.a.	n.a.	n.a.	19	4	n.a.	15
Soc. Security	31	19	15	n.a.	n.a.	9	n.a.	n.a.	4	16	n.a.	8
No./banks	6	9	7	4	15	7	12	9	10	24	8	5
Local	2	2	2	2	13	4	10	6	4	18	5	3
Foreign	4	7	5 2/	2	2	3	2	3	6	6	3	2
Concentration—												
3 largest, %	74	56	60	na	60	71	45	64	77	n.a.	70 5/	55
Banks												
RoE, %	35.4	24.5	13.0	61.1	n.a.	5.6	21.4	19.6 6/	15.4=>20.4			17.6
RoA, %	2.3	3.0	1.8	4.7	n.a.	0.7	1.3	0.8 6/	1.4=>1.7		0.4	1.7
Capital Adequacy, %	9.2	10.0	14.9	12.5	n.a.	16	6.3 7/	20.8 6/	>8.2		0.6=>8	17.5

1/ **Aruba**, 1999, Central Bank of Aruba; **The Bahamas**, 1999 (GDP), 1996 (market shares), 2000 (other data), Central Bank of the Bahamas; **Barbados**, 1999, Central Bank of Barbados; **Belize**, 1999, Central Bank of Belize; **Guyana**, 1999 (GDP), 2000 (all other data), Bank of Guyana; **Netherlands Antilles**, 1999, Bank of the Netherlands Antilles; **Suriname**, 2000, Central Bank of Suriname; **Trinidad and Tobago**, 1999, Central Bank of Trinidad and Tobago. **All others: GDP, GDP per capita**: IFS, 1998 data. **Quasi-liquid liabilities as a percent of GDP**: World Bank and CCMS, 1995 data. **Market shares, percent of total financial assets**: World Bank and CCMS, data for 1992 (Dominican Rep.), 1995 (OECS). **Number and ownership of banks, banking concentration (percent of assets accounted for by three largest banks)**: World Bank and CCMS, 1996 (OECS), 1997 (Dominican Rep., Haiti). **Return on equity (RoE), return on assets (RoA), (risk-weighted) capital adequacy**: World Bank and CCMS, 1998.

2/ Including a Trinidad and Tobago-owned bank.

3/ 1997.

4/ Including TT Unit Trust Corp., a mutual fund, with a 5 percent share.

5/ Percent total bank credit.

6/ Quarter ending June 2000.

7/ Not risk weighted.

Table 2. Comparative Financial Sector Data, 1995

	Domestic Bank Credit as percent of GDP	Quasi-liquid Liabilities as percent of GDP	Credit to Private Sector as percent of GDP	Stock Market Capitalization as percent of GDP
Caribbean Average	43	39	37	Range: 2 to 38
LAC Average	26	23	28	23
Asian NICs Average	104	81	111	136
OECD Average	114	56	88	55

Source: World Bank and CCMS (1998).

Finance companies, mortgage banks, insurance companies, and credit unions have all played a significant role in financing household expenditure. They attracted funds through deposits, as well as lines of credit from commercial banks with which many of these institutions are affiliated. Credit unions played a significant role in the financial systems of Dominica¹² and Belize. Social security funds accounted for a large proportion of financial assets in Aruba, the Bahamas, the OECS, and Barbados. Guyana, and Trinidad and Tobago also had sizeable public pension schemes.

The banking sector in the Caribbean is highly concentrated, with a small number of institutions and the lion's share of assets held by the three or four largest banks everywhere except in Haiti. In Belize, at one end of the spectrum, there are four banks, two foreign owned. Only Haiti and the Dominican Republic have a dozen banks or more. In the Netherlands Antilles the three largest banks account for 77 percent of the system's assets; in Trinidad and Tobago they account for 55 percent. Except for Haiti, all other countries fall inside this range.¹³

Financial liberalization throughout the region in the 1990s was followed by a reduction in the number of banks. Locally owned banks have amalgamated or have been consolidated in the process of reform in some countries. In other countries, the U.K. and Canadian banks established in the Caribbean in the 1950s or earlier, maintained a dominant position. U.S. and other international banking firms, which established branches in the Caribbean in the past three decades, usually found that they were unable to compete high

¹²A member of the OECS, not to be confused with the Dominican Republic.

¹³This is true for individual member countries of the ECCB, although the three largest banks in the ECCB area as a whole account for somewhat less than 40 percent of the banking system's assets.

quality customers away from those already established banks, and most withdrew within a decade. With that experience, the liberalizations of the 1990s brought no new interest by reputable international banks in investing in the Caribbean financial sector. Foreign banks account for the majority of assets in the Bahamas, Barbados, Belize, Suriname, and the OECS countries, and they have a large share in the financial sector of Jamaica as well. Though significant, foreign banks account for a relatively small proportion of financial assets in the Dominican Republic, Guyana, Haiti, and Trinidad and Tobago.

III. THE REGULATORY AND SUPERVISORY FRAMEWORK

The responsibility for the regulation and supervision of the domestic financial system in a majority of Caribbean countries analyzed in this study rests formally with ministers of finance. However, when central banks were established in the region from the 1960s onwards, the primary responsibility for promoting monetary stability and a sound financial system was delegated to central banks, although there remains a number of other regulatory bodies. As a result of problems experienced by a number of non-bank institutions in recent years and a lack of effective supervision of these entities, some countries have put them under the direct supervision of the central bank. For example, Jamaican credit unions are now supervised by the Bank of Jamaica, and finance companies in Barbados and Trinidad and Tobago are supervised by their respective central banks. With the exception of the OECS countries¹⁴ the offshore banking sector is also regulated by the central banks in the region.

Insurance companies, credit unions,¹⁵ and other non-bank financial institutions are under the supervision of varying government departments. Following the example of bank supervisors, insurance regulators have formed the Caribbean Association of Insurance Regulators which meets regularly to discuss matters of common interest. Some countries in the region have also amended their insurance legislation in keeping with the Model Insurance Act prepared by the Caribbean Law Institute,¹⁶ and they are preparing common supervisory

¹⁴Two OECS countries, Dominica and Grenada, have taken legal steps to delegate to the ECCB responsibility for the regulation of the offshore sector. This is strongly recommended for other OECS members, since the ECCB's superior expertise and experience lends credibility and greater effectiveness to the regulatory framework.

¹⁵The Commissioners of Cooperatives of OECS countries, which are responsible for the supervision of credit unions, are required to forward quarterly balance sheet and income statements to the ECCB.

¹⁶A research and advisory institute attached to the Faculty of Law of the University of the West Indies, Cave Hill (Barbados) Campus.

standards for the insurance industry.¹⁷ The securities industry has been to a large extent self-regulated, but recent efforts have been made to establish securities exchange commissions in Barbados, Jamaica, and Trinidad and Tobago.

Over a period of more than two decades, bank supervision departments at Caribbean central banks have developed systems for monitoring and supervising the activities of banks and other deposit-taking financial institutions. Programs of on-site inspection are well established, based on U.S. regulatory methodologies, and with staff trained in inspection techniques by the Regional Group of Bank Supervisors, and at the Federal Reserve Board and other leading regulatory institutions. These programs are complemented by off-site assessment of prudential returns submitted periodically to the regulator. Recognizing the value of working together in the development and implementation of regional supervisory standards, Caribbean central banks created the Caribbean Group of Bank Supervisors, which held its first meeting in 1983. The group has played a major role in the introduction of minimum regulatory and supervisory standards for banks and other deposit-taking financial institutions operating in the Caricom region, and in the development of training programs for bank examiners. The group works closely with the Basel Committee and other international regulators to keep regulatory and supervisory practices in the region abreast of international standards.

Between 1992 and 1994 the regional central banks, with the assistance of a banking supervision consultant sponsored by the International Monetary Fund,¹⁸ carried out a study of the existing bank regulatory and supervisory practices in the Caricom region to assist member countries, several of whom were individually revising their banking laws and enhancing prudential and regulatory standards. The study's recommendations for the harmonization of the region's regulatory and bank supervisory processes in a number of key areas formed the basis for the strengthening of the bank supervisory systems in the region in recent years. In some countries these standards have also been applied to the offshore banking sector and to non-bank deposit taking financial institutions.

Recommendations were made with respect to the legal framework (capital requirements, shareholding, large exposures, auditing and management), the scope and powers of the regulator, and regulatory standards and requirements. Details are given in Box 1. The study also recommended the introduction of deposit protection mechanisms in all territories. There are presently three deposit insurance schemes operating in the region. The first was introduced in Trinidad and Tobago in 1986. Since the study was completed, two other regional countries introduced deposit insurance schemes—Jamaica in August 1998, and

¹⁷The ECCB has sponsored a model Harmonized Insurance Act for the OECS, which gives insurance supervisors wider powers, but this legislation, has not yet been passed in any country.

¹⁸The assignment was carried out by Ms. D. Cherebin, co-author of this paper.

the Bahamas in December 1999. Although the report recommended that deposit insurance be introduced in tranquil times so that the insurance fund could be built up, the schemes in Jamaica and the Bahamas were introduced only after problems had surfaced in the financial system. Deposit insurance is under active consideration in Barbados and the OECS countries.

All regional central banks request and obtain statistical information on the operations of banks in their respective territories. In recent years many of the supervisory authorities in the region have increased their reporting requirements to facilitate enhanced off-site surveillance systems and to better monitor the operations of banks and other financial institutions. In Jamaica comparative statistical information on the financial condition of banks is published quarterly by the central bank.

Particular attention has been given to the training of bank examiners. The regional bank supervision training programs, with the help of resource personnel from the U.S., Canadian and other regulatory agencies, have been extremely successful in building up expertise. Building on this foundation, the Caribbean Group of Bank Supervisors has embarked on a comprehensive two-year training plan with the following objectives:

- The continued development of the skills of the region's bank examiners to ensure that the region's supervisory practices are consistent with international supervisory standards and practices.
- The strengthening and expansion of the bank supervision harmonization efforts in the region through the restructuring of existing training courses, and the introduction of additional courses and seminars in areas not previously covered.
- The training of a team of regional trainers who will be able to conduct junior training courses on an on-going basis at their respective central banks, and the development of training manuals for use by the trainers which would also serve as reference materials for regional supervisory agencies.

Caribbean regulators have played an active role in global efforts towards implementing the minimum standards recommended by the Basel Committee and other international agencies for strengthening supervisory systems and promoting soundness in the banking system. They are all now working towards the implementation of the Basel committee's *Core Principles for Effective Banking Supervision*, and the adoption of international accounting standards for banks. However, while some countries have reported progress in implementing the Core Principles there has been no independent assessment of each country's compliance using the Basel Committee's assessment methodology.

Box 1. The Caricom Bank Supervision Harmonization Project Recommendations

The Caricom Bank Supervision Harmonization Project (see Cherebin, 1994), identified areas where bank supervisory practices in the region could be harmonized, and made recommendations for action to be taken in the areas listed here. Caricom central bank governors have used the recommendations in ongoing upgrades of the regulatory framework and administration.

The legal framework

A number of laws governing the operations of banks in the Caricom region have been amended in recent years and other amendments are underway, to include provisions for the following:

Capital

- A minimum level of paid-up capital of the equivalent of US\$2 million for banks and US\$1 million for non-banks.
- Assignment of capital for foreign bank branches.
- The definition of the elements, which constitute a financial institution's capital base.
- The introduction of capital adequacy criteria based on the Basel Core Principles (see BIS, 1997) and penalties for non-compliance.

Regulation of shareholding

- Approval by the supervisory authority of holdings in excess of 25 percent of capital by any one individual.
- Regular reporting of large shareholding.

Regulation of bank holding companies

- Provisions for the supervisory authority to supervise the activities of bank holding companies.

Large exposures

- Restricting loans to one individual or group to 25 percent of capital and ceilings for overall large exposures.
- Reporting of all loans in excess of 10 percent of capital.

Audit requirements

- The annual audit of all banks including the local operations of foreign branches.
- Approval of the external auditor by the supervisory authority.
- Notification to the supervisory authority of changes in or the resignation of the auditor.
- Provisions for regular dialogue with external auditors and for the disclosure of information concerning the financial position of an institution.

Special powers

- Provisions for corrective action to be taken by the supervisory authority and powers to issue cease and desist orders when considered necessary.
- Adequate winding up and exit provisions.
- Protection for the officers of the supervisory authority for action taken in good faith.

Box 1. The Caricom Bank Supervision Harmonization Project Recommendations (concl'd)

Prudential regulations

- Duties and responsibilities of directors.
- The imposition of penalties on directors of banks which violate laws and directives.
- Limits on loans to insiders.
- "Fit and proper" criteria for directors and officers.

Prudential regulations

- Provisions for the supervisory authority to issue prudential regulations governing the operations of banks and for penalties to be imposed for non-compliance.

Supervision of non-bank financial institutions

- Provisions for the central bank to regulate and supervise the activities of credit unions and the lending business of other non-bank financial institutions where their activities impact significantly on the financial system.

Prudential regulations and supervisory standards

Steps have been taken by regional central banks to introduce prudential criteria as recommended by the Harmonization Project. These include:

- Minimum entry requirements and licensing criteria for new banks.
- Minimum capital adequacy requirements recommended by the Basel Committee, adapted to Caribbean circumstances (for example, by adjusting country risk weightings to reflect obligations within Caricom).
- Classification and provisioning criteria for non-performing loans.
- Audit standards and the format for audited statements.
- Internal controls and corporate governance requirements.

Deposit protection mechanisms

Financial reporting requirements

On-site and off-site inspection procedures

Training

Caribbean regulators have taken a number of measures, in close association with the Caribbean Financial Action Task Force (CFATF), to counter the use of the region's financial system for money laundering. Some have enacted anti-money laundering legislation and established financial intelligence agencies. Others have issued anti-money laundering guidelines to financial institutions, have held workshops for the staff of financial institutions on *know-your-customer* requirements, and have participated in mutual evaluations of the CFATF (described in the next paragraph). They also work closely with their respective law enforcement authorities in the fight against money laundering. Regulators and law enforcement agencies continue to work closely with the (international) Financial Action Task Force (FATF) and the CFATF in ongoing efforts to upgrade the regulatory framework.

These measures have assumed great urgency because of the international focus, since 1999, on money laundering. The FATF, OECD and the Financial Stability Forum (FSF) have separately issued lists of offshore centers, classified so as to suggest that some jurisdictions lack adequate regulatory frameworks. None of the three bodies has published a regulatory standard to provide a basis for their classification. In the absence of such standards, the classifications may inhibit competition in the market for provision of international financial services. The development of agreed standards for cross border financial transactions is a vital aim of the FATF and CFATF. The issuing of lists has resulted in intense legislative activity in the Caribbean, but this will have limited effect in the absence of improved surveillance in the OECD countries themselves.¹⁹

The CFATF has underway a program for peer group assessments among member countries, by small teams of specialists. These mutual evaluations are conducted in two phases, with a one year interval for countries to implement their recommendations. They are conducted with reference to the 40 principles recommended by the FATF, supplemented by a list of 19 guidelines to address the specifics of Caribbean international financial centers. The first phase was due to be completed, for all CFATF members, by the end of 2000.

Although major upgrading of the regulatory framework has been undertaken and upgrades continue, the process is slowed by tardiness in revising legislation to keep pace with developments in the financial sector. There have been some delays executing corrective action for violations of laws and regulations, especially where government-owned financial institutions are involved. The pool of adequately trained supervisory personnel is not yet sufficient for the region's needs. Moreover, some financial entities, none of them of systemic importance, remain outside the jurisdiction of skilled supervisors.

IV. REVIEW OF FINANCIAL SECTOR PERFORMANCE IN SELECTED COUNTRIES

In this section, we review the literature that is available on financial sector performance in the Caribbean, for all countries for which such assessments have been undertaken in one form or another. Caribbean financial systems have proven robust to a variety of economic circumstances and strategies, except in the case of Jamaica. However, some countries, for example Barbados and Guyana, had to undertake costly restructuring of state-owned banks. In addition, central banks have intervened financial institutions in several countries, but for the most part these were small banks, with little consequence for the financial system as a whole. A few countries (Aruba, the Bahamas, and Barbados) have a large volume of international financial business relative to the size of the domestic economy,

¹⁹For example, The *Financial Times* reported on March 2, 2001 that senior vice-presidents of treasury functions at J.P. Morgan and Bank of America testified to the U.S. Senate Governmental Committee that their banks failed to monitor adequately their correspondent accounts for two offshore banks in Antigua.

but there was no significant transfer of funds between the market for international financial services and domestic financial markets.²⁰ In Jamaica, a financial crisis resulted from a combination of factors, including financial liberalization, financial regulation and macroeconomic instability.

Aruba

In the decade following the closure of its oil refinery in 1985, the economy of Aruba was transformed from dependence on processing of petroleum to a tourism-oriented economy, with investment that more than tripled the number of hotel rooms. In recent years the economy has continued to grow at a modest rate, with low inflation and comparatively low rates of unemployment. Fiscal policy has been conservative, the exchange rate has been pegged to the U.S. dollar at an unchanged rate, foreign exchange reserves stood at the equivalent of 4.8 months' imports at end-1998, and credit controls have been administered flexibly.

There are six banks operating in the local market in Aruba, along with two offshore banks not involved in providing services domestically. Two of the banks that service the local market are branches, and two others are subsidiaries of foreign banks. The financial sector also includes two mortgage banks and other minor financial institutions. All are supervised by the central bank. At end-1999, banks' return on assets and equity, respectively, were 2.3 percent and 35.4 percent, capital was equivalent of 9.2 percent of risk weighted assets, and liquid assets were sufficient to cover 30 percent of total liabilities. The assets of the two offshore banks exceeded those of the eight banks operating in the domestic market, but there appears to have been no transfer between these markets. In May 1998, an ordinance was passed to bring bank regulations to the standards stipulated by the Basel Committee. Anti-money laundering legislation passed in 1996 requires all banks to report suspicious transactions to Government's Financial Intelligence Unit, and stipulates that financial service providers maintain sound "know-your-customer" procedures. The central bank monitors compliance with anti-money laundering directives issued in 1995 and updated in 1997 and 1998, through on-site inspections.

The Bahamas

The Bahamas maintains an exchange rate peg at parity with the U.S. dollar, a rate unaltered since 1966, when the parity was switched from sterling. The current account is open and capital controls are liberally administered. The financial system has been stable, with only a few small failures in the past 30 years. The Bahamas is host to an offshore banking sector, which is of an order of magnitude greater than the business of banks that

²⁰This may be inferred from the fact that there have been no major unexplained injections to the money supply recorded in surveys of the economies concerned. No data are published on the magnitude of these transfers.

transact business with residents. Licensed banks may provide both on and offshore banking services, but of 400 banks registered at the end of 1999 only about 20 choose to provide both categories of service. There are nine banks that provide services exclusively for residents, of which two are locally owned. Banks and near-banks account for 80 percent of domestic financial assets (exclusive of social security funds). The banking sector, including the offshore banks, contributes 15 percent of GDP, larger than for any Caribbean country except the Caymans.

Comprehensive reform of the legal framework for financial activity was undertaken in the Bahamas in 2000, and the supervisory capacity of the Central Bank of the Bahamas has been considerably strengthened. A new Central Bank of the Bahamas Act strengthens the regulatory powers and autonomy of the Central Bank of the Bahamas, and a program for on-site inspection of all banks and financial institutions was initiated at the beginning of 2001, with the help of experts with experience in the U.S. federal regulatory system. Legislation has also been introduced to provide guidelines for financial reporting. New oversight bodies have been established to scrutinize procedures for customer identification and treatment of suspicious transactions at non-bank financial institutions.

Barbados

Commercial banks account for 62 percent of financial assets in Barbados (equivalent to 72 percent, if social security funds are excluded from the total). There are seven banks, four foreign owned and the other three owned by government, the domestic private sector, and regional institutions. The foreign banks and the government bank between them account for over 80 percent of bank assets and they each have comparable shares of deposits. The government bank has a much smaller share of credit than the foreign banks, as a result of large losses in the 1980s, which involved the write-off of two-thirds of its credit to enterprises. Banks are profitable, with averages of 13 percent and 1.8 percent return on equity and assets, respectively, in 1999. Risk weighted capital ratios average 14.9 percent, and non-performing loans were 5.4 percent of total loans at end-December 1999.

There were two major interventions in the banking system in the past decade. The Central Bank of Barbados godfathered the sale of the local branch of BCCI when that international bank collapsed in 1991, allowing buyers a grace period for the restructuring of the bank. Two thirds of the portfolio of the government-owned Barbados National Bank (BNB) fell into the non-performing category by 1992, as a result of government guarantees for state enterprises and the national sugar processing company, all of which failed to generate revenues sufficient to service their borrowings. The bank was recapitalized and bonds were issued to replace the impaired assets, which were placed with a newly established recovery institution.

Banks and other deposit taking institutions (the latter accounting for 8 percent of financial assets) are licensed by the Minister of Finance on the recommendation of the Central Bank of Barbados, under provisions of the Financial Institutions Act of July 1997. This legislation incorporated most of the recommendations of the Caribbean project for the

harmonization of supervisory practices, mentioned earlier in this report. The minimum capital requirement is set at BDS\$4 million (US\$2 million), banks are subject to liquidity and reserve requirements, and to limits of their foreign currency exposure (which are not geared to the level of risk, however). The Central Bank of Barbados carries out on- and off-site inspections. Current balance of payments transactions are unrestricted, and controls on the capital account are liberally administered.

At end-2000 there were 52 offshore banks in Barbados operating under a 1980 law that provides for a separate license to do offshore business only. Their outstanding assets totaled in excess of US\$20 billion, about five times the total for the domestic sector. Offshore banks are subject to on- and off-site inspection, and they are required to observe prudential norms such as capital adequacy and maximum concentrations of credit or funding with a single client. Also, offshore banks are expected to operate within limits that assure their liquidity and solvency. In addition to offshore banks, Barbados' legislation has attracted a modest volume of the business of "captive insurance," where large companies set up funds exclusively to insure the company's own internal risks. The captive insurance companies are supervised by the government's Supervisor of Insurance, who also supervises domestic insurance companies.

Second in importance to banks in the mobilization of domestic finance are insurance companies, whose domestic assets accounted for 11 percent of financial sector assets at December 1997. The government's compulsory social security scheme held assets amounting to 15 percent of total financial assets. (Separate aggregate information is not available for private pension funds, which hold deposits at banks and non-bank financial institutions, government securities, real estate, and small amounts of foreign assets. These funds are managed by regulated insurance companies.) The other category of financial institution, which makes up the sector, is credit unions, with 5 percent of assets. Credit unions are not subject to official supervision, although they are required to report to the Registrar of Cooperatives. The largest credit unions belong to one or other of two national institutions, to which they contribute towards a self-insurance fund. However, there are no mechanisms for inspection, and no sanctions for inadequate performance.

The Barbados Securities Exchange, which was inaugurated in 1987, remains a marginal institution. Twenty four firms are listed, trading is light and there have been only half a dozen new issues in the history of the exchange. Market capitalization of the exchange was equivalent to 139 percent of GDP at December 2000, but half of that is due to a single company, a subsidiary of an international bank, which floated a small percentage of the shares of the subsidiary on the local exchange.

Belize

There are four commercial banks in Belize, two of them branches of international banks. The banks accounted for 74 percent of monetary liabilities at December 1999. There are 12 credit unions, which offer mortgages and loans to small businesses, and which are not regulated by the central bank. There is a government development bank, which is funded by

medium term foreign loans and a government savings bank, which lends to small borrowers. The commercial banks are regulated under the Bank and Financial Institutions Act 1995, which incorporates recommendations of the Caricom regional harmonization project. At end-1999 banks' risk-weighted capital adequacy ratio was 12.5 percent in the aggregate, and banks' returns on assets and equity were 4.7 percent and 61 percent, respectively.

Guyana

In 1988 interest and exchange controls were lifted in Guyana, beginning a process of financial liberalization, which reversed policies (dating back to the mid-1970s) of nationalization and state control of all economic activity, including banking and finance. The largest commercial banks were subsequently wholly or partially privatized, leaving Guyana at December 2000 with seven commercial banks, three wholly owned or majority controlled by domestic private interests, three foreign owned, and one government owned. Banks held 71 percent of all financial assets at the end of 2000; the remaining assets were evenly distributed among insurance companies, trust companies, pension funds, and a development bank. Twenty eight percent of bank assets were in the form of government treasury bills.

In 1995, two state-owned institutions (one commercial bank and one development bank) were merged, with the commercial bank acquiring all the performing as well as non-performing assets and liabilities of the development bank. This contributed to an apparent decline in the asset quality of the commercial bank. Subsequently, however, some of the merged non-performing assets were transferred to an independent debt recovery entity.

A Financial Institutions Act of May 1995 requires all depository institutions to be licensed by the Bank of Guyana after consultation with the Ministry of Finance. In November 1998 revisions to the Bank of Guyana Act were passed to prohibit lending by the central bank to government or public enterprises, and to provide for the central bank to issue its own securities for monetary policy purposes. Deposit taking institutions are subject to on- and off-site supervision by the Bank of Guyana, and insurance companies are supervised by an office of supervision in the Ministry of Finance.

Haiti

Financial reform in Haiti has been ongoing since the country returned to constitutional rule in October 1994. Between 1993 and 1995 five banks were established, and two foreign banks ceased domestic operations. One small local bank in difficulty was merged with a larger local institution in February 1997. In early-1998, the banking system consisted of 12 commercial banks—two government owned, eight owned by the domestic private sector, and two foreign branch banks—and two private mortgage banks. Rural communities were poorly served; 60 of 77 branch offices were in the capital, Port-au-Prince. In contrast to the situation in other Caribbean countries for which we have relevant data, banking business is distributed among the banks. The largest three account for 45 percent of deposits, and, except for the two smallest, other banks have shares ranging from 3 percent to 10 percent of deposits.

In 1997/98, the average return on assets for the banking system was 1.3 percent, and the return on equity was 21.4 percent. Loans were 48 percent of total assets; the unweighted ratio of capital to assets was 6.3 percent. Non-performing loans were 7.2 percent of the total, and provisions covered 58 percent of the non-performing loans. From 1996 onwards a series of prudential regulations has been issued, covering foreign exchange exposure, cross ownership of financial institutions, credit concentration, loan classification and provisioning, reporting requirements, internal controls and consolidated supervision. The banking law was under revision in mid-1998. Technical assistance has been provided to the Bank of the Republic of Haiti (BRH) to upgrade human resources and information technology.

Jamaica

Jamaica is the only Caribbean country to have suffered a major financial crisis in the 1990s, and it is still in the process of resolution. The causes of the Jamaican financial crisis have been identified as (1) rapid financial liberalization, which made it difficult for financial supervision to keep pace; (2) differentials in the reserve requirements for different types of financial institution, with especially high requirements for banks; and (3) tight monetary policies in 1995/96, accompanied by interest rates which persisted at the very high levels of the previous period of high inflation. At these rates, the return on investment in equipment and other fixed investment was not competitive with the return on financial assets. As the market value of their fixed investment fell, and revenues from these investments ceased to grow, insurance companies, which continued to borrow from banks at short term, were unable to service their loans.

In January 1997, the Financial Sector Adjustment Company (FINSAC) was established, and by March it had taken control (via equity and Board appointments) of five of the country's nine commercial banks, along with their subsidiaries (three building societies and five merchant banks), as well as five life insurance companies. The National Commercial Bank (NCB), the country's largest, with 36 percent of deposits, has been reorganized and its non-performing loans replaced with government securities, which, by the end of 1999, constituted the bulk of the bank's assets. In August 1999 three intervened banks were merged, but they continued to rely on liquidity support from the government. Three of the intervened life insurance companies were restructured in August 1999; deposit-like liabilities were transferred to the largest foreign commercial bank, and the life insurance business was sold to a Trinidadian insurance company. The cost of the program of financial restructuring is estimated to have exceeded 30 percent of GDP.

For the quarter ended June 2000 the banking system recorded a return on assets of 0.8 percent and profits equal to 19.6 percent of revenues. The risk-weighted capital asset ratio stood at 20.8 percent for the system as a whole. Past-due loans were 12.8 percent of total loans, above the Bank of Jamaica's target of 10 percent. Provisions covered 115.2 percent of past-due loans. Banks' liquid asset ratio stood at 50.6 percent of deposits, compared with a required ratio of 46 percent. At end-July 1999, 28 percent of this liquidity was in the form of securities issued by FINSAC.

The Bank of Jamaica is charged with the supervision of deposit-taking institutions. It undertakes on- and off-site inspection. Since 1996 prudential regulations have been issued to set criteria for determining "fit and proper" candidates for bank directorates, limits to unsecured lending, new limits on lending to connected parties, guidelines for the accrual of interest on past due obligations, and stipulations on the information that banks must publish. The Bank of Jamaica has been empowered to require special audits of financial institutions, at its discretion. Insurance reform has included setting performance benchmarks for the intervened companies, requiring fuller reporting, and strengthening the capabilities of the office for the supervision of insurance companies. The first on-site inspection of an insurance company took place in December 1998.

Suriname

The three largest banks in Suriname, which are wholly or largely foreign owned, accounted for about 70 percent of total bank credit at December 31, 2000. There are five other banks, three of which are 100 percent government owned, a fourth (a development bank) which is 99 percent government owned, and a small privately owned bank. The rest of the financial system is made up of 12 insurance companies, 30 pension funds, 29 savings societies and credit unions, and 5 finance companies.

In the 2000 fiscal year the return on assets of the financial system was 0.4 percent, down from a reported 2.4 percent in the 1996 fiscal year. Only one bank had a risk-weighted capital base equivalent to 8 percent of assets in December 2000. For the others the ratio ranged from 0.6 percent to 6.3 percent. No data are reported on non-performing loans, but it was thought that loans to rice farmers, a major item of bank credit, were largely impaired.

The Central Bank of Suriname was in the process of drafting a new Financial Institutions Act in the first quarter of 2001 to address the perceived deficiencies in the legal framework and regulatory practices. The legislation will include licensing requirements and stipulations on changes of ownership, and it will empower the Central Bank to set exposure limits and limits on credit to related parties. In the meanwhile, directives on the licensing of banks, issued under the 1956 Banking Act and the 1968 Supervision Act (both last revised in 1986), were extensively revised in 2000. The IMF continues to provide technical assistance to upgrade the central bank's regulatory and supervisory capabilities.

Trinidad and Tobago

Commercial banks account for the largest segment of the Trinidad and Tobago financial sector, with 46 percent of total assets at December 2000, compared with a 20 percent share for financial companies, mortgage companies, investment banks, and other near-banks. Insurance companies are the third largest segment, with 15 percent of assets. The social security fund accounts for 8 percent of assets, and credit unions for another 5 percent. Mutual funds, which have more than doubled in size in the second half of the 1990s decade, now have as large a share as do the credit unions.

The financial sector is concentrated, with the three largest commercial banks accounting for 55 percent of assets of banks and near-banks, while the largest insurance company commands over half the assets of the insurance sector.²¹ The largest bank and the largest insurance company both have networks that include branches and operations elsewhere in the Caribbean, partly a reflection of the fact that Trinidad and Tobago is the English Caribbean's largest economy, in terms of aggregate GDP. The two largest banks are locally owned, as is the largest insurance company, while the third largest bank is foreign owned. Insurance companies in Trinidad and Tobago have made a much larger contribution to fixed capital formation in that country than for any other English Caribbean country.

Banks' loan to deposit ratio in 1999 was 75 percent, while the share of securities in the banks' portfolios rose noticeably during the 1990s, to reach 22 percent of deposit liabilities by the end of the decade. Banks introduced new liability instruments such as investment note certificates (a note backed by a share in an investment security) and deposit instruments that incorporated an element of life insurance.²² However, the new instruments account for only a small proportion of bank liabilities.

At end-1999 banks' ratio of risk weighted assets to capital stood at 17.5 percent. The returns on assets and equity averaged 1.7 percent and 17.6 percent, respectively, for that year. However, the spread between average loan and deposit rates was wide, at 9 percentage points. The rates of nonperforming loans to total loans was 5 percent reflecting, a reduction by half in this ratio in the second half of the 1990s.

V. QUANTITATIVE ANALYSIS OF BANK SOUNDNESS

In this section we explore whether the behavior of a number of macroeconomic and prudential variables is correlated with the performance of financial institutions. There is a growing number of econometric studies of bank soundness which have used similar methodologies (see Evans et al., 2000, Chapter III, for a recent survey). Our results, which should be tested for robustness when a larger number of observations becomes available, suggest that a relatively high ratio of nonperforming to total loans, faster growth of credit than for real GDP, a high proportion of consumer to other types of credit, a slowdown in real output growth and a deterioration of the external current account, are all factors associated with a high incidence of bank failure. When these conditions are present, regulators should insist that financial institutions increase their coverage on risk exposures, ensure that they are well capitalized and liquid, and that they reduce risk exposure to the extent possible.

²¹A test for oligopoly, conducted by an IMF team in 1997, revealed an increase in market power of the largest firms over the 1980s and 1990s, from an initial position where market power was already high.

²²The range of instruments is described on Sergeant (1996).

Two previous studies provide estimates of the probability of bank failure in the English-speaking Caribbean, using a methodology, which measures the contribution of a large number of macroeconomic variables and prudential indicators (see Theatin, 1997, and Craigwell and Polius, 1997).²³ The results in both cases are preliminary. Using quarterly data for eight banks in Barbados from the beginning of 1990 to the end of 1996, a period during which two banks were intervened, Theatin found that contractions in real GDP, low levels of liquidity, and a small proportion of mortgages relative to other banks are factors that make banks more vulnerable. However, her test produced results which are difficult to explain: larger banks, banks with low operating costs relative to their competitors and banks whose borrowing from the central bank is below the average for the system all appear to be more vulnerable. Craigwell and Polius carried out a similar test using annual data for the 1990-96 period for Barbados, Belize, Guyana, Jamaica, and the OECS countries, taken all together. The factors which were estimated to have a significant correlation with bank fragility were a high proportion of consumer loans, a low return on assets and a high ratio of expenses to assets, all relative to other banks in the system.

Methodology

The present study employs discriminant analysis, a technique used to compare the distribution of one or more attributes across different groups or populations.²⁴ It is used to divide observations into identifiable, mutually exclusive groups, each of which is distinguished by the values of certain independent variables. The objective of this study is to derive a set of predictor variables that facilitate the classification of banking sector observations into those that represent episodes of bank fragility, and those that do not. It is assumed that the independent variables used to define the two groups have a multivariate normal distribution, that their variance-covariance matrix is the same, for observations in each group, and that there exists no multicollinearity among them (see Johnson and Wichern, 1998).

If the cost of misclassification is $C(1/2)$ for allocating an observation to group 1 when in fact it belongs to group 2, and the *a priori* probabilities of misclassification are π_1 and π_2 , the expected loss for any given assignment rule is defined as follows:

$$L = \int x_n \exp[g_1 C(1/2)\pi_2 f_2(X_n)] dx_n + \int x_n \exp[g_2 C(2/1)\pi_1 f_1(X_n)] dx_n$$

²³Both studies used logit models. The second, by Craigwell and Polius, used a subset of the data reported below.

²⁴Discriminant analysis was chosen as an alternative to a logit or probit equation to discover whether, in light of the limited number of observations, this technique might yield somewhat more consistent results than in the Craigwell and Polius paper. For data that do not meet the strictest criteria for reliable inference, discriminant analysis may produce results that are more robust.

Minimizing this loss function using a linear classification rule, an observation with characteristics X_n is assigned to group I if:

$$X_n' \gamma - \alpha \geq \ln [C(1/2) \pi_2 / C(2/1) \pi_1]$$

Where:

$$\begin{aligned} \gamma &= \sum^l (u_1 - u_2) \\ \alpha &= ((u_1 + u_2)' \gamma) / 2 \end{aligned}$$

and the u are the random residuals from the observations assigned to each group. The weights of the discriminant function, represented by $X_n' \gamma$, are called the discriminant score, and are computed using a linear weighting of X_n . The discriminant score is compared to a cutoff point defined as $\alpha + \ln [C(1/2) \pi_2 / C(2/1) \pi_1]$. The observation is classified as belonging to group I when the score is above the cutoff point, and it is assigned to group II otherwise.

The significance of the computed discriminant function is tested using Wilks' Lambda (also called the U statistic), the ratio of the within-group sum of squares to the total sum of squares. It tests the equality of group centroids by measuring the proportion of the total variance in discriminant scores that is not explained by differences among groups and it varies between 0 and 1.²⁵ The predictive ability of the discriminant function is assessed using classification matrices and a Chi-squared test of significance.

If the discriminant function is statistically significant and the level of accuracy for classification of observations is acceptable, standardized discriminant weights and partial F values may be used to assess the relative contribution of each variable to the discriminant function. Discriminant weights are subject to a high level of instability and must be interpreted with caution. The results are cross-validated with the original sample.

Data and explanatory variables

The sample consists of commercial banks operating in the OECS territories, Barbados, Belize, Trinidad and Tobago, Guyana, and Jamaica. Balance sheet data from 1990 to 1996 for the banks were used to examine the factors that influence bank failure. The model was estimated using panel data, and expresses bank fragility as a function of financial performance and a selection of macroeconomic variables.

In the context of this paper, fragility is defined as central bank intervention in the operations of a commercial bank. The number 1 defines an observation for a bank where there has been no intervention and the number 2 indicates that the bank was intervened at the time of the observation. In cases where an intervened bank has survived, the paper assumes

²⁵ Alternative test criteria include Rao's and Mahalanobis' procedures (see Hair et al., 1995).

that the period of fragility ended when the unadjusted capital adequacy ratio reached 12 percent. The prior probabilities for the two groups were computed from the groups' sizes and are 0.9 for the non-fragile group and 0.1 for the fragile group.

Data availability and the literature on bank failure informed the choice of variables used in the analysis. The literature on bank failure points to microeconomic, macroeconomic, and banking sector factors as causes of bank failure. Lindgren, Garcia and Saal's (1996) worldwide survey on banking sector problems reveals that most cases were characterized by a high level of non-performing loans, undercapitalization and connected lending, providing justification for including the ratio of non-performing to total loans (NPL) as an explanatory variable.²⁶ De Juan (1996) cites poor management, over extension, rapid credit growth and inappropriate lending practices as among the main causes of bank failure. Proxies for management and operational efficiency include the ratio of operating expenses to total assets (OEX), the ratio of operating expenses to operating income (OEI), the return on assets (ROA) and the return on capital (ROC). The rate of growth of commercial bank credit relative to growth of the economy is measured by the ratio of total loans to gross domestic product (LNI), and the effect of credit growth on liquidity is measured by the ratio of private deposits to total loans (DEP). Sundararajan and Baliño (1991) argue that fluctuations in real sector output have an impact on the health of banks through their loan portfolios, and Lindgren, Garcia and Saal (1996) contend that sharp changes in relative prices can have an impact on the ability of households and businesses to service their loans. The selection of macroeconomic variables used to reflect these influences includes the consumer price index (CPI), the proportion of consumer loans to total loans (CONS), the gross domestic product index (GDPI), the nominal exchange rate (NEXR), and the treasury bill rate (TBR). The current account balance (CABAL) and net capital inflows (KABAL) were included as a possible signal of vulnerability to a currency crisis.²⁷

Estimation and results

The discriminant functions were estimated by a stepwise method, using the statistical software package SPSS. Partial F values and values of Wilkes' lambda are used to interpret the relative discriminating power of the independent variables. SPSS defines a minimum F value of 3.84 for variables to enter the equation and a maximum of 2.71 for variables to be removed. Large values of lambda indicate that means for the groups are not significantly different, while smaller values indicate a variable that may have greater power to discriminate among the observations on the dependent variable. At the 0.05 significance level, the null hypothesis of equal group means is rejected for the variables OEX, CABAL,

²⁶Insufficient observations were available to include capitalisation and connected lending in the tests.

²⁷For comparison with variables used here, a tabular summary of variables used in previous econometric studies of bank fragility appears in Evans et al. (2000).

DEP, GDPI and NPL (Table 3), suggesting that these five variables are likely predictors of bank fragility. The ratio of non-performing loans to total loans (NPL) appears to have the greatest discriminatory power.

Table 3. Test for Equality of Group Means

Variable	Wilks' Lambda	F-value	Significance
LNI	.99891	.3924	.5314
NEXR	.99373	2.2664	.1331
OEX	.98370	5.9502	.0152
ROA	.99992	.0292	.8644
TBR	.99122	3.1810	.0753
CABAL	.98164	6.7148	.0100
CPI	.99735	.9535	.3295
DEP	.98735	4.6000	.0326
GDPI	.98544	5.3036	.0219
CONS	.99858	.5100	.4756
ROC	.99963	.1326	.7159
NPL	.96286	13.848	.0002
OEI	.99981	.0688	.7933
KABAL	.99440	2.0223	.1559

The stepwise procedure, frequently used when variables are correlated, proceeds by including variables according to their relative strengths or discriminating power, beginning with the variable for which the means are most different between groups. At every step variables are tested for removal from the equation. At each step F statistics are recomputed, and the variable with the largest F statistic or the smallest Wilks' Lambda enters the equation. NPL, with the largest F value of 13.84, was the first variable included, followed by GDPI, LNI, CABAL, and CONS. Beyond this F values were below the 10 percent significance level. Table 4 presents the F values for the variables after the fifth recomputation and a summary of the discriminant function.²⁸

²⁸In contrast to those in Table 3, the F values in Table 4 represent the combined effects of the variables included.

Table 4. Variables Included in the Analysis

Variable	F Value	Wilks' Lambda	Significance
NPL	13.84	0.96286	0.0002
GDPI	9.58	0.94934	0.0001
LNI	8.08	0.93637	0.0000
CABAL	7.57	0.92152	0.0000
CONS	7.2	0.9022	0.0000

The canonical correlation is a measure of the degree of association between the discriminant scores and the associated groups. The canonical variable is the linear combination of variables that maximizes the difference between the means of the fragile and non-fragile groups. The canonical discriminant function generated from the analysis is presented in Table 5 below.

Table 5. Canonical Discriminant Function

Eigen Value	Can. Corr.	Wilks' Lamba.	Chi. Square	D.F.	Significance
.1023	.3036	.9072	34.71	5	0.0000

The eigenvalue is the ratio of between-groups to within-groups sum of squares. A single canonical function accounts for 100 percent of the total between-groups variability. The significance of the lambda statistic is based on its chi-square transformation. The standardized canonical function coefficients, shown in Table 6, indicate the relative contribution of the independent variables to the discriminant functions.

Table 6. Standardized Canonical Functions

Variable	
LNI	-.79396
CABAL	.56443
GDPI	-.42987
CONS	.75360
NPL	.55265

Table 7 summarizes the classification results, indicating that approximately 79 percent of the observations were correctly classified for non-intervened institutions, and 90 percent for intervened institutions. (The diagonal elements of the matrix indicate the percentage and number of cases correctly classified in each group.)

Table 7. Matrix of Classification Results

Actual Group/Membership	No. of Cases	Predicted Group Membership	
		Group I	Group II
Group I	395	311 (78.7 percent)	84 (21.3 percent)
Group II	10	1 (10 percent)	9 (90 percent)

These results, though limited in scope and coverage, contribute to the ongoing search for useful indicators of financial system instability. The ratio of non-performing to total loans appears to be a useful indicator of banking distress,²⁹ along with the following macroeconomic indicators: the growth of real output, the extent of loan expansion relative to output, the current account balance, and the proportion of consumer lending in the institution's portfolio.

VI. AN AGENDA FOR FURTHER INVESTIGATION

In order to complete the picture of the current health of the Caribbean financial sector, further investigation is needed, in the areas suggested below.

A regional survey should be undertaken to update the documentation of the regulatory framework carried out in 1993/94. Revisions to internationally agreed norms for supervisory practices are currently being discussed under the auspices of the Basel Committee, and methodologies have been developed to assess compliance with these norms. While countries in the region have been working towards the implementation of these norms, an independent assessment of each country's progress undertaken as part of the survey would provide the basis for new recommendations for improvement and the development of a program for regional countries to achieve full compliance with the norms. The regional project should also be extended to the setting of common standards for international financial services, so that countries compete on the quality of the services they offer, and regulatory arbitrage is eliminated.

²⁹An interesting question for future research, if data permit, is whether the robustness of NPL as an indicator is affected by the extent of provisioning against impaired credits.

Further studies need to be undertaken, based on the use of macroeconomic and prudential indicators of bank fragility, to explore the vulnerabilities of the financial system. Methodologies are still under development, but there is a body of work on which the investigation may draw. The results of an exercise of this kind for Caribbean countries might contribute to the evolution of the quantitative assessment methodologies in ways that are appropriate to the circumstances of small financial systems, typically dominated by a handful of banks. Qualitative and judgmental assessment of the indicators might be complemented by econometric studies with a richer pool of data than was available to us. Regional central banks and their bank supervision departments might collaborate with the Caribbean Center for Monetary Studies in undertaking such studies.

There is also a need for comprehensive description and documentation of the range and scope of offshore financial activity in the Caribbean, and a careful record of the regulatory frameworks under which different types of activity operate. These frameworks need to be strengthened, additional supervisory resources provided and assessment methodologies similar to the Core Principles carried out. Institutions undertaking promotion of international services should be separate from those responsible for regulation. Prudential considerations with respect to licensing criteria and the solvency and liquidity of the offshore sector would broaden the scope of discussion of offshore banking. The recently introduced program for IMF assessments and technical assistance for offshore financial centers promises to be an important first step in this process.

Caribbean central banks should consider following the example of the Bank of Jamaica, with regular publication of prudential indicators and bank performance data, in aggregate, in their periodicals and on the internet. Publication of data on profit and loss accounts is now required of financial institutions in most countries, but it is not made available anywhere in a form which allows comparisons among banks or analysis of developments over time, and publication therefore does not serve the intended purpose. In addition, consideration should be given to the frequent publication of up-to-date prudential indicators such as risk weighted capital ratios, the percentage of non-performing loans, and the extent of provisioning for impaired assets.³⁰

Further enhancement of the supervision of the region's financial system is required to bring all financial intermediaries under effective supervision. Some types of financial institution which are not yet effectively supervised (mainly credit unions) now carry out similar functions to those of commercial banks (on a much smaller scale, however). In addition, a number of financial conglomerates have emerged, some regional banks are now involved in insurance and securities trading, and some insurance companies are heavily

³⁰The Central Bank of Aruba publishes capital adequacy and liquidity ratios in its Quarterly Bulletin, the Bank of Jamaica publishes limited prudential information on its website (www.boj.org.jm), and the Central Bank of Trinidad and Tobago issues an annual report on "Operating Results of the Financial System."

involved in lending activities. Although regulators for the financial sub-sectors do meet to discuss matters of common concern, institutional arrangements for coordination are needed, including consideration of consolidated supervision of entities involved in more than one type of financial activity.

Arrangements for sharing financial information among regional financial regulators should be improved, to minimize the risk of contagion across regional boundaries. In addition, an increasing number of financial institutions now operate across borders. There is a role for regional institutions such as the Caricom Secretariat and the Caribbean Center for Monetary Studies to play in this program of research and strengthening of institutional cooperation.

References

- Bank for International Settlements (BIS), "Consultative Paper on a New Capital Adequacy Framework," June 1999.
- _____, "Core Principles for Effective Banking Supervision," September 1997.
- Boamah, Daniel, "The Stock of Fixed Capital in Barbados 1958–1981: Some Exploratory Estimates," *Central Bank of Barbados Economic Report*, December 1984, XI (2) pp. 8–10.
- Calvo, Guillermo and Carmen Reinhart, "When Capital Inflows Come to a Sudden Stop: Consequences and Policy Actions," University of Maryland, June 29, 1999.
- Central Bank of Trinidad and Tobago, IMF and IADB, "Banking Soundness from a Macroeconomic Perspective," Seminar (Port of Spain, January 17–19, 2000).
- Cherebin, Desiree, "Report of the Study of Bank Supervisory Practices in the Caribbean," Caribbean Group of Bank Supervisors, February 1994.
- Clarke, Laurence and Donna Danns, Editors, *The Financial Evolution of the Caribbean Community 1970–96*, Caribbean Centre for Monetary Studies (CCMS), 1997.
- Craigwell, Roland and Tracy Polius, "Bank Fragility in the Caribbean," Central Bank of Barbados, Working Papers, 1997, Volume 1, pages 239–50.
- De Juan, Aristobulo, "The Roots of Banking Crises: Microeconomic Issues and Supervision and Regulation," in Liliana Rojas-Suarez and Ricardo Hausmann, Editors, *Banking Crises in Latin America* (Washington, D. C.: Interamerican Development Bank, 1996).
- Evans, Owen et al., *Macprudential Indicators of Financial System Soundness*, IMF Occasional Paper No. 192, 2000.
- Hair, Joseph, et al., *Multivariate Data Analysis*, Prentice Hall, 1995.
- Johnson, Richard and Dean Wichern, *Applied Multivariate Statistical Analysis*, Prentice Hall, 1998.
- Lindgren, Carl-Johan, Gillian Garcia, and Matthew Saal, *Bank Soundness and Macroeconomic Policy* (Washington, D. C.: International Monetary Fund, 1996).
- Sergeant, Kelvin, "New Instruments in the Financial Sector of Trinidad and Tobago," *Social and Economic Studies*, 45:2&3, June/September 1996, pages 225–47.

Sundararajan, V. and Tomás J.T. Baliño, "Issues in Recent Banking Crises in Developing Countries," in Sundararajan and Baliño, Editors, *Banking Crises: Cases and Issues*, IMF, 1991.

Theatin, Laurence, "The Fragility of Financial Institutions in the Caribbean," Central Bank of Barbados, Working Papers 1997, Volume 1, pages 221-38.

World Bank and Caribbean Center for Monetary Studies (CCMS), "Wider Caribbean Financial Sector Review," May 1998.

Worrell, DeLisle, "Finance and Investment in Barbados," *Central Bank of Barbados Economic Review*, September 1990.

Zephirin, Mary and Dave Seerattan, *Financial Innovations in the Caribbean*, Caribbean Center for Monetary Studies, 1997.

I. CONFERENCE THEMES—CARIBBEAN GROUP OF BANK SUPERVISORS

1997

- The juxtaposition of prudential goals and macroeconomic policy objectives.
- Revisiting licensing and ownership policies in the financial services industry.
- Technological innovations and the implications for the supervision of the financial system.
- Legislative changes in response to existing and emerging issues in the financial system.
- Contemporary issues in bank supervision (panel discussion).

1998

- A perspective on the role of international lending agencies as it relates to banking system stability.
- The Year 2000—impending chaos or programmed transition?
- Maintaining the integrity of the offshore sector.
- Optimizing supervisory resources.
- Contemporary supervisory issues.
- Recent work of the Basel Committee on Banking Regulation and Supervisory Practices.

1999

- Growth of the international financial services industry and the implications for bank supervisors.
- New and increased anti-money laundering initiatives in the financial sector and the extent to which bank supervisors should be involved.
- Y2K—the time remaining.
- Cross-border cooperation in problem financial institution resolution.

2000

- Macroeconomic and prudential indicators of bank fragility.
- Widening the supervisory net: focus on credit unions, building societies and other non-bank financial institutions.
- Internet banking, e-commerce and the related supervisory challenges.
- Threats and challenges to offshore centers in the region.
- Risk management from a private sector perspective.
- Basel Committee electronic banking group initiatives.
- The Caribbean response to OECD initiatives on the regulation of offshore centers.
- The new Basel capital accords.

II. AN ALTERNATIVE SPECIFICATION OF THE MODEL OF FINANCIAL FRAGILITY

This appendix reports on the results of an alternative to the specification of the model described in Section V. Model II includes a larger number of microeconomic variables, but fewer observations, because we had shorter series for many of the additional variables. Some macroeconomic variables were omitted, to maximize the degrees of freedom. The treasury bill rate (TBR), nominal exchange rate (NEXR), the real effective exchange rate (REFFER), and the consumer price index (CPI) were the macroeconomic variables included. The ratio of agricultural loans to total loans (AGR) was added. The literature suggests that the failure of one institution may induce the failure of other banks through high inter-bank exposures. Therefore, the ratio of inter-bank loans (IBM) to total loans was included as a measure of the level of inter-bank exposure. A foreign exchange exposure variable, the ratio of foreign loans to total loans (FORR), was also included.

The analysis reveals that AGR, CONS, NPL, OEX, and LNI were important discriminatory variables, along with TBR and CPI from among the macroeconomic variables.

Table 1. Summary of Discriminant Analysis

Step	Variable Entered	Wilks' Lambda	Significance
1	CPI	0.88313	0.0000
2	AGR	0.86129	0.0000
3	CONS	0.84069	0.0000
4	LNI	0.82966	0.0000
5	TBR	0.81464	0.0000
6	NPL	0.79598	0.0000
7	OEX	0.78480	0.0000

Table 2. Canonical Discriminant Function (Model II)

Eigen Value	Can. Corr.	Wilks' Lambda	Chi Square	D.F.	Sign
.2742	.4639	.7847	81.5	7	0.0000

The chi-square statistic of 81.5 corresponding to the Wilks' Lambda indicates that there is significant difference between the means of the variables included (CPI, AGR, CONS, LNI, TBR, NPL, OEX) for the fragile and non-fragile groups.

Table 3. Standardized Canonical Function (Model II)

Variable	
AGR	-0.818
CONS	0.399
CPI	0.676
LNI	0.487
NPL	-0.472
OEX	0.283
TBR	0.556

The matrix of classification suggests that that 92.9 percent of the observations were correctly classified. However, only 7 percent of the observations categorized as fragile were correctly classified. Approximately 2 percent of the observations in the non-fragile group were misclassified. These results indicate that the ratio of banks' operating expenses to total assets, the ratio of agricultural to total loans, the consumer price index, and the treasury bill interest rate might also be useful indicators of financial stress, along with the variables indicated in the main text of the paper.