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Quantitative Assessment of a Financial System—Barbados

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IMF Working Paper

Monetary and Financial Systems Department

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Abstract

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A banking system module is incorporated into the Central Bank of Barbados's multisectoral macroeconomic forecasting model, and a medium-term forecast is generated for bank capitalization, profitability, liquidity and nonperforming loans. Stress tests are performed for the first year of the forecast, to test the banking system's resilience to real sector shocks. The analysis, which would in practice be only part of the vulnerability assessment, indicates that the banking system is stable and resilient to macroeconomic shocks of a type and magnitude that Barbados has experienced in the past.

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I. INTRODUCTION

The quantitative assessment of the banking system reported in this paper, is an important element in the Central Bank of Barbados's (CBB) ongoing monitoring of its financial system, and was an input for the IMF Financial System Soundness Assessment (FSSA) of the country.² The methodology of financial sector assessment, which is still evolving, combines quantitative elements, such as those covered in this paper, with an examination of the regulatory and supervisory framework of the financial sector, analysis of the payments system, discussion of the breadth and depth of the market for securities, and analysis of the development of financial services. These nonquantitative aspects are not covered in this paper.

The techniques that have been developed, and are being refined, for the quantitative assessment of financial systems, may be grouped under the headings of financial soundness indicators (FSIs), financial forecasts, and "stress tests", tests of the solvency of substantial parts of the financial system under a range of plausible shocks. FSIs are those prudential and macroeconomic variables that appear to be significantly correlated with the incidence of financial distress for the system as a whole, or for individual institutions (see Sundararajan and others, 2002). They may give warning of financial difficulty if their values fall below regulatory requirements or internationally agreed norms, or if they fall short of the performance of comparable financial institutions or systems. The FSIs may be combined using weighting systems that are based on experience and intuition, or on econometric tests (see Worrell, 2004). However, this paper uses only methodologies based on comparators for the analysis of FSIs.

The financial forecasts in this paper are derived from links to the forecasts of the CBB's macroeconomic model, a structural multisectoral model that is routinely employed for economic analysis and policy (see Craigwell and others, 1996). The model, which produces forecasts of deposits and loans, has been augmented with a module that produces forecasts of the banking sector, for the purposes of the current exercise.

The analysis of this paper relates to commercial banks that provide services to the domestic economy, to the exclusion of other financial institutions, which, with the exception of insurance companies,³ are too small to affect the soundness of the financial system as a whole. The activity of the international financial services centre (IFSC) is also excluded, because there are no significant links between IFSC institutions and those that provide domestic financial services.

² See IMF (2003).

³ The insurance industry deserves to be the subject of a separate study.

Section II of the paper describes the structure and importance of Barbados' financial system—the types of financial service, the extent of use of financial services, ownership of financial institutions, patterns of concentration, and payments systems—and the recent trends in financial soundness indicators. Section III explains the methodology of the financial sector forecasts, generates a five-year forecast, and performs stress tests. It provides an illustration of some of the methodologies described in Worrell (2004). Section IV concludes.

II. FINANCIAL STRUCTURE AND BANKING PERFORMANCE

Commercial banks are by far the most important financial institutions in Barbados, with assets equivalent to 135 percent of GDP at the end of 2003 (see Figure 1). Banks are well established,⁴ and bank branches are accessible to, and used by, people at all income levels. Insurance companies are next in importance, with assets held in Barbados equivalent to 17 percent of GDP. Mortgage finance companies, credit unions, and finance companies, in descending order of importance, bring the total financial assets ratio to 147 percent of GDP. This is a comparatively high ratio, judging by recently published FSSAs (see Figure 2); of the countries shown, Iceland, Korea, and Sweden have much higher ratios, and those for Mauritius and the Czech Republic are comparable, but 10 others are lower.

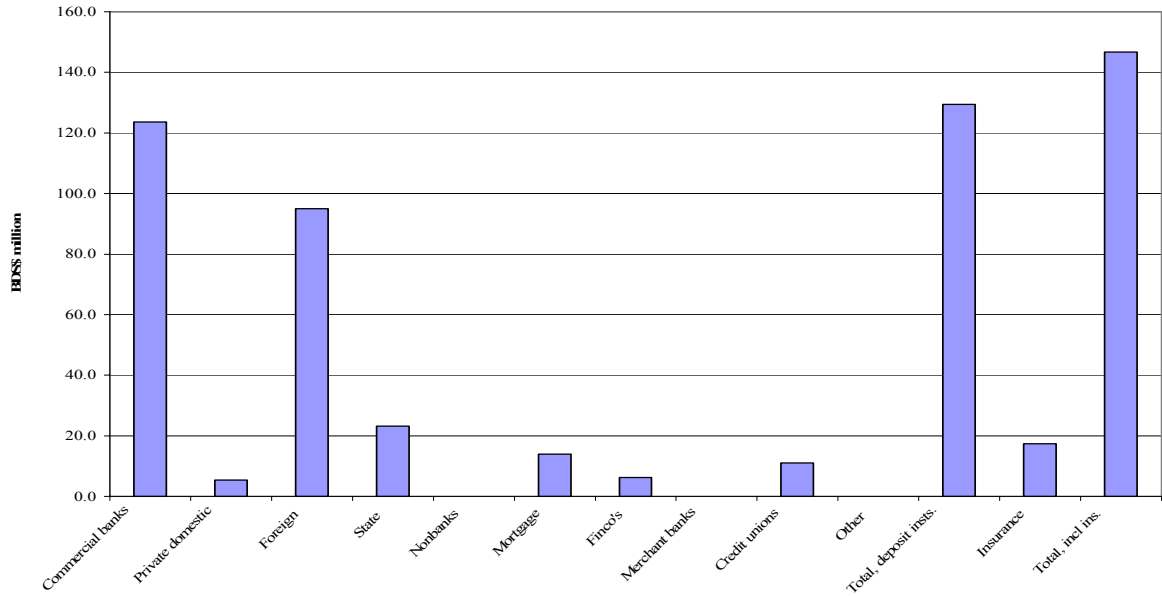
Branches and subsidiaries of foreign banks, with headquarters in Canada, Trinidad and Tobago, Bermuda, and the United Kingdom, accounted for almost the entire commercial banking system at end-2003, with government and private domestic interests having only a minority shareholding in a single bank. Prior to 1978, all commercial banks were foreign owned. In that year, the government-owned savings bank was given a commercial banking license, but in 2003 arrangements were concluded for the purchase of a majority share of this bank, by a bank with headquarters in Trinidad and Tobago. One other bank has its parent in that country. The only bank owned by the domestic private sector was also sold in 2003, to a Bermudan bank. This bank was established in 1993, when the Central Bank of Barbados managed the sale of the domestic operations of the Luxembourg and Cayman Islands based Bank of Credit and Commerce International (BCCI), which failed in that year (see Box 1).

The degree of concentration in the Barbados banking sector is extremely high, with the five largest banks accounting for almost the entire market, a higher degree of concentration than for any other country shown in Figure 3. The high level of concentration is a market-determined phenomenon: bank entry has never been restricted, and the market is concentrated in the hands of foreign banks. There is evidence that the domestic market will not support a larger number of banks, in the record of entry, and subsequent exit, of four U.S. banks in the 1960s and 1970s.

Commercial banks' main business is accepting deposits, making loans, and making payments, both in local currency and foreign exchange. Banks also hold substantial portfolios

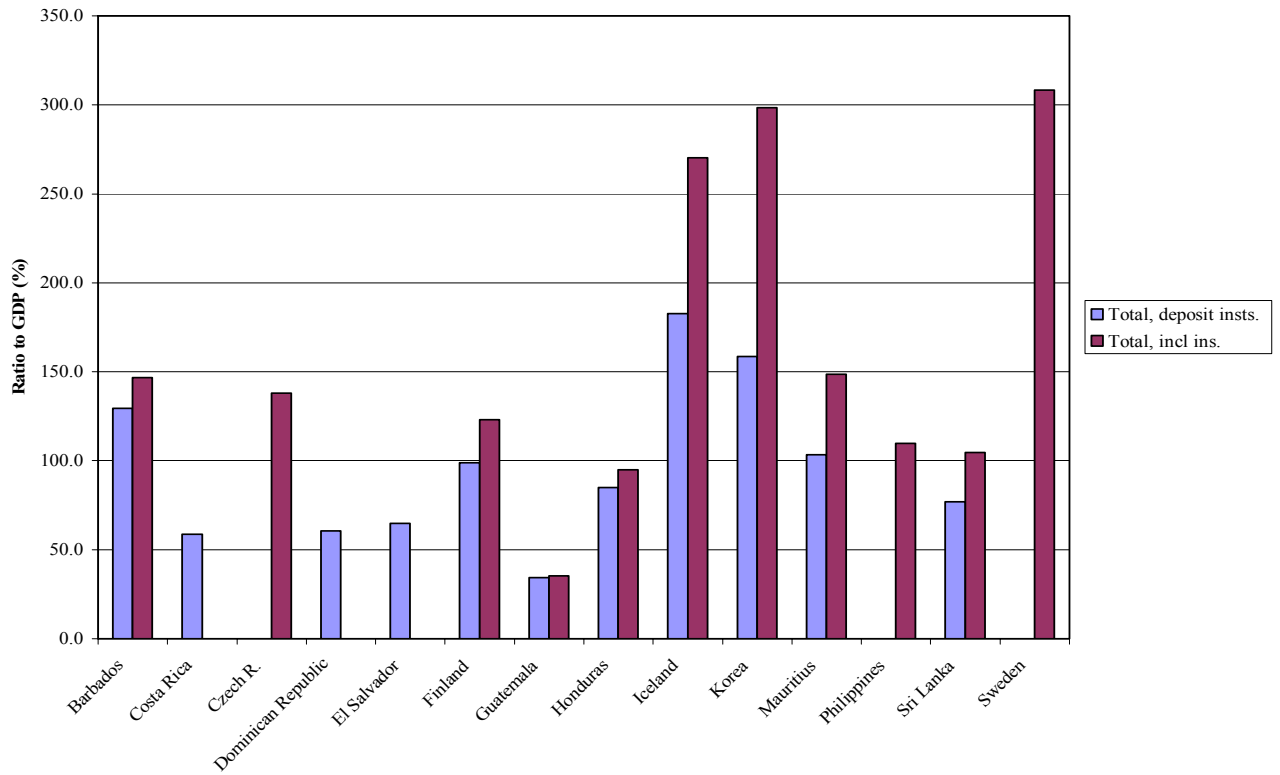
⁴ The first bank to begin operations in Barbados, the Colonial Bank, was established in 1837.

Figure 1. Barbados Financial Structure



Source: Central Bank of Barbados.

Figure 2. Financial Structure Comparisons



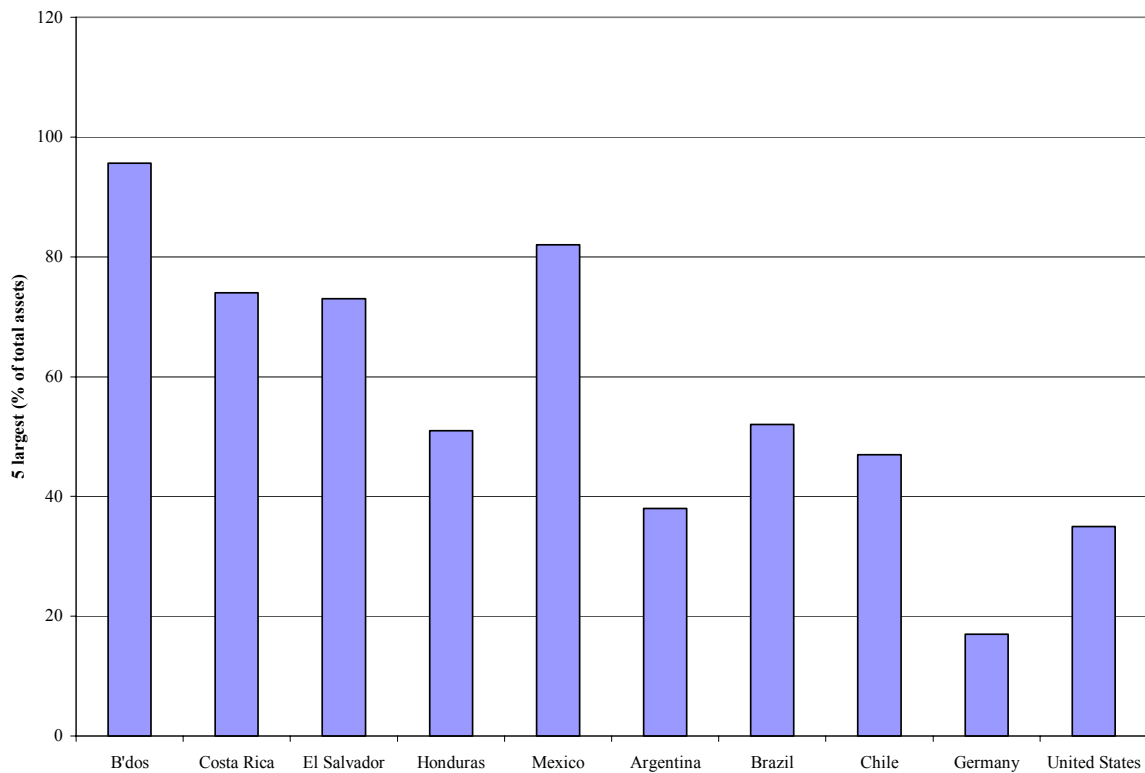
Sources: Central Bank of Barbados, and IMF, "Financial System Stability Assessment" Reports for selected countries listed, available on www.imf.org.

Box 1. The Mutual Bank

The Mutual Bank of the Caribbean Inc. commenced operations on March 1, 1993, with a loan portfolio comprised of the loans taken over from the former BCCI, which had been closed on the recommendations of the Bank of England. Under an arrangement with the Central Bank of Barbados and the National Insurance Scheme, interest was imputed on impaired assets in the BCCI portfolio, and paid on deposits maintained by these statutory bodies in the form of deferred interest, which was accumulated. This meant that the bank was not required to establish a provision against the impaired loans taken over.

By September 2003, the bank had collected or written off all outstanding monies due on this portfolio, as a result of active follow-up and legal proceedings. The main source of funds used to write off loans came from interest on deposits, realization of security, and dividends paid by BCCI liquidator in Grand Cayman on deposits held there. At inception in 1993, the portfolio was valued in excess of \$20.0 million but by September 2003 had been fully liquidated. In November 2003, the bank was sold to the Bank of Butterfield of Bermuda.

Figure 3. Market Concentration in the Banking Sector



Sources: IMF, 2003, "Costa Rica – Financial System Stability Assessment," Country Report 03/103 (April), and IMF, 2003, "Barbados - Financial System Stability Assessment."

of treasury bills, and some other marketable securities issued by government and its agencies, but there are no liquid tradable instruments issued by enterprises, for which they might compete. The majority of deposits are owned by households (72 percent of bank deposits), with an average size of about BDS\$30,000, equivalent to almost twice the country's per capita income. Household balances are mainly held in interest-bearing savings and time deposits. Firms' deposits, which account for 20 percent of total deposits, are mainly on current account.

The greatest concentration of bank lending is term loans to households, 38 percent of the total, and about one-third of that amount is for housing mortgages. Lending to the wholesale and retail sector, mainly for working capital, accounted for about 20 percent of loans at end-2003, mostly in the form of overdrafts. Although tourism is by far the main export sector in what is a very open economy, its demand for bank credit is modest, accounting for only 12 percent of the total. Credit cards are widely used, but for relatively small transactions, and they account for an insignificant proportion of outstanding credit.

The CBB stipulates a floor on the savings deposit rate, and in 2002 re-imposed a ceiling on the weighted average interest on the banks' loan portfolio, but the spread between the weighted averages of deposits and loans remained extremely high by international standards, at almost 750 basis points, and banks retain wide discretion in setting and changing interest rates. Rates on all loans other than mortgages are linked to the bank's prime rate, which varies, usually with the CBB's discount rate. Interest rates on savings deposits—and on demand deposits, when interest is paid on them—are also variable. Banks ensure they are not exposed to interest re-pricing risk by restricting their mortgage portfolio; mortgages account for 7 percent of bank assets, compared with the equivalent of 15 percent of assets which are held on term deposit. Mortgages may be repriced with six months notice, in most contracts. Government treasury bills are sold at open auction, and their rates vary with demand and supply. While there remains a stipulated minimum of treasury bills which banks must hold, that minimum has never affected prices, since it has always stayed below the actual bank demand for treasury bills (see Worrell, 1997).

Commercial banks operate a check-based payments system, with a minority of transactions made in cash or by debit or credit card. Up to the end of 2002 clearings were conducted daily, and settlements were made on the banks' reserve accounts with the central bank. The CBB stipulates an average minimum daily reserve balance that must be maintained by all banks, and banks are required to ensure that this account is sufficiently funded to meet their expected obligations at the clearing. When banks experience large adverse clearings they borrow on the interbank market. Each bank has established a limit for every other bank in the clearing system, for the extension of such credit. A real time gross settlement system (RTGS), and an associated facility for bulk processing of small transactions and payments for which speed of settlement is not crucial, was installed by the CBB in 2002.

The CBB buys and sells foreign exchange at the fixed rate, plus a small margin for transactions costs, without limit, for current account transactions, for capital account transactions valued less than defined limits, and for all other capital account transactions that

have been vetted by the central bank. The limits for vetting by the CBB have been progressively relaxed, so that only comparatively large payments must now be submitted for approval. The supply of foreign exchange has been rationed only once in the CBB's history, for about six months in 1992, while an adjustment program with IMF support was being put in place. The estimated volume of foreign exchange trading on informal markets is insignificant, and the informal market trades at the official rate.

Commercial banks in Barbados are profitable, their asset holdings are of relatively good quality, and the four locally incorporated banks⁵ are well capitalized. The capital of the locally incorporated banks was the equivalent of about 20 percent of their risk-weighted assets, and almost all of it was in Tier I. Although the ratio of NPLs to total loans of banks in Barbados, at almost 10 percent, is worse than for industrialized countries such as Finland and Sweden, it is on par with most emerging market countries in the sample in Figure 4. The return on average assets of Barbadian banks, at 1.5 percent, was higher than for all but two countries in the sample. Barbados' foreign currency exposures are contained: the ratio of foreign currency deposits to the total is the lowest of any country shown in Figure 5, and the ratio of net open positions in foreign currency, to capital, for locally incorporated banks, is less than 10 percent, lower than for four of the six comparator countries shown.

Banks experienced a significant deterioration in the quality of their portfolios in 2002 and 2003 (see Figure 6). In the next section of this paper we try to determine the extent to which this might reflect an overall worsening of economic conditions. The increase in NPLs has substantially reduced the coverage provided by loan loss reserves (see Figure 7). There has been an erosion in bank profitability since 1998 (see Figure 8).

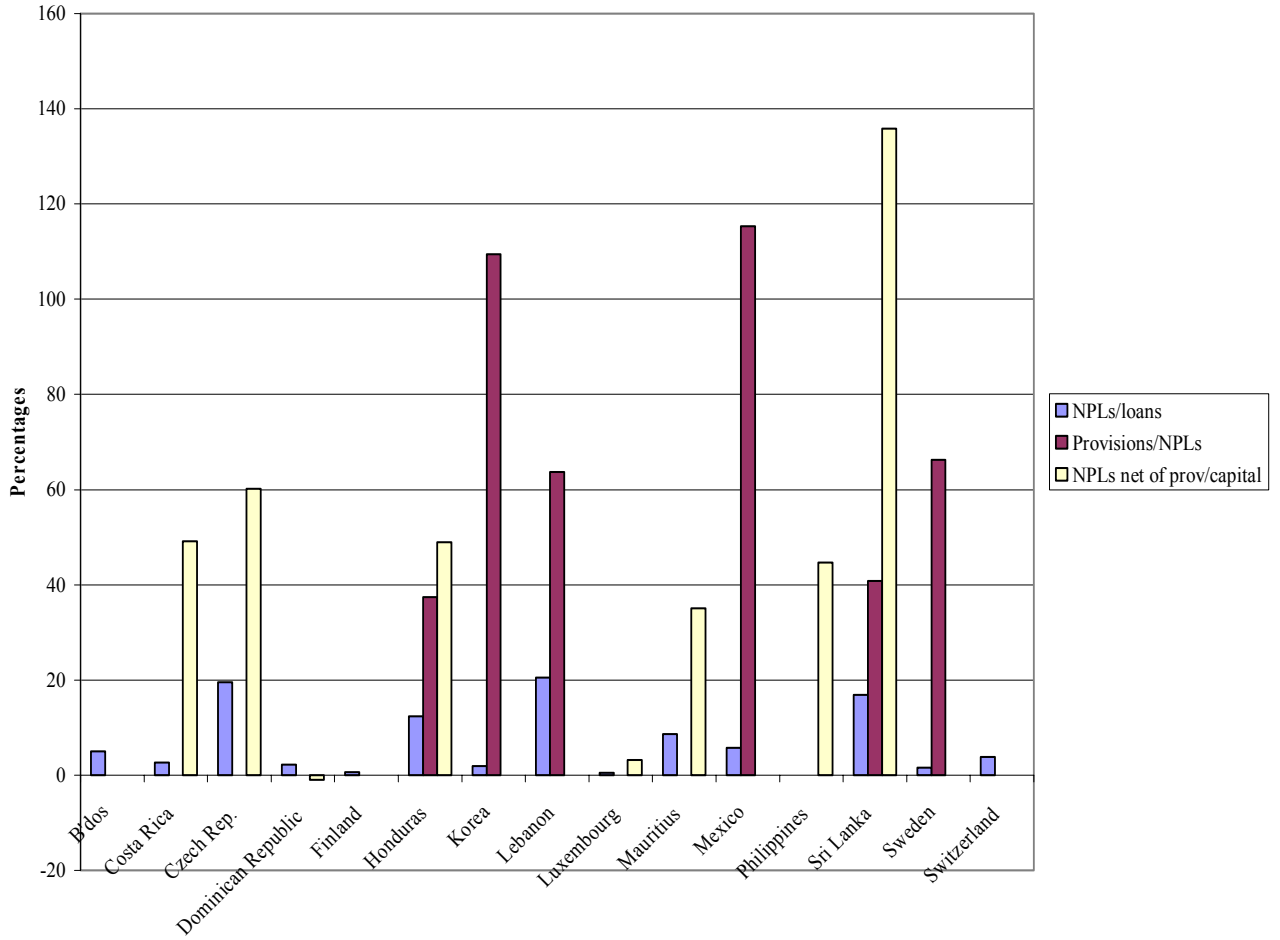
III. FINANCIAL SECTOR FORECASTS AND STRESS TESTS

This section presents a financial stability module (FSM), which is used for financial forecasts and to conduct stress tests under various scenarios. It utilizes the Central Bank of Barbados (CBB) macroeconomic forecasting model (MFM) to develop a framework for forecasting prudential ratios for the banking system over the short to medium term. The analysis is undertaken for the period 2004 to 2008, and the forecasts for 2004 are evaluated under three different scenarios: a stagnation in tourism earnings, an acceleration in imported inflation, and an end to the current construction boom.

The MFM assumes an export-led economy, and is divided into four sectors; real, financial, balance of payments and fiscal. The real sector is further decomposed into tradable and nontradable sub-sectors. The model contains twelve behavioral equations, whose

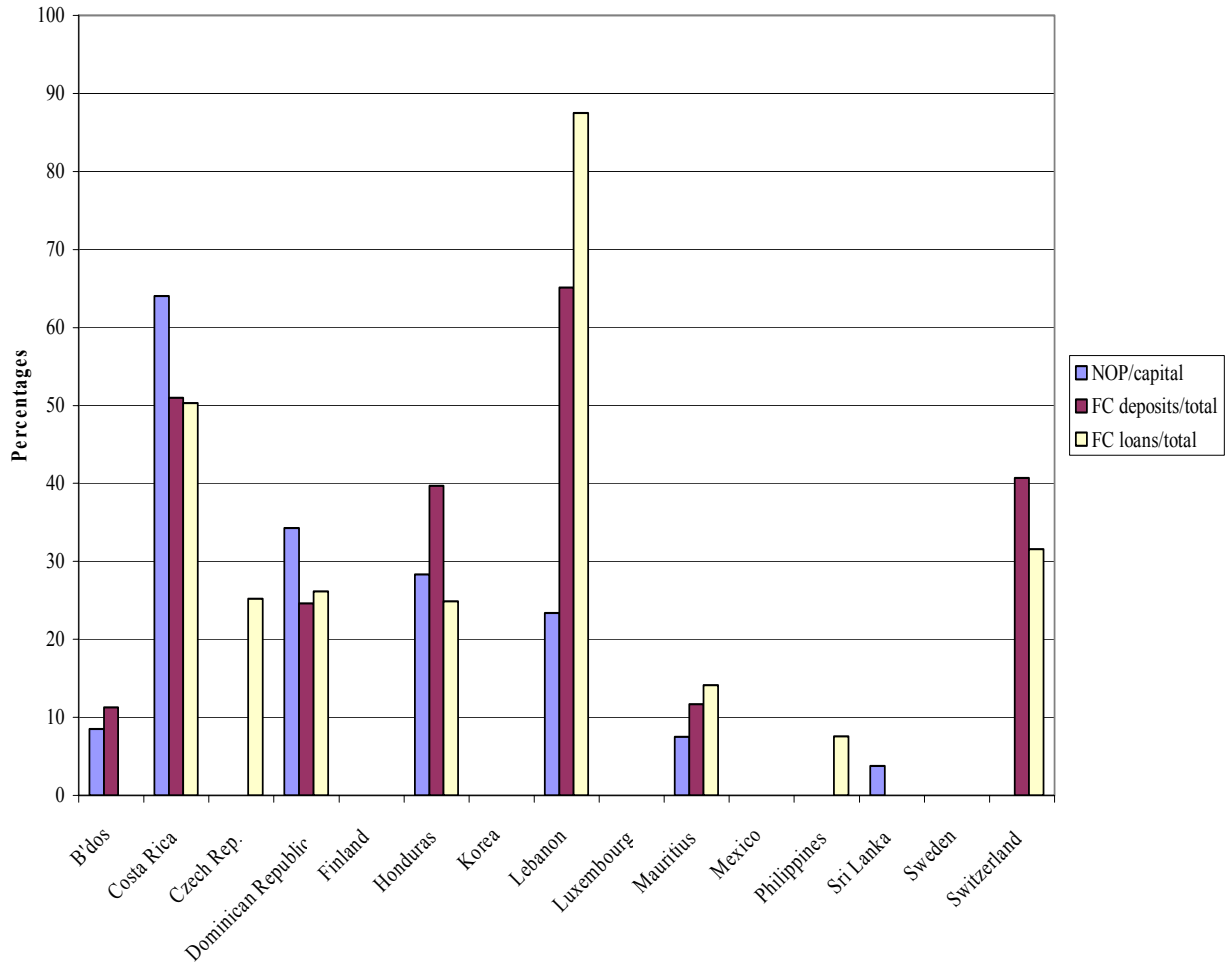
⁵ Four banks are locally incorporated subsidiaries of foreign banks, while the remaining two operate as branches of their foreign parents.

Figure 4. NPLs and Provisions—Comparisons



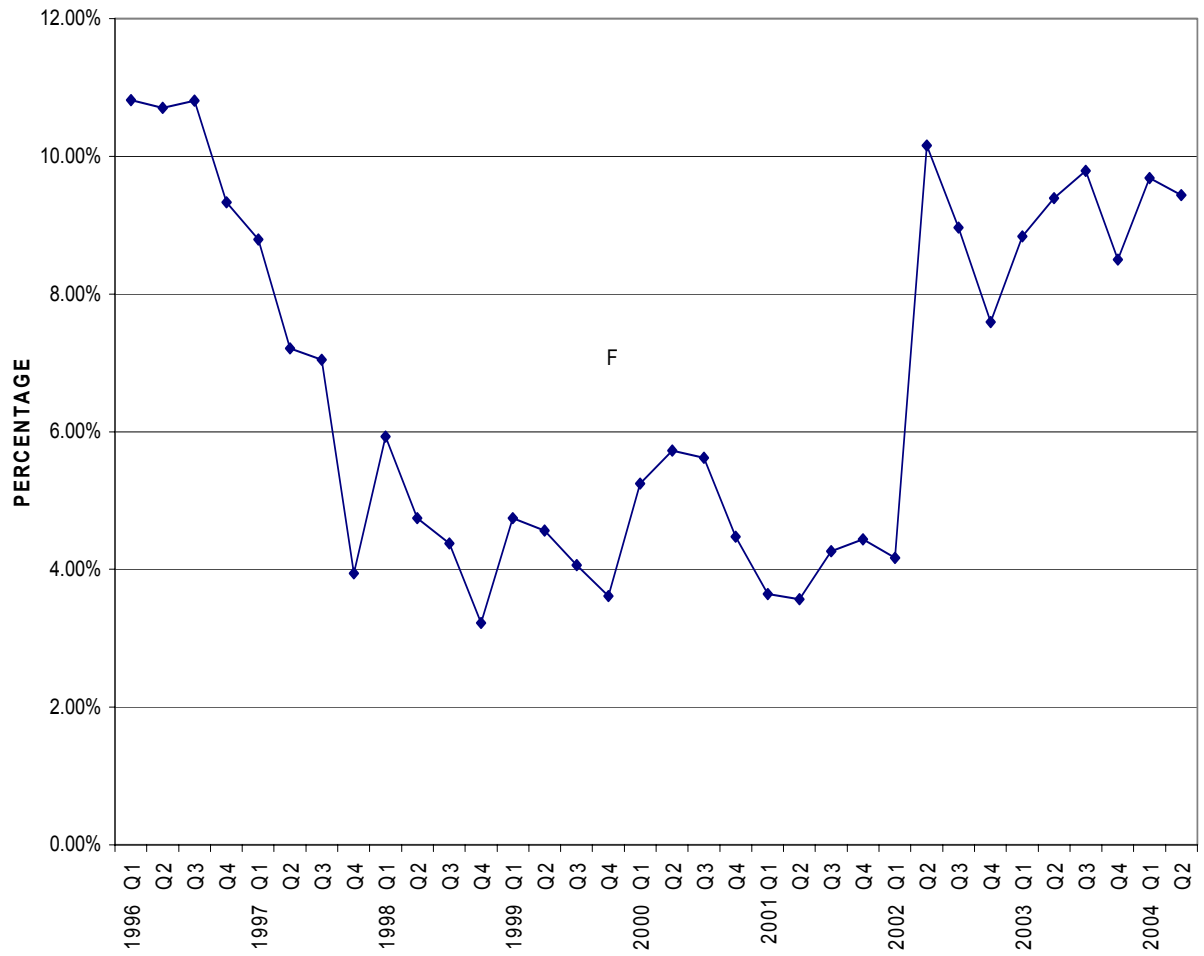
Sources: Central Bank of Barbados, and IMF, “Financial System Stability Assessment,” selected countries listed.

Figure 5. Foreign Currency Exposure



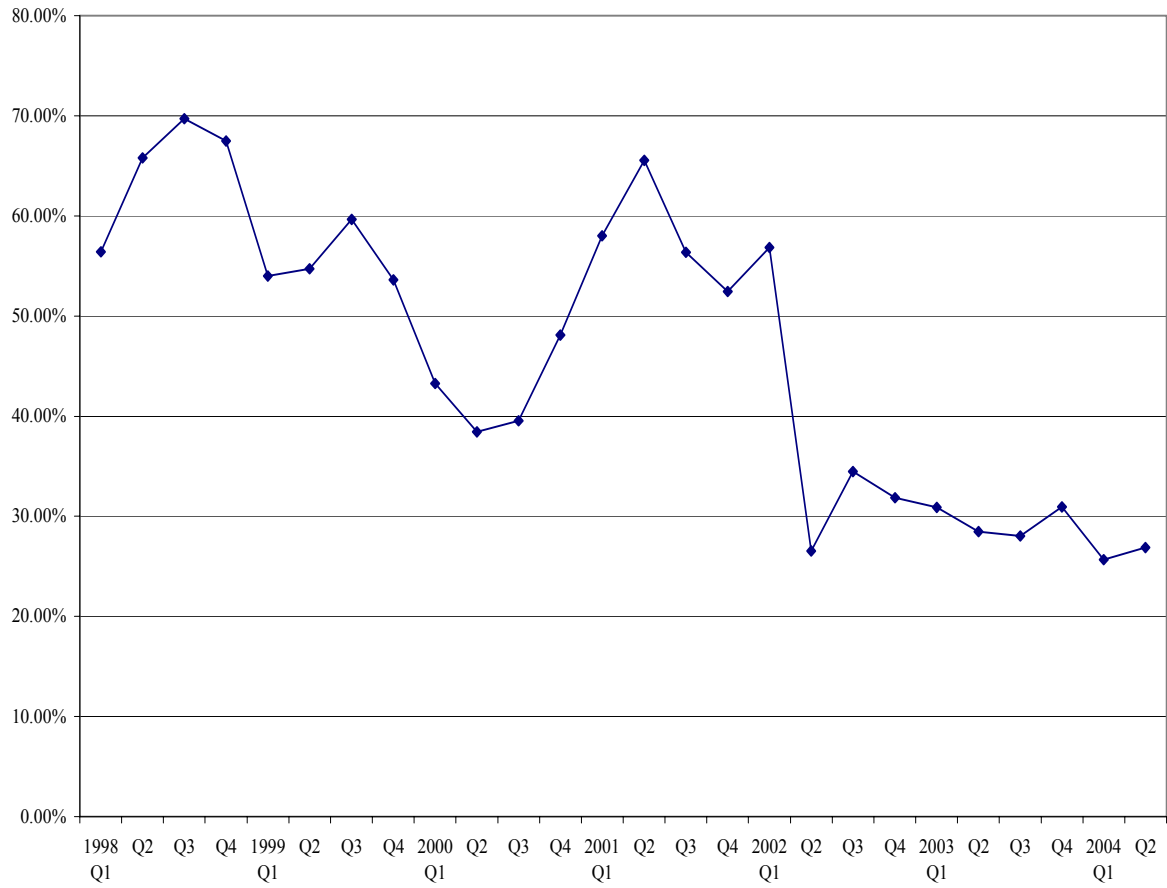
Sources: Central Bank of Barbados, and IMF, "Financial System Stability Assessment," selected countries listed.

Figure 6. Barbados—NPLs, 1996–2004



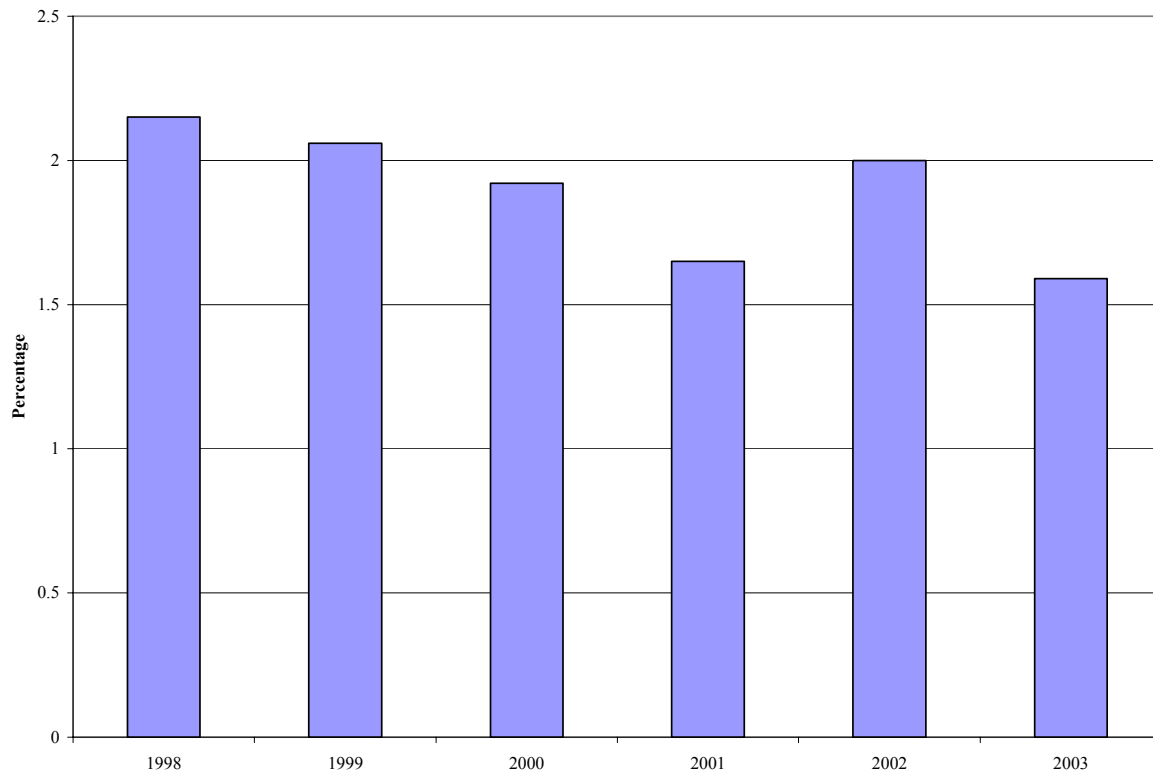
Source: Central Bank of Barbados.

Figure 7. Barbados—Loan Loss Reserves to NPLs, 1998–2004



Source: Central Bank of Barbados.

Figure 8. Barbados—Banks' Return on Assets, 1998–2003



Source: Central Bank of Barbados.

specifications have been determined by sectoral studies conducted over many years. They include studies on tourism, inflation, wages, investment, private sector credit and private sector liabilities. The model combines time-series regression and judgmental input, through the use of adjustment factors. It is used to produce quarterly forecasts over a five-year forecast horizon. (Craigwell and others (1996) provides a detailed presentation.)

The FSM provides forecasts of bank liquidity, the capital adequacy of domestically incorporated banks, and bank profitability. The forecast of bank liquidity was generated from forecasts of deposits, loans and other macroeconomic variables, taken directly from the MFM. In determining the capital adequacy forecast (for locally incorporated banks), it is assumed that capital remains unchanged at the 2003 level.

The forecast of bank profitability divides the income statement into seven key components: interest income from loans, other interest income, other income, deposit interest expenses, other interest expenses, non-interest expenses and provision expenses. Interest income from

loans is projected using the change in credit from the MFM and the ratio of interest income to total loans from the previous year, the growth in other interest income is the same as predicted inflation, while other income is assumed to grow in line with nominal GDP. Interest expenses arising from deposit liabilities are obtained from the change in deposits from the MFM and the previous year's ratio of deposit interest expenses to total deposits ratio. Other interest expenses and non-interest expenses are assumed to grow in line with inflation, and provision expenses grow along with the NPL forecasts.

The forecast of the ratio of nonperforming loans to total loans (NPL_t) for the banking system is obtained from the following equation:

$$NPL_t = f(r_{t-1}, \dot{p}_t, \dot{y}_t, NPL_{t-1}) \quad (1)$$

+ + - +

where r is the treasury bill rate, p is the consumer price index, y is real GDP and a superimposed dot denotes the variable's rate of growth. The interest rate is expected to be positively related to the ratio of nonperforming loans as higher interest rates makes it more costly for borrowers to repay loans. High levels of inflation make long term economic decisions more difficult and increase uncertainty, leading to higher levels of problem loans.⁶ In contrast, an expansion in national income makes it easier for economic agents to service their debts and should lead to a reduction in the ratio of nonperforming loans to total loans. Finally, a lagged dependent variable is also included in the model to account for inertia in the process of dealing with problem loans.

This equation is estimated by ordinary least squares and quarterly data from 1996 to 2002. The regression results are provided in Table 1. The model is able to account for 80 percent of the variation in nonperforming loans and passed a number of diagnostic tests for model misspecification including those for serial correlation, normality and heteroskedasticity. All the explanatory variables are significant at classical levels of testing and are in line with a priori expectations.

Table 2 presents the forecasts from the FSM for the period 2004 to 2008. Growth in real GDP is expected to average 2.4 percent, primarily due to robust growth in tourism arising from increased spending on marketing and promotion, the hosting of the Cricket World Cup in 2007 and the home porting of several cruise ships in Barbados. Inflation should remain below 2 percent on account of relatively low prices in most of the nation's major trading partners. Accompanying the expected expansion in real economic activity, credit growth should rebound during the period, outpacing deposit growth; liquidity will fall, but it will still be ample, with the loan to deposit ratio at the end of 2008 projected at 61.6 percent.

⁶ In countries that experience high levels of inflation, it is plausible to expect an inverse relationship, but not at the levels of inflation experienced by Barbados over the past 30 years.

Table 1. Nonperforming Loans Forecasting Equation

	Coefficient Estimates
r_{t-1}	1.008 (0.252)**
\dot{p}_t	0.404 (0.148)*
\dot{y}_t	-0.286 (0.089)**
npl_{t-1}	0.464 (0.112)**
Intercept	-2.653 (1.205)*
<i>Summary Statistics</i>	
Adjusted R^2	0.821
S.E. of Regression	1.052
Jarque-Bera Statistic	0.662
LM Test for Autocorrelation	0.871
White Heteroskedasticity Test	0.147

Source: Central Bank of Barbados, authors.

Notes:

- (1) Standard errors are given in parentheses.
- (2) ** and * indicates significance at the 1 and 5 percent levels, respectively.
- (3) Dummy variable (not reported) for the period 2002Q2-2003Q4 included in the regression to capture a shift in the classification of nonperforming loans.
- (4) Normality, autocorrelation and heteroskedasticity tests show probability values.

The financial sector is predicted to remain liquid and highly profitable, with capital for most banks well above the required minimum. The NPLs ratio should remain at the same rate as in 2003, as the negative effect of higher income growth is offset by slightly higher interest rates and inflation. The return on asset ratio is likely to remain close to 2 percent, and the risk-weighted CAR should be fairly constant throughout the period under investigation.

The first stress test investigated is a 15 percent contraction in tourism earnings (see Table 3).⁷ Such a shock can occur due to another major terrorist attack or a sharp increase in fuel prices, which causes a sharp expansion in the cost of travel.⁸ In this scenario, the effective contraction in real GDP from the baseline scenario is 3.4 percent. With the decline in tourism, the country's main source of foreign exchange earnings, the current account of the balance of payments rises from 7.1 percent of GDP in the baseline to approximately

⁷ This compares with the largest contraction in tourism earnings since 1970, recorded in 1990 (7 percent).

⁸ A hurricane of the magnitude that was experienced by Grenada in 2004 might have even more dire consequences, but Barbados has not experienced a major hurricane since 1955.

Table 2. Forecasts For the Barbadian Financial Sector

	Forecasts								
	2000	2001	2002	2003(P)	2004	2005	2006	2007	2008
<i>Macroeconomic Forecasts</i>									
GDP Real Growth (%)	2.4	-3.4	-0.4	2.2	3.1	2.4	2.1	2.0	2.0
GDP Nominal Growth Factor Costs (%)	3.7	-0.6	1.1	3.7	5.0	4.4	4.0	3.9	3.9
Inflation	2.4	2.8	0.2	1.5	1.9	1.9	1.9	1.9	1.9
Reserve movements (-incr./+decr.)	-401.6	-452.9	-177.5	-192.8	-73.6	46.3	87.1	114.6	138.7
BOP Current A/C	-290.0	-221.1	-342.3	-420.8	-401.4	-404.6	-427.7	-429.9	-446.8
Current Account / GDP Nominal - Market Prices(%)	-5.6	-4.3	-6.6	-7.8	-7.1	-6.8	-7.0	-6.7	-6.7
Retained Imports / GDP Nominal - Market Prices(%)	41.4	38.3	38.3	40.9	40.9	41.1	41.4	41.7	42.0
Import Reserve Cover (weeks)	22.2	36.7	35.6	35.3	35.3	32.7	29.4	25.7	21.9
<i>Liquidity</i>									
Loans/Deposit Ratio	1454.8	1778.4	2384.6	2587.4	2597.5	2651.8	2564.2	2444.0	2358.5
Deposits	64.4	59.6	53.6	51.5	53.3	54.4	57.4	59.9	61.6
Loans	4087.3	4397.9	5141.9	5338.9	5558.3	5819.3	6023.5	6088.3	6148.6
Credit to Private Sector	2632.5	2619.5	2757.3	2751.5	2960.8	3167.5	3459.3	3644.3	3790.1
Credit to Govt	2504.2	2512.6	2599.2	2616.0	2825.3	3032.0	3323.8	3508.8	3654.6
Credit to rest of financial system	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	128.3	106.9	158.1	135.5	135.5	135.5	135.5	135.5	135.5
<i>Capital adequacy</i>									
Total Assets (reporting banks only)	2211.5	2382.3	4030.0	4181.0	4499.0	4813.1	5256.6	5537.6	5759.1
Capital(Tier I & Tier II) (all banks)	267.6	295.9	445.2	497.3	536.7	581.3	634.0	692.3	688.3
Capital(Tier I & Tier II) (reporting banks only)	255.0	283.3	432.6	484.7	523.1	566.6	617.9	674.8	670.9
Capital/assets ratio (%) (reporting banks only)	11.7	11.9	10.8	11.7	11.9	12.1	12.1	12.5	12.0
Capital to risk weighted assets ratio (%) (reporting banks only)	17.1	18.2	18.7	21.1	21.2	21.4	21.4	22.2	21.2
Ratio of NPL to total loans (%)	3.8	4.9	7.9	9.8	8.4	9.3	9.7	9.8	9.8
Ratio of loan write offs to NPL (LW00) (%)	5.5	13.1	5.2	1.1	1.1	1.1	1.1	1.1	1.1
Volume of forecast NPL (NPLvol)	100.4	136.1	228.6	340.3	247.7	294.0	336.7	357.6	371.9
\$ value for write offs	5.5	17.9	10.2	3.7	2.7	3.2	3.7	3.9	4.0
<i>Profitability (before tax)</i>	121.1	120.8	78.7	76.2	85.9	97.6	114.9	127.1	0.0

Source: Central Bank of Barbados, authors.

Table 3. Stress Tests of the Barbadian Financial Sector

	2004				
	2003	Scenario 1		Scenario 2	Scenario 3
		Baseline Scenario	(15% drop in Tourism Receipts)	(5% rise in Inflation)	(15% drop in construction)
<i>Macroeconomic Indicators</i>					
GDP Real Growth (%)	2.2	3.1	-0.3	2.6	1.7
GDP Nominal Growth Factor Costs (%)	3.7	5.0	1.6	7.8	3.6
Inflation	1.5	1.9	1.9	5.0	1.9
Reserve movements (-incr./+decr.)	-192.8	-73.6	241.3	-39.7	-52.0
BOP Current A/C	-420.8	-401.4	-716.4	-435.4	-329.1
Current Account / GDP Nominal - Market Prices(%)	-7.8	-7.1	-13.1	-7.5	-5.9
Retained Imports / GDP Nominal - Market Prices(%)	40.9	40.9	42.2	41.4	39.9
Import Reserve Cover (weeks)	35.3	35.3	28.3	33.2	36.1
<i>Liquidity</i>	2587.4	2597.5	2378.5	2606.5	2552.0
Loans/Deposit Ratio	51.5	53.3	53.0	50.4	51.9
Deposits	5338.9	5558.3	5058.3	5256.0	5308.3
Loans	2751.5	2960.8	2679.8	2649.5	2756.3
Credit to Private Sector	2616.0	2825.3	2544.3	2514.0	2620.8
Credit to Gov't	0.0	0.0	0.0	0.0	0.0
Credit to rest of financial system	135.5	135.5	135.5	135.5	135.5
<i>Capital adequacy</i>					
Total Assets (reporting banks only)	4181.0	4499.0	4072.0	4026.0	4188.3
Capital(Tier I & Tier II) (all banks)	497.3	536.7	516.6	525.0	526.4
Capital(Tier I & Tier II) (reporting banks only)	484.7	523.1	503.5	511.7	513.1
Capital/assets ratio (%) (reporting banks only)	11.7	11.9	12.7	13.0	12.6
Capital to risk weighted assets ratio (%) (reporting banks only)	21.1	21.2	22.5	23.1	22.3
Ratio of NPL to total loans (%)	9.8	8.4	10.2	8.5	9.0
Ratio of loan write offs to NPL (LWOO) (%)	1.1	1.1	2.9	1.2	1.8
Volume of forecast NPL (NPLvol)	340.3	247.7	272.9	225.7	249.0
\$ value for write offs	3.7	2.7	7.9	2.8	4.4
<i>Profitability</i> (before tax)	76.2	85.9	55.6	62.3	68.3

Sources: Central Bank of Barbados, authors.

13.1 percent. The fall in national income results in a contraction in deposits and credit. The decline in credit to the private sector is not as large as the reduction in deposits, and overall liquidity should contract. The ratio of NPLs worsens by almost 2 percentage points from in the baseline scenario to 10.2 percent and the loan write-offs almost double. With the slowdown in credit growth and higher loan write-offs, bank profitability falls but still remains high, and the capital to risk-weighted asset ratio remains at acceptable levels.⁹

The second scenario examines the likely implications for the financial sector of a spike in (imported) inflation. In this instance real growth contracts somewhat from the baseline scenario as consumers' real spending power declines. The rise in imported inflation results in higher imports and thus a deterioration in the current account of the balance of payments. Liquidity expands as the fall in deposits is much less than the contraction in credit to the private sector. The ratio of NPLs worsens slightly, but not by as much as for the first scenario, and is the lowest of the three scenarios examined. Bank profitability remains relatively high as the contraction in credit is partially offset by higher interest rates. Again, the capital to risk-weighted asset ratio remains at comfortable levels.

The final scenario provides an assessment of the potential implications of a sharp end to the current construction boom. The impact on growth is slightly greater than in the inflation scenario, but not as much as in the tourism shock. The expansion in reserves is slightly less than in the baseline scenario, as the reduction in construction imports is partially offset by lower private sector inflows for construction projects. The level of liquidity is similar to that as in the baseline scenario as the contraction in capital inflows results in slower deposit growth and less lending by banks. The slower rate of GDP growth results in rise in the ratio of NPLs of 0.6 of a percentage point. Bank profitability is not significantly affected and is the highest of the three scenarios examined given the relative small exposure of commercial banks to construction projects. As in the previous scenarios, the capital risk-weighted asset ratio is well above prudentially required levels.

IV. CONCLUSIONS

The commercial banking system in Barbados is well capitalized, profitable, and liquid, with a modest proportion of impaired assets, and banking services are accessible to a wide range of businesses and households. Although there are only six banks, the risk of interbank contagion is mitigated by the fact that they are all foreign owned, three of them by large banks with headquarters in Canada and the United Kingdom. The financial sector forecast derived from the Central Bank of Barbados' medium term economic forecast indicates that it is probable that bank performance will continue to be favorable with adequate capitalization, continuing profitability, and relatively high liquidity, although not much progress is forecast in reducing

⁹ It is assumed that the risk-weighted profile of assets remains unchanged under the stress scenarios.

NPLs. The banking system is resilient to feasible macroeconomic shocks of a size and type similar to those experienced in the past.

The conclusions are consistent with those of the Barbados FSSA, which showed that, on average, locally incorporated banks could absorb an increase of 90 percent in NPLs before reaching the statutory CAR and 145 percent before becoming insolvent. The worst case scenario considered by the report resulted in a 43 percent increase in NPLs (see IMF, 2003).

Nevertheless, the limitations of this analysis need to be taken into account, in assessing the banking system's overall vulnerability. The analysis focuses on credit risks, which are the most important, though in practice operational and other risks are taken into account. It was not possible to forecast bank performance (including NPLs) at the individual bank level, leaving the unexplored possibility that some individual bank weaknesses may be obscured in the aggregate. The limitations imposed by the current state of the art of quantitative financial assessment, discussed in Worrell (2004), should also be borne in mind.

The principal source of vulnerability may well be in the external economy, in the headquarters countries of the banks with major operations in Barbados, or in other countries where these banks have major exposures. The collapse of BCCI, the consequences of which were managed so as to avoid losses to Barbadian depositors, is an illustration of this risk. Furthermore, the vulnerability analysis should be extended to cover insurance companies and superannuation funds, which may be large enough to have systemically important implications, and to analyze the financial condition of firms and households, which may affect their ability to service and sustain their obligations to banks. As was mentioned at the outset, the quantitative analysis is one element in a comprehensive assessment, which would also include legal, regulatory, and institutional analyses. Finally, the paper does not address important issues of financial efficiency and financial development.

REFERENCES

- Craigwell, Roland, Hyginus Leon, Janice Christopher-Nicholls, Shelton Nicholls, Audra Walker, and Patrick Watson, 1996, "Reflections on Macroeconometric Forecasting in the English-Speaking Caribbean," in *Problems and Challenges in Modelling and Forecasting Caribbean Economies*, ed. by Watson, Patrick, Shelton Nicholls, and Hyginus Leon, (Port-of-Spain: Caribbean Centre for Monetary Studies, Technical Study No.1).
- International Monetary Fund, 2003, "Barbados - Financial System Stability Assessment," Country Report No. 03/35, February, www.imf.org.
- Sundararajan, V., and others, 2002, *Financial Soundness Indicators: Analytical Aspects and Country Practices*, IMF Occasional Paper, No. 212 (Washington: International Monetary Fund).
- Worrell, DeLisle, 2004, "Quantitative Assessment of the Financial Sector: An Integrated Approach," IMF Working Paper 04/153 (Washington: International Monetary Fund).
- _____, 1997, "Bank Behavior and Monetary Policy in Small Open Economies with Reference to the Caribbean," *Social and Economic Studies*, Vol. 46, Nos. 2 & 3, pages 59–74.