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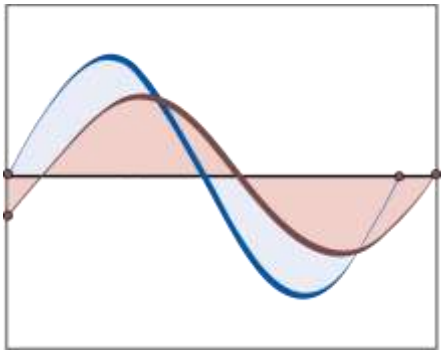

Exploring the Benefits of Stress Testing: The Case of Trinidad and Tobago

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Stress tests have been conducted in many countries to gauge the vulnerability of banks to key shocks. In Trinidad and Tobago, five such tests were completed between 2005 and 2010. This paper finds that they broadly addressed the main vulnerabilities faced by domestic banks including interest rate, exchange rate, credit and liquidity risks and sensitivities to energy prices and local or regional disasters. The stress testing process itself has been instrumental in bringing about closer discourse between the regulator and banks as well as integrating a more macroprudential perspective into the evaluation of the performance of institutions and sources of strains that they could face. However, while the system has shown great resilience in part due to conservative banking practices and high capital buffers, greater attention should be paid in future tests to shocks from other sources, notably sovereign risk, sudden stops in capital flows and contagion from other financial institutions.

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Table of Contents

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1. Introduction

Due to their central role in an economy, financial intermediaries are vulnerable to shocks from many different quarters. Domestically, a slump in real sector activity, political turmoil, fiscal difficulties and problems in related financial institutions are among the many sources of potential strain on individual intermediaries. As global financial integration has intensified, the role of external shocks—including for example sovereign debt defaults, natural disasters abroad, and contagion effects leading to sharp contractions or sudden stops in capital flows—has become more important for financial entities. Moreover, problems faced by large systemically important financial institutions can have a destabilizing influence on the rest of an economy, potentially sending shockwaves through an entire region.

One of the starkest examples of the feedback between the financial and real sectors was the 2008/09 global financial crisis. Here, as sub-prime loans in a weakening US housing market became toxic, some large institutions fell, precipitating a crisis of confidence which snowballed as problems in other financial companies were uncovered, and eventually spilling over to other countries. The costs of the financial system problems have proven to be enormous in terms of real output foregone as well as taxpayer resources in the form of fiscal support.

It would be a worthwhile effort therefore to have some way of assessing the susceptibility of financial systems prior to the occurrence of the shocks in order to help reduce vulnerability. Stress testing offers one means of gauging the resilience of a financial institution to large, plausible shocks *ex ante*. Simply put, similar to the stress tests of a cardiologist, the examinations involve simulation of the effects of stressful stimuli, which are then analyzed and a remedial program put in place as required. Clearly, the usefulness of the tests would depend on the methodology employed, the relevance of the shocks and how the results are used.

Many banks and other financial institutions use some sort of stress tests to ascertain the likely impacts of some important variables—for example interest, exchange or mortality rates—on their profitability. Financial regulators and

[1] The authors are economists in the Research Department of the Central Bank of Trinidad and Tobago. Drafts of the paper were presented at the Central Bank of Barbados and Central Bank of Trinidad and Tobago in August and November 2011 respectively. The comments from participants at these seminars are gratefully acknowledged. The authors were also part of the team that conducted stress tests at the Central Bank of Trinidad and Tobago.

supervisors have also increasingly adopted stress testing in their evaluation of the health of the companies under their purview. Notable examples of large scale efforts at stress testing include tests on the US and European banking systems in 2009-2011 and of European insurance companies in 2011, which incorporated macroeconomic shocks and where the results were used to determine the extent of capital needed by the financial institutions.

This paper looks at the experience of Trinidad and Tobago in the stress testing of commercial banks, institutions that have generally been characterized as well capitalized, highly profitable and very conservative. It examines the five sets of stress tests that were conducted to date: two of these were done in the context of Financial Stability Assessment Program (FSAP) exercises by the International Monetary Fund in 2005 and 2010, and three were conducted by the Central Bank of Trinidad and Tobago in 2010-2011.

The paper is organized as follows. Following this Introduction, Section 2 gives a background on the banks and the main difficulties they have experienced over the last fifty years or so. Section 3 reviews the basic objectives, approaches and results of the five stress tests that were run on the commercial banks. Section 4 compares these exercises, and explores whether there is enough evidence to judge whether system vulnerabilities have changed over time. Section 5 assesses whether the tests have contributed to an understanding of the banking system's vulnerabilities, influencing bank behaviour, enhancing regulation and supervision, and improving transparency. Section 6 concludes.

2. The Banking System in Trinidad and Tobago

The financial system in Trinidad and Tobago has evolved and grown in complexity over the last five decades. In 1964, when the Central Bank of Trinidad and Tobago was established, there were seven commercial banks, six non-bank financial institutions (NFIs), fifty insurance companies, and about three hundred credit unions. Commercial banks have remained the dominant players over the years, providing the major source of funding to the domestic private sector and by 2010 commanded 46 per cent of the assets of the financial system (Table 1).

In the 1960s, commercial banks and some NFIs operated as branches of foreign owned parent companies. During the 1970s this situation changed as the ownership structure shifted away from foreign to local partly as a result of deliberate government policy. Growth of financial intermediation was facilitated by high international energy prices for oil-exporting Trinidad and Tobago. During the 1980s, the domestic financial system experienced a relatively slower pace of growth and the system also underwent some restructuring. Part of this slowdown and restructuring was due to the collapse of international oil prices which lead to a contraction of the economy. Several financial institutions experienced distress, culminating among other things with the merger of three locally owned commercial banks and the winding up of the operations of several NFIs. In the 1990s and beyond, the financial system saw some revival in

Table 1: Trinidad and Tobago: Structure of the Financial System (2006-2010)

	2006	2007	2008	2009	2010
Number					
Commercial Banks	6	8	8	8	8
Nonbank Financial Institutions	17	17	17	18	18
Credit Unions	129	130	131	129	129
Insurance Companies	51	51	51	45	47
Private Registered Pension Funds	256	256	256	257	262
Development Banks	2	2	2	2	2
Thrift Institutions	3	3	3	3	3
National Insurance Board	1	1	1	1	1
Unit Trust Corporation	1	1	1	1	1
Deposit Insurance Corporation	1	1	1	1	1
Financial System Assets (in billions of TT$)					
Commercial Banks	67.9	75.7	88.1	104.0	103.7
Nonbank Financial Institutions	25.0	28.1	27.1	13.8	11.2
Credit Unions	6.3	6.6	7.0	7.9	9.2
Insurance Companies	29.7	33.5	35.8	34.3	30.3
Private Registered Pension Funds	23.9	25.5	24.7	26.7	28.4
Development Banks	2.5	2.6	3.3	3.7	3.7
Thrift Institutions	0.1	0.1	0.1	0.1	0.1
National Insurance Board	14.4	15.3	17.1	18.0	19.3
Unit Trust Corporation	17.4	19.0	20.8	22.7	21.0
Deposit Insurance Corporation	1.0	1.1	1.2	1.5	1.6
As a Per Cent of Total Financial System Assets					
Commercial Banks	36.1	36.5	39.1	44.7	45.4
Nonbank Financial Institutions	13.3	13.6	12.0	5.9	4.9
Credit Unions	3.3	3.2	3.1	3.4	4.0
Insurance Companies	15.8	16.2	15.9	14.8	13.3
Private Registered Pension Funds	12.7	12.3	11.0	11.5	12.4
Development Banks	1.3	1.3	1.5	1.6	1.6
Thrift Institutions	0.0	0.0	0.0	0.0	0.0
National Insurance Board	7.7	7.4	7.6	7.7	8.4
Unit Trust Corporation	9.2	9.1	9.2	9.8	9.2
Deposit Insurance Corporation	0.5	0.5	0.6	0.6	0.7
Stock Market					
Number of Listed Companies	34	33	34	32	32
Market Capitalization (in billions of TT$)	96.8	98.2	76.4	70.6	77.8
Market Value of Shares Traded (in millions of TT$)	2,498.0	2,250.0	2,191.0	1,474.2	864.5

Source: Central Bank of Trinidad and Tobago.

activity as the economy rebounded although the role of NFIs continued to slip. The system as a whole remained relatively stable, with the major problem occurring in 2008 / 09 due to the financial distress of a large conglomerate (CLF Group) which had two insurance companies and an NFI as subsidiaries. Central Bank intervention and substantial fiscal support helped to limit the contagion effect felt by the rest of the financial system.[2]

As noted, this paper focuses on the commercial banks which dominate the financial system and are the major source of financing for personal and business borrowing. Of the eight commercial banks in operation at the end of 2010, six were either wholly or majority foreign-owned and two were locally owned, one by the government. Banking activity has been heavily concentrated in a few large institutions—the three largest commercial banks held 75 per cent of the banking sector's assets at the end of 2010. In terms of ownership structure, some commercial banks have been operating within financial holding companies, and this structure could bring about future unforeseen risks and vulnerabilities. The banks may also be exposed to other specific vulnerabilities as discussed below.

3. The Stress Testing Exercises

Basic Approaches and Objectives

In Trinidad and Tobago, regulation and supervision of commercial banks is conducted by the Inspector of Financial Institutions[3], who heads the Financial Institutions Supervision Department (FISD) of the Central Bank. Several pieces of legislation, as well as regulations and guidelines, form the framework of FISD's operations.[4] Over time, the scope of operations has been expanded to include not only banks, but nonbank deposit taking financial institutions, insurance companies and pension funds while credit unions are carded to also be covered in the near term.

FISD's examinations of financial institutions have traditionally been micro in nature. The Department assesses the risk profile of each financial institution by way of off-site monitoring and regular on-site examinations. As part of their analysis of the financial performance and condition of the institutions, FISD examiners review both audited and ongoing financial statements and financial indicators related to capital adequacy, asset composition, geographic distribution of loans, asset quality, earnings and profitability and liquidity (Table 2). Over the past few years, a more macro perspective has been progressively included in the analysis of financial system vulnerabilities, particularly with the inauguration of Financial Stability Reports since 2009 and the incorporation of the results of the stress tests of banks.

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[2] For a discussion on the CLF collapse See IMF, Trinidad and Tobago: Selected Issues March 2011, IMF Country Report No 11/74 available at http://www.imf.org/external/pubs/ft/scr/2011/cr1174.pdf.

[3] Formerly the Inspector of Banks until 2008 when the Financial Institutions Act was revised.

[4] See http://www.central-bank.org.tt/content/legislation-guidelines-and-letters-0 for details on the legislation, regulations and guidelines.

Table 2: Trinidad and Tobago: Financial Soundness Indicators 2006-March 2011

(in per cent unless otherwise indicated)

	2006	2007	2008	2009	2010	Mar-10	Mar-11[p]
Capital adequacy[1]							
Regulatory capital to risk-weighted assets	18.0	19.1	18.8	20.5	24.2	22.0	24.6
Regulatory Tier I capital to risk-weighted assets	16.2	17.0	15.5	18.5	21.7	18.9	21.4
Regulatory Tier II capital-to-risk-weighted assets	1.9	2.1	3.2	2.0	2.5	3.1	3.2
Regulatory capital-to-total assets	11.3	12.4	12.1	10.7	12.2	11.3	12.3
Banking sector asset composition							
Sectoral distribution of loans-to-total loans							
Households	41.3	41.4	39.9	39.8	42.2	40.4	41.2
of which: Proportion secured as mortgage loans	26.5	26.1	28.4	36.7	37.4	37.7	38.2
Financial sector	18.7	22.5	19.8	18.8	16.3	17.4	18.0
Oil and gas sector	3.8	2.8	3.3	3.2	3.2	3.3	3.2
Construction	6.5	6.1	6.8	10.3	11.8	10.9	11.1
Transport and communication	2.9	2.8	1.8	2.2	2.0	2.7	2.1
Non-residents	6.3	7.1	6.6	5.9	4.5	5.5	4.6
Geographic distribution of loans-to-total loans							
Domestic	93.9	93.3	93.6	94.5	95.8	94.9	95.7
Foreign	6.1	6.7	6.4	5.5	4.2	5.1	4.3
Foreign currency loans-to-total loans	22.9	21.4	23.0	22.8	18.7	21.8	19.4
Banking sector asset quality							
Nonperforming loans-to-gross loans	1.4	0.7	1.0	4.6	5.3	5.5	5.5
Nonperforming loans (net of provisions)-to-capital	2.3	-0.3	1.1	7.8	10.6	9.7	12.7
Specific provisions-to-impaired assets	60.9	109.7	72.4	52.3	38.7	47.2	29.7
Specific provisions-to-gross lending	0.8	0.8	0.7	2.4	2.1	2.6	1.6
Banking sector earnings and profitability							
Return on equity	27.7	27.3	25.9	20.2	17.2	17.0	18.6
Return on assets	3.4	3.4	3.5	2.7	2.3	2.2	2.6
Interest margin-to-gross income	61.7	61.4	65.2	66.6	67.0	67.1	67.3
Non-interest expenses-to-gross income	51.1	48.3	49.7	58.1	63.3	64.3	60.6
Spread between average lending and deposit rates	7.4	7.9	8.3	10.1	9.1	9.9	8.8
Banking sector liquidity							
Liquid assets-to-total assets	20.1	17.0	22.1	25.0	24.3	25.2	23.8
Liquid assets-to-total short-term liabilities	26.9	22.6	30.0	32.5	31.9	33.2	31.6
Customer deposits-to-total (non-interbank) loans	125.8	118.0	124.7	165.2	163.0	167.2	161.8
Foreign currency liabilities-to-total liabilities	34.6	33.8	32.7	33.1	27.5	31.9	27.6

Source: Central Bank of Trinidad and Tobago.

[1]Effective January 2008, there was a change in the methodology for computing regulatory capital to include market risk.

Equity Investments in Banking and Financial Subsidiaries are now deducted from Total Regulatory Capital and no longer considered as part of Risk Weighted Assets.

The first formal stress tests of the financial system in Trinidad and Tobago were carried out by the International Monetary Fund/World Bank as part of the initial Financial Stability Assessment Program (FSAP) exercise for Trinidad and Tobago.[5] The tests were also carried out in 2010 in the context of a later FSAP exercise in 2011.[6] In 2010, the

[5] See IMF, Trinidad and Tobago: *Financial System Stability Assessment*, (February 2006). FSAPs were launched by the IMF/World Bank in 1999 and were designed to provide a comprehensive and in-depth analysis of a country's financial sector.

Central Bank of Trinidad and Tobago (CBTT), with technical assistance from the Caribbean Technical Assistance Centre (CARTAC) initiated its own stress tests of commercial banks using data at end December 2009. The CBTT tests were later updated using data at end June 2010 and at end December 2010.[7]

The stress tests in Trinidad and Tobago were conducted in an environment of a generally stable banking system. The main objectives were to more fully understand potential vulnerabilities faced by banks and build the capacity to integrate this type of analysis into ongoing supervision. This contrasts, for example, with stress tests in some jurisdictions that were prompted by financial crises and an immediate need for answers on the extent of capitalization needed to shore up weak institutions, as was the case for example in the United States, Europe and Ireland in 2009/11 (see Appendix 1 for a fuller discussion of these cases and the comparison with Trinidad and Tobago).

The five stress tests in Trinidad and Tobago all generally utilized a 'top-down' approach, i.e. the IMF or CBTT executed a range of standard tests based on information provided by the banks. This contrasts with a more 'bottom-up' approach whereby the banks themselves would conduct the tests, which would then be reviewed by the IMF or CBTT. Nonetheless, the Central Bank's approach was very collaborative as representatives from all the banks were provided with the templates and the methodology and results were discussed with individual institutions. The information sharing and feedback from the banks helped in the interpretation of the raw information and the findings of the tests as well as in refining the methodology.

As discussed in more detail below, the tests simulated the impacts of various shocks that were considered relevant to the Trinidad and Tobago banking system (Table 3). Single factor shocks assessed the repercussions arising from changes in interest rates, exchange rates and the health of credit portfolios (including those related to property prices and concentrations in various creditors), as well as a sharp decline in deposits (liquidity). Scenario shocks were also imposed, taking into account a decline in energy prices or a local or regional natural disaster. The magnitudes of the shocks were determined based on an assessment of what were considered "large but plausible". The shock parameters were kept constant in the three CBTT exercises but these differed from the two FSAP sets of tests. For the most part, the impacts of the shocks on the banks' capital base or liquidity position were calibrated. The effect on capital was considered important as representing the cushion or resources available to the banks to absorb losses.[8]

[6] The 2010 exercise was called a Financial System Stability Assessment—Financial Stability Module and was conducted by the IMF and several external experts. See IMF (2011).

[7] The official results from tests conducted using June 2011 information are not yet available but preliminary results are refererred to in Section 4 below.

[8] An alternative to testing the impact of certain shocks on bank capital is to calibrate the magnitude of the change in the shocks that would be required for the banking system to fail (capital to fall to an unacceptable level). See for example Worrell (2008).

Table 3: Tests included in the CBTT and FSAP Exercises

TEST	FSAP 2005	FSAP 2010	CBTT[9]
Single Factor			
Interest Rate Risk	√	√	√
Foreign Exchange Risk	√	√	√
Credit Risk	x	√	√
Credit Risk – Property Price	√	x	√
Credit Risk – Large Exposure	x	√	√
Liquidity Risk	x	√	√
Scenarios			
Energy Price	√	x	√
Local Natural Disaster	x	x	√
Regional Natural Disaster	√	x	√

Results

i. Interest Rate Shock

Sudden and large changes in interest rates can affect a bank's portfolio in a number of ways. On the asset side, rate changes affect earnings from interest bearing instruments directly, while bond prices react inversely to such changes.[10] On the liability side, interest rate fluctuations affect a bank's payments on deposits and borrowings that it may have contracted. The net impact of interest rate changes would primarily depend on the direction and magnitude of the changes and the size of the mismatch between interest-earning assets versus liabilities. Another important factor is the time it takes for changes in interest rates to affect earnings or payments - the more flexible the interest contract and the shorter the maturity of the instrument, the faster would higher interest rates be reflected in a bank's portfolio.[11]

Depending on the structure of a financial institution's portfolio, there could be an adverse overall reaction to either increases *or* decreases in interest rates. Consequently the interest shocks in the stress testing exercises generally tested for the impacts of both projected rises as well as declines in rates. The 2005 FSAP conducted two interest rate tests, shocking the yield curve upward by 500 basis points (bps) and downward by 300 bps. The 2010 FSAP incorporated only upward shocks of 200 bps to interest rates. The CBTT sensitivity tests were the most severe for

[9] CBTT in this and later tables refers to the 3 tests conducted using December 2009, June 2010 and December 2010 data.

[10] When interest rates go up, bond prices go down and when interest rates go down, bond prices go up.

[11] Often the most significant source of interest rate risk is the repricing risk. Repricing risk relates to the fact that different assets and liabilities may be repriced at different times and rates. For example, a bank may lend money at fixed rates and pay interest on deposits at variable rates. Changes to the variable interest rate expose the bank to repricing risk.

rate increases, assessing the impact of a parallel upward shift of the yield curve by 700 bps, while the downward shock incorporated a decline of 100 bps in interest rates.[12]

As Table 4 shows, the interest shocks had a relatively small impact in the FSAP 2005 and 2010 tests. In the 2005 exercise the CAR declined by just 0.2 per cent (increased by 0.7 per cent) for a 500 bps rise (300 bps decline) in rates. The order of magnitude was somewhat larger in FSAP 2010 although the direction was reversed (a 200 bps increase in interest rates led to a 1.4 per cent *increase* in the CAR). In contrast the positive interest shock had a substantial impact in the CBTT tests, ranging from 11.5 to 12.1 per cent decline in CAR following the 700 bps rise in interest rates.[13,14]

It should be noted that commercial banks as a whole displayed a low duration in their portfolios, although there was a mismatch between assets and liabilities: for example, the data show that 73 per cent of bank assets and 84 per cent of bank liabilities were due to re-price within 12 months of December 31, 2010. In the context of the mismatch, the severe nature of the CBTT shock accounted in part for the substantial drop in the CAR in the CBTT exercises. Nonetheless, because of the large capital buffer banks held, the banking system CAR did not decline below the legal minimum of 8 per cent (in each test staying above 9 per cent).

[12] The Central Bank argued that the extremely low level of interest rates prevailing in 2010/11 suggested that a substantial increase in rates was not implausible, although the movement would in practice be much gradual than an instantaneous 700 bps increase.

[13] The decline in interest rates had a symmetric effect, with the 100 bps decline resulting in an increase in the CAR ranging from 1.5 to 1.6 per cent.

[14] Apart from the magnitude of the parameters, the differences in size and direction between in the FSAP 2010 relative to the CBTT results is likely related to the methodology employed. FSAP 2010 incorporated initial projections of bank profits in a baseline scenario while CBTT simulated the impact of interest rate changes directly on bank portfolios and the resulting CARs (see Section 4 below for more details on the differences in methodology).

Table 4: Interest Rate Risk Tests

Aspect	FSAP 2005	FSAP 2010	CBTT
Methodology	Applied a time-to-repricing gap model to floating rate instruments.	Used a combination of 2 methods: 1. Duration – applied only to investment portfolio. 2. Repricing – applied to all interest bearing assets and liabilities.	Applied Duration of Equity Method to all assets and liabilities.
Magnitude	Instantaneous parallel shift of yield curve (YC) - +500 & -300 bps Instantaneous flattening of YC - +25bps @ 3mth rate; -25bps @ 1yr rate; -50bps @ 5yr rate Instantaneous steepening of YC - +25bps @ 3mth rate; +100bps @ 1yr rate; +150bps @ 5yr rate.	Duration – assumed a 200 bps ↑ in interest rates Repricing – Assumed an asymmetric ↑ in lending and deposit rates of 200 and 150 bps respectively.	700 bps ↑in interest rates 100 bps ↓ in interest rates
Results	Upward parallel shift of 500bps - ↓ in CAR of 0.2% Downward parallel shift of 300bps - ↑ in CAR of 0.7%	↑ in CAR of 1.4%	700 bps ↑: ↓ in CAR of 11.5-12.1% 100 bps ↓: ↑ in CAR of 1.5-1.6%

ii. Foreign Exchange Shock

Foreign exchange risk is associated with potential losses incurred by an institution holding foreign currency-denominated instruments due to adverse movements in exchange rates. Broadly speaking, exchange rate risk is larger the greater the difference between assets and liabilities in foreign currency denominated instruments (the net open foreign currency position). Sudden and large currency depreciations (or appreciations) of the local currency could therefore have important impacts on bank portfolios.

All of the stress tests simulated the impact of a depreciation, given that this was considered to be the more likely risk for Trinidad and Tobago than an appreciation. While the 2005 FSAP modeled three possibilities (10, 30 and 50 per cent), both FSAP 2010 and the CBTT tests used a 40 per cent depreciation as the shock.

For each of the FSAP 2005 depreciations, CAR moved only marginally downward (a range from 0.4 to 1.9 per cent) which was likely related to a small short position by the banking system as a whole. By 2009-2010, banks had hedged even more against foreign exchange risk—setting caps on short positions and generally holding long positions in foreign currency instruments. As a result, when the 2010 FSAP and CBTT tests were conducted, each applying a 40 per cent depreciation of the TT dollar against major currencies, CARs actually *improved* slightly as a result of the shock—by 1.6 per cent in FSAP 2010 and between 0.3 and 0.8 per cent in the CBTT evaluations.

Table 5: Foreign Exchange Rate Risk Tests

Aspect	FSAP 2005	FSAP 2010	CBTT
Methodology	Applied Net Open Position Methodology	Applied Net Open Position Methodology	Applied Net Open Position Methodology
Magnitude	10%, 30% and 50% depreciation of exchange rate	40% depreciation of exchange rate	40% depreciation of exchange rate
Results	10% - ↓ in CAR of 0.4% 30% - ↓ in CAR of 1.2% 50% - ↓ in CAR of 1.9%	↑ in CAR of 1.6%	↑ in CAR of 0.3-0.8%

iii. Credit Risk – General Shock

Credit risk arises due to the inability of counterparties (e.g. borrowers of funds, bond issuers) to meet their obligations when due. For banks, this is a major source of potential risk given that their core objective involves loaning funds that have been deposited in their institutions. Simply put, banks could face major liquidity and eventually solvency problems if they are unable to collect the interest and principal from borrowers in a timely fashion or if there is outright default on the loans.

Credit risk therefore featured prominently in all of the stress testing exercises. Apart from the overall credit portfolio, specific tests (discussed below) were conducted to determine the vulnerability of banks to problems in the property sector as well as to concentration of credit to certain groups or sectors of the economy.[15]

In terms of procedure, the 2005 and 2010 FSAP exercises both used econometric models, tracing the impact of declines in asset quality on non-performing loans and the CARs. In the 2010 tests, two levels of stress—moderate and severe—were simulated. The CBTT tests assumed that the decline in asset quality would be manifested in an increase in past due loans, requiring additional provisioning. The change in non-performing loans was arrived at by first examining the historical evidence on loan performance when the Trinidad and Tobago economy was weak, and then applying this performance ratio to the various past-due loan buckets.

[15] The scenario shocks also incorporated a weakening of the credit portfolios.

Table 6: Credit Risk Tests

Aspect	FSAP 2005	FSAP 2010	CBTT
Methodology	Econometric model[16] to estimate the increase in Non-Performing Loans (NPLs) within the context of the Energy Price Scenario.	Econometric model [17] to estimate increase in NPLs. Provisions then estimated and retained earnings and P&L computed taking into account tax rates and dividend payout. Qualifying capital adjusted based on estimates of retained earnings.	Migrated loan portfolio across deteriorating past due brackets and applied provisioning rates based on CBTT 2007 Guideline which was used to adjust capital.
Magnitude	25% decline in GDP	Baseline: Ave[18]. Δ in Index of Domestic Production (IDP): 0.8% Ave. price of natural gas ($US): 4.33 Moderate Stress: Ave. Δ in IDP: -1.0% Ave. gas price: 3.45 Severe Stress: Ave. Δ in IDP: -2.0% Ave. gas price: 2.91	30% decline in asset quality
Results	$\downarrow$ in CAR of 2.4%	Baseline: 2010: $\uparrow$ in CAR of 1.6% 2011: $\downarrow$ in CAR of 0.4% Moderate Stress: 2010: $\uparrow$ in CAR of 1.6% 2011: $\downarrow$ in CAR of 0.4% Severe Stress: 2010: $\uparrow$ in CAR of 1.7% 2011: $\downarrow$ in CAR of 0.6%	$\downarrow$ in CAR of 1.7-2.5%

Overall, the impacts of the general credit shocks were relatively small: in FSAP 2005 there was a 2.4 per cent decline in the CAR; in FSAP 2010 the decline was 1.7 per cent for the severe stress case; and in the CBTT tests the drops in the CAR ranged from 1.7 to 2.5 per cent. The findings suggest that the commercial banking system in Trinidad and Tobago exhibited little vulnerability to general credit default risk. The results are consistent with the traditionally conservative stance adopted by banks in granting loans. The incidence of non-performing loans rose to 5.5 per cent

[16] Econometric model: $\ln(NPL) = f(NPL_{t-1}, \ln(GDP_t), \ln(\text{Gross Loans}_{t-1}), \ln(\text{Gross Loans}_{t-2}), \ln(\text{Basic Prime Lending Rate}_t), \ln(\text{Basic Prime Lending Rate}_{t-1}), \ln(\text{Foreign Reserves}_t), \ln(\text{Foreign Reserves}_{t-1}))$.

[17] Econometric model: NPL Ratio = $f(\Delta(\text{Index of Domestic Production}_{t-1}), \text{Price of gas}_{t-1}, \Delta(\text{Loan Growth}_i))$; Satellite model: Loan Growth = $f(\text{Loan Growth}_{i,t-1}, \Delta(\text{Index of Domestic Production}), \Delta(\text{House Prices}), \text{Lending Rate}_{i,t-4})$.

[18] Average over 6 quarters – QIII-10 to QIV-11.

of total loans in March 2011, compared to 4.6 per cent at the end of 2009.[19] This suggests that vulnerability to credit risk could be increasing in a situation where slow (or negative) economic growth is dampening business earnings and employees' incomes.

iv. Credit Risk - Property Price Shock

In Trinidad and Tobago, as in other countries, asset price bubbles in the real estate market could be a major source of strain for financial institutions. In the early 1980s when oil prices dropped, the ripple effect was felt in the prices of non-tradeables, including real estate. The value of mortgage collateral declined, profitability of many of the large real estate projects that were in train sank and several business firms as well as private individuals could not service their mortgage loans on time.

Consequently, both the FSAP 2005 and CBTT tests incorporated specific shocks related to property prices. The former modeled a decline of 20 per cent in the market value of banks' real estate portfolio, while the latter explored the impact of a 30 per cent rise in past due real estate mortgage loans.

The FSAP 2005 property price shock resulted in a 3.8 per cent decline in the banks' overall CAR, while the declines in the CAR for the CBTT tests ranged from 0.8 to 2.0 per cent. Notwithstanding some difference in methodology between the FSAP 2005 and CBTT exercises, the results seem to indicate relatively little vulnerability of the banking system as a whole to property prices. Moreover, the sensitivity seems to have decreased over time—from CAR declines of 3.5 per cent in FSAP 2005 to 2.0 per cent in the initial CBTT test based on December 2009 data to just under 1 per cent in the later CBTT tests.

The generally prudent provisioning and conservative lending policies adopted by commercial banks in Trinidad and Tobago to guard against real estate loan delinquency are important contributors to the low sensitivity to property price crashes.[20]

[19] Refer to Table 2.

[20] Nonetheless, the Central Bank cautioned that some individual institutions had more significant exposure as they had financed several large luxury housing projects.

Table 7: Credit Risk-Property Price Shock

Aspect	FSAP 2005	FSAP 2010	CBTT
Methodology	Examined value-of-assets impact leading to increased NPLs	No test conducted	See Table 6.
Magnitude	Market value of real estate portfolio declines 20 percent	No test conducted	30 per cent increase in past due real estate mortgage loans.
Results	↓ in CAR of 3.8%	No test conducted	↓ in CAR of 0.8-2.0%

v. Credit Risk - Large Exposure Shock

Concentration of credit to certain individuals/groups or certain sectors can be an Achilles' heel for financial institutions. In this regard the FSAP 2010 and CBTT tests looked at deterioration of the quality of banks' assets where there was significant exposure.

The approach of FSAP 2010 to test for large exposure risk involved the application of additional provisioning to all loans that qualify as large exposure (whether performing or not) as a proxy for a decline in loan quality. Two versions of the test were conducted involving: a) 20 per cent provisioning to performing loans and 25 per cent provisioning to NPLs; and b) similar provisioning but related to all exposures (as opposed to only loans). The CBTT tests took a somewhat different approach, directly testing the sensitivity of banks to asset quality deterioration in those areas where their portfolios were most concentrated (each bank's top 3 economic sectors or business groups).

According to FSAP 2010, the banking system's CAR would decline by 1.5 per cent when loans were taken into account (Table 8). The deterioration is larger (4.6 per cent) when overall exposures are included, suggesting that defaults on other credits such as bonds, letters of credit and bankers acceptances add a meaningful risk to the commercial banks. In the case of the CBTT exercises, the finding was that between end 2009 and end 2010 the sectors of heaviest exposure for the commercial banking system included Finance, Real Estate and Construction. However, all in all, the banking system showed no significant vulnerability to the 3 sectors to which it was most exposed—the CAR fell by less than 1 per cent in each case—although particular institutions had significant exposures to some sector such as construction. At the same time, the banking system did exhibit a significant degree of concentration in credit to particular borrower *groups*. As a result, a shock to the loans of the largest group caused the CAR to decline by 5.7 - 8.3 percentage points.

Table 8: Credit Risk—Large Exposure Risk Tests[21]

Aspect	FSAP 2005	FSAP 2010	CBTT
Methodology	No test conducted.	Assumed all exposures deteriorated concurrently requiring provisioning.	Applied provisioning rate to loan portfolio and assumed a decline in the value of all other assets for the top 3 exposed sectors and groups separately.
Magnitude	No test conducted.	2 versions of test conducted: 20% provisioning to performing loans (exposures); 25% provisioning to NPLs (non performing exposures).	50% provisioning and 50% decline in asset values.
Results	No test conducted.	Deterioration in loans only: ↓ in CAR of 1.5% Deterioration in all exposures: ↓ in CAR of 4.6%	Sector 1: ↓ in CAR of 0.7-2.7% Sector 2: ↓ in CAR of 0.1-1.4% Sector 3: ↓ in CAR of 0.0-1.0% Group 1: ↓ in CAR of 5.7-8.3% Group 2: ↓ in CAR of 0.0-0.1% Group 3: ↓ in CAR of 0.0%

vi. Liquidity Shock

A crisis of confidence is one factor that could trigger a sudden deposit run on banks, creating a major problem for the institutions if they cannot liquidate assets quickly enough to repay depositors. Liquidity problems could spiral out of control and result in significant loss of profits and eventual insolvency. With this in mind, the FSAP 2010 and CBTT tests assessed the impacts of large liquidity shocks on Trinidad and Tobago banks.

FSAP 2010 examined whether banks' liquid assets maturing in 30 days were sufficient to cover outflows of deposits and other liabilities of the same maturity. The CBTT test assumed a deposit run on banks at the rate of 1 per cent of deposits per day and assessed how long it would take for banks to become illiquid.

[21] Large exposures are defined to include credits exceeding the value of 10 per cent of capital.

Table 9: Liquidity Risk Tests

Aspect	FSAP 2005	FSAP 2010	CBTT 2010/2011
Methodology	No test conducted	Test examined whether liquid assets maturing in 30 days sufficient to cover outflows of deposits and other liabilities of same maturity. A coverage ratio[22] was calculated.	Deposit run over a 30 day period. Assumed banks will have access to all liquid funds and 50% of marketable securities. Examined whether banks would have sufficient liquid assets for the 30-day period.
Magnitude	No test conducted	2 versions of test conducted: 10% (20%) deposit withdrawal and 100% withdrawal of other liabilities maturing within 30 days.	30% deposit run over 30 days.
Results	No test conducted	Coverage Ratio: Version 1: 284% Version 2: 183%	Banking system becomes illiquid after 67-71 days.

Both sets of tests showed that the banks were highly resilient to liquidity shocks (Table 9). In FSAP 2010 the ratio of liquid assets to deposits stayed above 100 per cent—284 per cent with a 10 per cent deposit withdrawal and 183 per cent with a 20 per cent deposit withdrawal. In the CBTT tests, banks took as much as 67-71 days to become illiquid—well above the 30-days-to-illiquid benchmark. The results indicate that the conservatism of Trinidad and Tobago banks in lending extended to their approach to liquidity in 2009/11. Almost 50 per cent of bank investments were readily marketable and hence accessible in case of unexpected withdrawals by customers in December 2010.[23]

vii. Scenario Shocks

a. Energy Price Decline

In practice, the shocks to the banking system discussed above—interest, exchange rate, credit etc.—tend to occur simultaneously, perhaps in the context of an economic downturn driven by a major local or external event. For large scale stress testing exercises, such as in Europe and the United States (see Appendix I), the primary focus is on a macroeconomic shock which reverberates through the economy and affects the banking system in a number of ways.

[22] Coverage Ratio = (Liquid Assets Maturing within 30 days/(X per cent of deposits maturing within 30 days + 100 per cent of other liabilities maturing within 30 days)) X 100. Ratios greater than 100% are desirable.

[23] The Central Bank's Financial Stability Report June 2011 showed that at the end of 2010 some 22.2 per cent of total assets were liquid.

In light of the dependence of the economy on the fortunes of the energy sector, the 2005 FSAP and CBTT tests explored the implications of collapses in energy prices.[24] In the former, it was assumed that a decline in all energy prices would result, over 8 quarters, in a 25 per cent drop in GDP, a 300 basis point upward shift of the yield curve, and a 40 per cent depreciation of the local currency. The CBTT tests incorporated a 50 per cent fall in energy prices that was expected to expose the banking system to interest rate risk, foreign exchange risk and credit risk. The tests considered two variations. In the first, with no policy reaction by the monetary authorities to the shock, interest rates rose by 500 bps, the local currency depreciated by 20 per cent, and credit quality declined. In the second variation, the monetary authority responds to the shock by reducing interest rates; this increases the pressure on the exchange rate, which depreciates by 40 per cent (see Appendix 2 for diagrams tracing the effects of the CBTT scenario shocks).

In FSAP 2005 the banks' CAR declined by about 3.5 per cent in response to the energy price shock (Table 10). The energy shock in the CBTT tests elicited a much larger response when no monetary policy response was included, with the CAR declining by between 9.4 and 10.5 per cent. The impact was significantly muted in the monetary response case due to the effects of lower interest rates and a larger currency depreciation[25]--here the change in the CAR ranged from -0.2 to +0.6 per cent.

Table 10: Scenario Shocks

(percentage change in CAR)

	FSAP 2005	CBTT		
		Dec-09	Jun-10	Dec-10
Energy shock: No Monetary Policy Response	-2.5	-9.4	-10.5	-10.3
Energy shock: Monetary Policy Response	--	0.6	-0.1	-0.2
Natural Disaster in Trinidad and Tobago	--	-0.9	-3.4	-3.5
Natural Disaster in the Caribbean	-1.3	-1.7	-1.7	-1.9

b. Natural Disaster in Trinidad and Tobago

Only the CBTT tests directly examined the repercussions of a natural disaster in Trinidad and Tobago. In these tests, the domestic disaster, perhaps originating from a large hurricane or earthquake, was expected to severely affect the

[24] While FSAP 2010 did not formally present the results of a scenario shock, the individual shocks such as on credit quality, did incorporate changes to macroeconomic variables in the context of an econometric model.

[25] It should be recalled that in the single factor shocks a currency depreciation led to an improvement in the banks' CAR given that the institutions held long foreign currency positions.

economy's productive capacity leading to declines in government revenues, foreign reserves and gross domestic product. In such a setting, interest rates would rise (100 bps), the exchange rate would depreciate (40 per cent), bank customers would have difficulty in repaying their loans, and the value of financial investments held by the commercial banks would decline (20 per cent). Moreover, public sector securities would carry a higher risk weight. The result of this shock was a decline in the CAR of banks ranging from 0.9 to 3.5 per cent.

c. Natural Disaster in the Caribbean

Trinidad and Tobago banks have some exposure to the rest of the Caribbean either directly, by way of loans/investments in Caribbean territories, or indirectly through local customers who have business links to these countries. The 2005 FSAP considered two shocks designed to take into account a decline in regional asset values by imposing: (a) 100 per cent risk-weight on all non-Trinidad and Tobago, CARICOM-area sovereign securities; (b) a loss of 25 per cent of the market value on the regional asset portfolio. The CBTT stress tests assumed a deterioration in credit quality as reflected in an increase in non-performing loans to regional borrowers (incurring an additional 20 per cent provisioning on these loans), a 25 per cent write down on both equity holdings and private sector investments, and the application of a 100 per cent risk weight on claims on regional bodies. Due to fairly limited exposure to the rest of the Caribbean, the effect on the CAR in the FSAP 2005 and CBTT tests for the banking system as a whole was relatively small, and less than 2 per cent in all cases.

4. Comparison of Test Results

How different were the approaches?

As noted earlier, there were five sets of stress tests conducted, FSAP 2005, FSAP 2010 and three CBTT tests. Broadly speaking, the CBTT tests were similar to FSAP 2005 and FSAP 2010 but there were several differences in parameter values and technical approaches (Table 11).All of the CBTT tests maintained the identical scope and parameters for the December 2009, June 2010 and December 2010 test dates.[26] The constancy of the parameters in the CBTT tests appeared reasonable given the relatively short time span over which the evaluations were conducted, and the approach also facilitated comparability of results.

All of the tests covered the entire banking system—6 banks at the time of the FSAP 2005 and 8 when the other tests were carried out. Tests were done for individual banks and at the systemic level. Findings were reported at the system level for all tests, while the CBTT tests results for individual banks were shared and discussed with the relevant institutions.

[26] A test was also done using June 2011 information, for which preliminary results were made available (see Table 12).

Table 11: Comparison of Key Features of Stress Tests

FSAP 2005	• **Coverage:** all 6 commercial banks • **Data period:** December 2004 • **Impact period:** 1 or 2 year horizon • **How shocks affect capital:** Via operating profits as well as on capital separately • **Adjustment to CAR for under-provisioning?** Yes • **Measurement of liquidity shocks?** No • **Single factor shocks:** interest rate, exchange rate, property price, credit • **Scenarios:** energy price decline, regional shock • **Use of macroeconometric model?** Yes (see Table 6)
FSAP 2010	• **Coverage:** all 8 commercial banks • **Data period:** December 2009 and June 2010 where available • **Impact period:** 2 year horizon • **How shocks affect capital:** Gains and losses fed through a projected retained earnings (profits) of the banks and then to capital • **Adjustment to CAR for under-provisioning?** No • **Measurement of liquidity shocks?** Yes • **Single factor shocks:** interest rate, exchange rate, credit, large exposure, liquidity • **Scenarios:** None, but methodology for single factor credit tests incorporated macroeconomic variables. • **Use of macroeconometric model?** Yes (see Table 6)
CBTT	• **Coverage:** all 8 commercial banks • **Data period:** December 2009; June 2010; December 2010 • **Impact period:** immediate • **How shocks affect capital:** Gains and losses fed directly to capital • **Adjustment to CAR for under-provisioning?** Yes • **Measurement of liquidity shocks?** Yes • **Single factor shocks:** interest rate, exchange rate, general credit, property price, large exposure, liquidity • **Scenarios:** energy price, domestic disaster, regional disaster • **Use of macroeconometric model?** No

The tests all concentrated on the change in bank capital as the main measure of the effect of shocks. The FSAP tests initially assessed the impact on (projected) profits and losses, and then capital.[27] In contrast, the CBTT tests calculated the direct impact on capital, without first evaluating the repercussions on profits. For the most part, both approaches gave the same sense of direction from shocks but, without the "buffer" of profits, the magnitude of the change to capital in the CBTT results tended to be larger.

[27] More precisely, in the 2005 FSAP, gains/losses were fed through annual retained profits earned by the banks at the time. However, in the 2010 FSAP, the gains/losses were fed through projected retained earnings of the banks.

FSAP tests generally also projected how commercial banks' balance sheets would look in the upcoming year in the absence of shocks (a baseline scenario) and then imposed the shock, sometimes making use of explicit econometric models. The CBTT tests meanwhile did not project banks' balance sheets forward and also utilized historical relationships (e.g. on the pattern of nonperforming loans) instead of explicit econometric models. In principle, the FSAP approaches have the advantage of greater rigor, although they introduce more assumptions into the analyses and are more data intensive. The CBTT methodology meanwhile has the benefit of greater simplicity. Notwithstanding the technical differences, the results of the FSAP and CBTT tests pointed to very similar conclusions about the stability of the domestic banking system.

What were the main banking system strengths and risks reported?

The final results of the five stress testing exercises were made available to the public. [28] In all cases, system-wide results were divulged but no details were provided on the performances of individual banks, in contrast for example to the exercises in Europe and the US (see Appendix 1). Nonetheless, detailed results of the CBTT evaluations were discussed privately with the individual institutions.

The general tenor of the published analyses was very similar and revolved around 7 key themes:

(i) The risks to bank stability seemed relatively modest due to ample capital cushions, conservative provisioning and high profitability.

(ii) Starting off from positions of strong capitalization, high liquidity and generally long foreign exchange positions, for the most part banks were able to withstand the shocks relatively comfortably.

(iii) Overall credit risk, as well as risk specifically related to the property market, appeared limited.

(iv) Despite some asset liability maturity mismatches, it would take an extraordinarily large and sudden increase in interest rates for capital to be significantly affected.

(v) The dispersion across banks in terms of capital, liquidity, foreign exchange positions and the maturity composition of their portfolios meant that some institutions were at greater risk than others.

(vi) In particular, significant exposure of some banks to large clients was an important source of potential vulnerability.

(vii) The outcome of scenario shocks showed that the commercial banking sector could sustain itself against considerable levels of stress, although asset concentration needed to be carefully monitored as certain groups or sectors to which the banks are exposed could face prolonged strains in a weakened economic environment.

[28] See: International Monetary Fund, Trinidad and Tobago, Financial System Stability Assessment, January 2006, International Monetary Fund, Financial System Stability Assessment, January 2011 and Central Bank of Trinidad and Tobago, Financial Stability Report November 2010 and Mid-Year Review, June 2011.

Have system vulnerabilities changed over time?

In the context of the essentially favorable assessments of the stress tests, one issue that warrants attention is whether or not one can discern an *evolution* in the risks to the banking system. Such an analysis would be particularly useful for regulators to gain an appreciation of the latest sources of banks' potential weaknesses. The evaluation could also help to indicate whether banks had made adjustments to try to shore up vulnerabilities identified in past stress tests.

Table 12 summarizes the main results across the stress tests. One problem in comparing the impacts of the shocks across the five stress tests is the differences in some of the parameters and coverage in the FSAP 2005, FSAP 2010 and CBTT exercises. Consequently, we concentrated on the CBTT tests (including preliminary results based on June 2011 data), which held the test parameters constant and covered the 18-month period from December 2009 to June 2011. One of the initial observations is that over this period the capital adequacy ratio rose, thereby increasing the buffer held by banks for dealing with shocks. Consequently a given change in the CAR as a result of a shock may have a smaller real impact if the CAR has risen. In order to incorporate this change in the capital buffer, we normalized the changes in the CAR due to the shocks by dividing by the CARs at the test dates and multiplying by 100. The results are depicted in the charts in Figure 1. While there is little overall change in vulnerability evident between December 2009 and June 2011, some of the main observations are as follows:

(i) Interest rate risk seems to have risen marginally particularly in the first half of 2011, as some banks apparently increased their holdings of longer-term assets, slightly exacerbating the mismatch with their shorter tenor liabilities.

(ii) There was no perceptible change in banks' exposure to foreign exchange risk as banks continued to maintain small (and largely long) open positions.

(iii) There was little variation in credit risk, but property price seemed to have decreased. In a context of softening property prices in 2010/11, banks appeared to have consciously attempted to adjust their portfolios in order to reduce their exposure to property risk.

(iv) Large exposure risk also appeared to have declined. This observation is in line with the policy adopted by banks to progressively limit their asset concentration consistent with the requirements of the Financial Institutions Act (2008).[29]

[29] Under section 42(1) of that Act, licenses shall not incur a credit exposure to a person, borrower group or related group in an aggregate amount that exceeds 25% of its capital base. Licensees were given 3 years to conform to this requirement.

Table 12: Commercial Banks' Stress Test Results and Selected Financial Stability Indicators

(in per cent unless otherwise stated)

	IMF/FSAP		CBTT			
	Dec-05	Dec-09	Dec-09	Jun-10	Dec-10	Jun-11
Stress Tests						
Initial Capital Adequacy Ratio[1]	18.2	20.6	20.5	22.1	22.7	21.7
Change in Capital Adequacy Ratio						
Single factor						
Interest Rate[2]	-0.2	1.4	-11.5	-12.1	-11.6	-17.5
Foreign Exchange	-1.2	1.6	0.8	0.3	0.7	1.3
Credit Risk - Total	-2.4	1.7	-1.7	-2.1	-2.5	-2.3
Credit Risk - Property Price	-3.8	n/a	-2.0	-0.8	-0.9	-0.9
Credit Risk - Large Exposure by Sector[3]	n/a	-4.6	-1.8	-2.7	-0.7	0.0
Credit Risk - Large Exposure by Group	n/a	n/a	-5.8	-5.7	-8.3	-3.1
Liquidity/Bank Run[4]	n/a	183.0	67.0	71.0	70.0	70.0
Scenario						
Energy Price	-2.5	n/a	-9.4	-10.5	-10.3	-14.7
Local Natural Disaster	n/a	n/a	-0.9	-3.4	-3.5	-0.6
Regional Natural Disaster	-1.3	n/a	-1.7	-1.7	-1.9	-2.0
Selected Financial Stability Indicators						
Financial Soundness Indicators						
Banking sector asset quality						
Nonperforming loans-to-gross loans	1.7	4.6	4.6	3.8	5.2	6.5
Nonperforming loans (net of provisions)-to-capital	2.3	7.8	7.8	3.5	10.2	15.3
Banking sector earnings and profitability						
Return on equity	32.5	20.2	20.2	17.4	17.2	17.2
Return on assets	3.2	2.7	2.7	2.3	2.3	2.4
Banking sector liquidity						
Liquid assets-to-total assets	15.0	25.0	25.0	26.2	24.3	26.5
Liquid assets-to-total short-term liabilities	21.9	32.5	32.5	34.4	31.9	35.3
Macroeconomic Indicators						
Total Real GDP Growth (Annual)[4]	6.2	-3.5	-3.3	n/a	-0.02	n/a
Headline Inflation (end of period)	7.2	1.3	1.3	13.6	13.4	0.8
Unemployment Rate	6.7	5.1	5.1	4.8	6.3	n/a

Sources: Central Bank of Trinidad and Tobago, Central Statistical Office, International Monetary Fund

Notes:

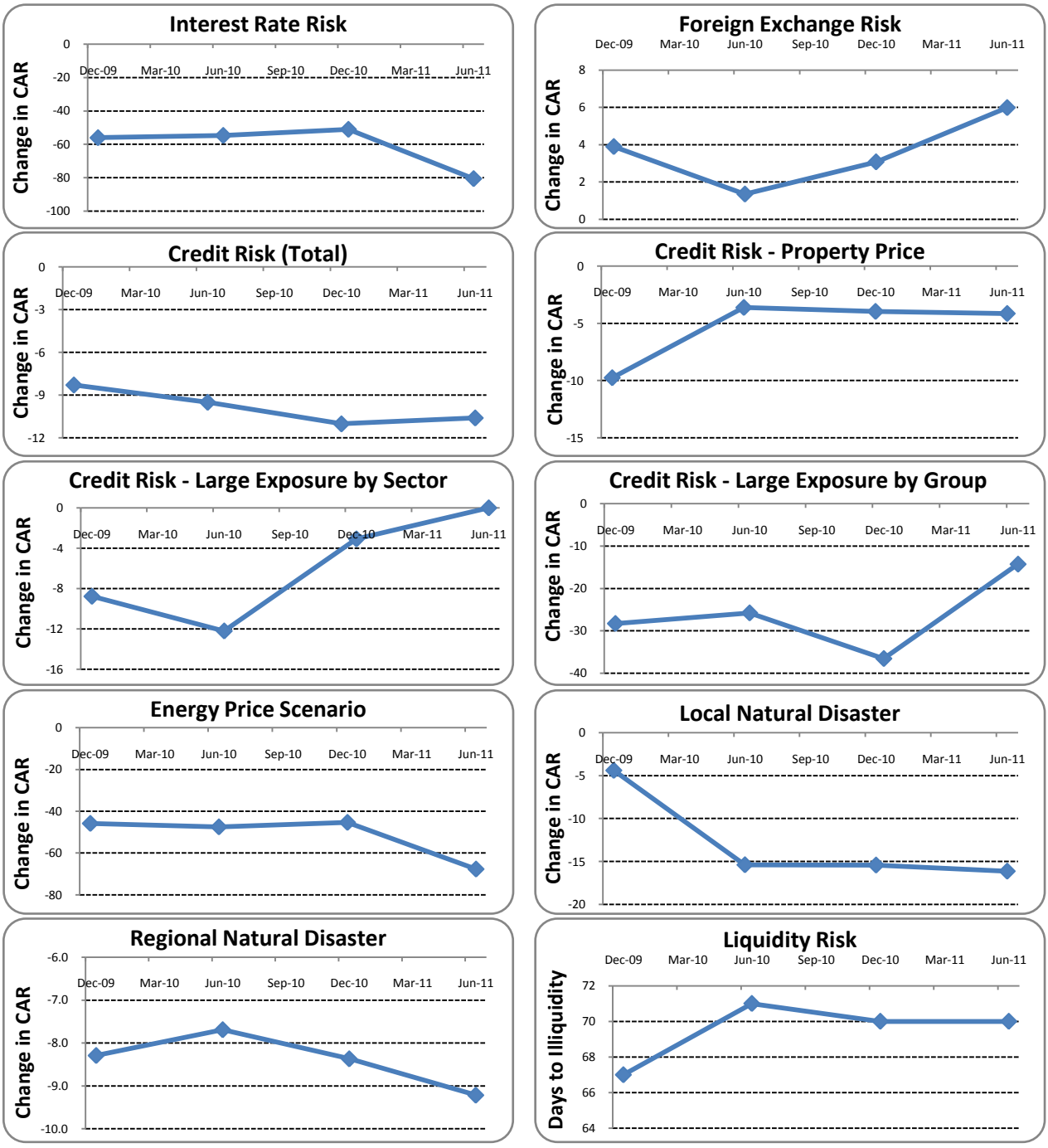
[1] Regulatory Capital Ratios (CARs) - Effective January 2008, there was a change in the methodology for computing regulatory capital to include market risk. In addition, the CARs for the CBTT tests were adjusted to take account of any under/over loan loss provisioning.

[2] The results of the CBTT test include only the impact of a 700 bps increase in domestic interest rates.

[3] The table only includes the results for the sector and borrower group which had the highest exposure at the time when the stress tests were conducted.

[4] The IMF/FSAP 2010 measured liquidity risk via a coverage ratio (per cent) while the CBTT measured liquidity risk in terms of the number of days till illiquid.

Figure 1: Normalized % Changes in CAR[30] and Days to Illiquidity in CBTT Tests (Dec 09-June 11)



[30] (Change in CAR / Initial CAR) x 100

5. Assessment of the Contribution of the Stress Tests

Having examined the methodology, conduct and results of the five stress testing exercises on the Trinidad and Tobago banking system, we now attempt to make an overall assessment of their contribution. In this regard, we evaluate their usefulness in four principal areas: (i) identifying vulnerabilities; (ii) influencing banking behaviour; (iii) enhancing regulation and supervision of banks; and (iv) improving transparency on the performance of the financial system.

Identifying Vulnerabilities

Stress testing can only be truly useful if it conducts the right shocks. In the absence of perfect foresight, it is very unlikely that actual shocks would be precisely the same size as those simulated. Nonetheless, the simulated shocks should be relevant to the banking environment in question, and should be of a reasonable order of magnitude to cover "large but plausible" scenarios.

To recap, the stress tests for Trinidad and Tobago covered shocks related to: interest rates, exchange rates, overall credit, property prices, large exposures, liquidity, energy prices, a local disaster and a regional disaster. This comprehensive list covers many of the main potential sources of risk to the domestic banking system. As noted earlier (see Table 3), FSAP 2005 encompassed a subset of these risks. In the later FSAP and CBTT exercises, it was recognized that there needed to be focus on certain factors not covered in FSAP 2005 but that were shown to be areas in which strains could arise. Consequently, the attention to credit risk was intensified, especially with a focus on property prices and asset concentration; tests for liquidity were incorporated; and the scenario involving a local disaster was included. The evolution of the coverage of the stress tests is commendable as over time, new problems will arise and the stress testing framework must be adaptable enough to cater for such developments.

The sizes of the shocks were determined based on the structure of the Trinidad and Tobago economy and appeared reasonable: for example, currency depreciation of 20-40 per cent, a 30 per cent drop in property values, and a 50 per cent drop in energy prices. In the case of interest rates, the CBTT tests included a 700 bps increase in interest rates, which is extremely large but could be justified by the historically low level of rates in 2010/11. Once again, it is important that economic conditions be kept under continuous review and the parameter values adjusted as warranted.

Apart from the vulnerabilities addressed and the magnitude of the shocks, it is also important to assess the risks that the stress tests may *not* have covered. For example, a main criticism of the European stress tests was that they did not adequately incorporate sovereign risk, so that banks such as the Franco-Belgian-Luxembourg Dexia group which passed the stress tests with flying colours had to be bailed out by governments just a few months after the tests.

Similarly, Irish banks that passed the EU stress tests faced major difficulties and then were subject to another set of specific stress tests arranged by the Bank of Ireland prior to receiving state support. Such episodes could strain credibility in the relevance of some stress tests, even if it is acknowledged that such tests are not equipped to model every source of shock.

In the case of Trinidad and Tobago, three areas that may need to be more formally addressed in the stress tests are:

(i) Sovereign risk—as the eurozone debt crisis demonstrates, the value of local or foreign government assets could quickly turn sour when major fiscal problems arise.[31] Banks therefore need to keep under continuous review their holding of government (and other public sector) paper.

(ii) Sudden stops of capital flows—another global financial crisis could lead to a decline in capital flowing to less developed markets, including Trinidad and Tobago. This could affect domestic bank's direct ability to access foreign financing or the capacity of their clients to secure such financing, while the cost of the external funding could rise dramatically.

(ii) Contagion from other financial institutions—the Trinidad and Tobago stress tests generally examined the impact of shocks on individual banks' portfolios and the banking system without formally taking into account the interactions among banks or between banks and other financial institutions.[32] However, as the CL Financial problems demonstrated, difficulties in one part of the financial system could easily spill over to other institutions. Over time therefore, the stress tests should progressively take account of the activities of other financial entities, including insurance companies, nonbanks, mutual funds, pension funds and credit unions (see Appendix 3 for an outline of the proposed approach to stress testing insurance companies in Trinidad and Tobago).

Influencing Banking Behaviour

Stress tests are not intended to be academic exercises. Ultimately, the information and analyses emanating from the tests should help to forestall banking problems by uncovering vulnerabilities before the shocks occur. In the cases of the US, Ireland and Europe the monetary and fiscal authorities relied partly on stress test results to determine the amount of fresh capital that needed to be injected into banks. At the same time, banks would in principle utilize the tests to fortify their institutions against potential shocks, or at least try to pass the stress tests before the results were announced.[33]

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[31] The CBTT scenario tests of domestic and regional disasters did incorporate some weakening of the sovereign debt portfolio.
[32] The formal links to other financial institutions would only have appeared in the large exposure tests.
[33] For example, several banks in Europe increased their capital just prior to the finalization of the July 2011 tests so that they would not be counted in the "failed" category.

For the stress tests to influence bank behavior, banks must be aware of the scope, methodology, and parameters of the exercises. They should also have access to and be able to interpret the results. The tests in Trinidad and Tobago offer a good start in this direction. For the CBTT exercises in particular representatives of all commercial banks engaged in discussions with Central Bank staff on the approach and were provided with templates so that they could replicate the test results for their institutions. Separate meetings were also held with individual banks to analyze and interpret their test results.

While it is difficult to precisely distill the contribution of the stress tests to influencing bank behavior in Trinidad and Tobago, especially given the relatively short time span of the CBTT tests, several observations are:

(i) The *interactive process itself* between the Central Bank and the banks appears to have been productive, focusing attention on the importance of regular stress testing and providing banks with a framework that they could adapt to their own particular circumstances, while facilitating feedback from the banks.

(ii) The macroeconomic perspective of the stress tests is especially useful for banks, most of whom would be using some type of sensitivity tests on a regular basis (for example to test the effect on their portfolios of every 100 bps rise in the interest rate).

(iii) As noted in Section 4 above, the attention to asset concentration in the stress tests may have prompted banks to further accelerate their reduction in large exposures.

(iv) To maintain effectiveness, the tests need to be conducted regularly, with parameters and the scope of shocks updated to cater for new economic developments while candid discussions should be held with banks on the findings.

Enhancing Regulation and Supervision

As pointed out earlier, the stress tests performed in Trinidad and Tobago were not directly tied to regulatory action, such as requiring certain banks to raise more capital, as in the US 2009 stress tests, for example. Of course, the large capital buffers in Trinidad and Tobago helped to assure that, despite very severe shocks, banks did not generally slip below the 8 per cent minimum capital adequacy ratio. While in the future the use of the stress tests to evaluate capital deficiencies in Trinidad and Tobago cannot be ruled out, at present the tests are intended to complement the existing set of supervisory and regulatory tools.

Traditionally, supervision of banks in Trinidad and Tobago has been micro in nature. Commercial banks provide detailed information on their financial activities which is assessed by staff of the Financial Institutions Supervision Department by way of offsite and onsite inspections. Stress tests can add another layer of evaluation by introducing a greater macroeconomic perspective. By subjecting banks to common shocks in a standardized fashion it would also

be easier to compare the extent of vulnerabilities across institutions. Overall, the use of the tests is consistent with the move towards more macro-prudential supervision in Trinidad and Tobago, a process marked by the publication of semi-annual *Financial Stability Reports* by the Central Bank since 2009.

The proposed approach to stress testing of insurance companies in Trinidad and Tobago is instructive (see Appendix 3 for details). Basically all insurance companies would be required to do annual stress tests, with the parameters and shocks determined in consultation with the Inspector of Financial Institutions. The test results would be shared with the companies' Boards of Directors and the Inspector. This approach offers the potential for insurance companies to fully integrate the stress tests into their ongoing operations while providing the Inspector with an opportunity to shape the test parameters. At present, this approach is not envisaged for the banks, nor in fact for other financial institutions. Nonetheless, in order to improve the effectiveness of supervision and regulation, efforts should be made to assure that banks progressively integrate stress tests into their own ongoing analyses and operations.

Improving Transparency on the Performance of the Financial System

Release of the results of stress tests provide a good opportunity for the public to enhance its awareness of strengths and vulnerabilities in financial institutions. Such transparency could in principle build confidence in the system as a whole. In practice however, a simple dissemination of details of the methodology, parameters and results is not enough. Key elements of the purpose of the stress tests, how they were carried out, and a clear interpretation of the results and implications must be provided publicly. Often, as the US and EU sets of tests in 2009/11, financial markets were more concerned about: (i) how many institutions "failed" the stress tests? (ii) who were these institutions? and (iii) how much more capital needed to be injected into the financial system? Except perhaps among the technical market analysts and researchers, interest in methodological details, caveats and nuances for the most part took second place to the excitement of the headlines.

Effective public communication of the test results must strike a balance between transparency and the implications for financial stability. For Trinidad and Tobago, an appropriate equilibrium was found whereby only system results were published and the main themes on vulnerabilities presented, while for the CBTT tests, details for each bank were discussed with the relevant institutions. For a small financial system, disclosure of detailed results of individual bank performance could have a destabilizing effect on the institution and potentially on the system as a whole. Over time, as more information and analysis is made available publicly on the performance of financial institutions, more information on the results of stress tests could be published. At the same time, financial institutions themselves should be encouraged to not only discuss in detail with their Boards and management the outcomes of their internal stress tests, but to also publish them.

6. Conclusion

Trinidad and Tobago is well on its way to establishing stress testing as a tool in promoting stability and crisis-readiness in the financial system. The five tests that have been completed so far have addresses some of the main potential sources of vulnerability, including interest rate, exchange rate, credit, property price, liquidity and large exposure risk, as well as scenarios involving an energy price collapse, domestic or regional disaster. The results of the tests in these areas support the view that the banking system has been relatively stable and is also able to withstand considerable levels of stress although particular attention must be paid to overly high asset concentration in some institutions. Analyses of sovereign risk, sudden stops in capital flows and contagion from other financial institutions are areas that could be included as the tests are further developed.

The stress testing process itself has helped to strengthen the dialogue between supervisors and banks as well as to engender a deeper appreciation of the macroeconomic developments that can affect the financial system. Refinements of the technical aspects of the methodology and updating of the stress parameters and scenarios should be done periodically in order to keep the tests relevant. Over time, it would also be desirable for the tests to be expanded to include other financial institutions, particularly those of systemic importance.

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Appendix 1: Bank Stress Tests in the US, Europe and Ireland

In this Appendix we briefly review some of the main aspects of the stress tests of the banking systems in the United States (2009), Europe (2010 and 2011) and Ireland (2011). We then compare these features to the exercises conducted for Trinidad and Tobago notably as regards the genesis, focus, coverage and basic methodology of the tests and the publication of the results.

I. United States (2009)

The campaign in the United States to deal with the financial crisis that took hold in 2008 included passage of the Emergency Economic Stabilization Act in October of that year, authorizing the creation of programs under the Troubled Assets Relief Program (TARP) to buy troubled assets from financial institutions. The Treasury also implemented the Supervisory Capital Assessment Program (SCAP) which required the largest bank holding companies to undergo stress testing. On the basis of these tests, resources from a Capital Assistance Program (CAP) would be used to inject additional capital if required into institutions unable to raise the necessary funds in the private market.

Regulators conducted stress tests for the nineteen bank holding companies with assets over $100 billion—in all about two-thirds of the country's banking assets. The tests included two different scenarios—a "baseline," which incorporated current projections for the economy, and a "more adverse," scenario involving a severe economic recession. The stress tests analyzed the capital positions of the financial institutions and determined whether they would be able to absorb any further economic decline while placing a particular focus on the makeup of an institution's Tier 1 capital.

Of the nineteen firms tested, nine were found to be sufficiently capitalized and required no additional capital. The remaining ten required additional capital totaling $75 billion after taking into account the companies' financing activities in the first quarter of 2009.

The economic reaction to the release of the results was muted and there was little change in the stock market. Nonetheless, several critics attacked the economic assumptions of the scenarios as not sufficiently severe. Since the tests were completed, the capital positions of the firms tested improved as they raised additional capital in excess of that required by the tests while also enjoying increases in stock prices. Under the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank) which was signed into law in July 2010, stress testing became an integral part of banking regulation in the United States. Within this framework, annual tests of financial institutions with assets greater than $10 billion and of bank holding companies with assets greater than or equal to $50 billion were required. Summaries of the test results are to be made public.

II. Europe (2010)

Following a round of stress tests conducted in 2009, the detailed results of which were kept confidential, the Committee of European Banking Supervisors (CEBS) was charged with conducting a second round of stress testing of European banks in coordination with their home countries. The aim was *"to provide policy information for assessing the resilience of the EU Banking*

system to possible adverse economic developments and to assess the ability of banks in the exercise to absorb possible shocks on credit and market risks, including sovereign risks."

In mid-2010, CEBS conducted stress tests on 91 banks in 27 countries (65 per cent of the European banking assets) with projections for the years 2010 and 2011. The testing included two sets of economic assumptions, "benchmark," based on interim forecasts of the economy by the European Union Commission, and "adverse," based on European Central Bank estimates with a separate "sovereign risk shock." Banks found to be deficient were responsible for addressing the deficiency with their country's respective regulator "within a given period of time."

Of the ninety-one banks tested only seven were classified as deficient under the "adverse scenario with sovereign shock"—having Tier 1 capital fall below 6 per cent—requiring an increase in reserves of €3.5 billion. These included five Spanish banks, one German bank, and one Greek bank. Without taking "sovereign shock" into account five banks would fall below the test threshold by 2011, with only one falling below in 2010.

Despite some initial depreciation in the value of the euro, the eventual response by the market to the release of the results was positive with the euro appreciating while stock markets in the US and Europe generally rose. The main criticism of the European Union test focused on what was considered to be inadequate treatment of the probability of sovereign debt default. An additional criticism was the inability to predict future problems actually experienced by the banks tested. For example, although all of Ireland's banks passed the tests, they continued to struggle and within several months fresh stress tests were commissioned by the Central Bank of Ireland to form the basis for capital injections (see below). In terms of follow-up, CEBS made a commitment to periodically stress test banks in the European Union.

III. Ireland (2010)

Severe problems in the Irish banking system associated with underlying strains in the property market led to a major adjustment program by the government, supported by the European Commission (EC), European Central Bank (ECB) and International Monetary Fund (IMF). One component was the Financial Measures Programme (FMP) of March 2011, which dealt with the banking element of the package and emphasized asset sales and a large increase in bank capital. In order to estimate the extent of the capital required, the Central Bank commissioned stress tests of the four main Irish-owned deposit banks using the services of a specialist firm, BlackRock Solutions, to conduct the evaluations. Two banks whose loan books were being wound down were not included in the exercise.

BlackRock did a loan loss exercise measuring the nominal losses banks might experience under base and adverse scenarios, over both a three-year and a loan-lifetime horizon stretching out to 2040. The base scenario was in line with EU forecasts for the Irish economy while the adverse scenario represented a more severe economic contraction. These losses were estimated from a bottom-up analysis of loan data. Additionally, the Central Bank relied on the Prudential Capital Assessment Review ("PCAR") 2011, an annual stress test of the capital resources of the domestic banks under a given stress scenario, closely in line with the 2011 EBA stress tests on European banks (see Section IV below). Finally, the Central Bank took into account plans that had

been established to reduce the leverage of the banking system and the banks' reliance on short-term, largely Central Bank, funding.

Taking all these factors into consideration—the BlackRock analyses, the PCAR tests and the deleveraging exercise—the Central Bank determined that the overall minimum capital needed by the four Irish banks was €24bn. The Central Bank later noted that because of the efforts to shore up these banks, all of the Irish banks that were tested in the July 2011 European wide exercises passed those stress tests.

IV. Europe (2011)

In mid-July 2011 the European Banking Authority (EBA) published the results of its 2011 EU-wide stress test of 90 banks in 21 countries. For this exercise, the EBA allowed specific capital increases in the first four months of 2011 to be considered in the results, thereby incentivizing banks to strengthen their capital positions ahead of the stress test. Like the earlier EU test of 2010, baseline and adverse scenarios were developed. This time the adverse scenario entailed a more severe deviation of GDP growth from the baseline (-4 per cent in the two years).

Broadly speaking, the results showed: (i) at the end of 2010, 20 banks would fall below the 5 per cent Core Tier 1 Ratio (CT1R) threshold over the two-year horizon of the exercise with an overall shortfall of €26.8 billion; (ii) however, taking into account capital raising actions between January and April 2011, only 8 banks fell below the capital threshold of 5 per cent CT1R with an overall shortfall of €2.5 billion. The EBA recommended that national supervisory authorities should require banks whose CT1R fell below the 5 per cent threshold to promptly remedy their capital shortfall. It also recommended that national supervisory authorities request all banks whose CT1R was above but close to 5 per cent, and which had sizeable exposures to sovereigns under stress, to take specific steps to strengthen their capital position.

Analysts generally felt that the overall results were in line with expectations. The general market impact was again muted, except for some individual bank stock prices. Nonetheless there was some skepticism about the good results in light of the ongoing European sovereign debt crisis and the fragile near-term macroeconomic outlook. In fact, the EBA itself admitted that it may not have adequately taken into account sovereign risk: *"We are aware that the treatment of sovereign exposures is very contentious and the stress test itself is not designed to deal directly with every twist and turn in the crisis to deal with the sovereign debt issue… Direct exposures to the sovereigns experiencing the most severe widening of credit spreads, Greece, Ireland and Portugal, is concentrated in the banks of those countries. It is clear that for these banks a higher capitalization is warranted."*[34]

V. Comparison with Trinidad and Tobago

There are several elements which distinguish the stress tests in Trinidad and Tobago from the US, European and Irish cases:

a. **Genesis:** Specific concerns about the fragility of the banking systems in light of international or domestic financial crises prompted the conduct of the tests in the US, EU and Ireland. Significant taxpayer resources were being devoted

[34] Andrea Enria, Chairperson of the European Banking Authority, *Opening Statement: Publication of the 2011 EU-wide Stress Test Results,* London, 15 July 2011.

to assist banks and justification for the amount of support as well as progress in improving their ability to withstand shocks needed to be demonstrated. In contrast, the Trinidad and Tobago tests were run in an environment in which no particular banking system problems had been identified—in 2009/10 there had been a problem with a major insurance company which had sizeable fiscal implications but its spill over to the banks was limited.

b. **Purpose:** In all cases, including in Trinidad and Tobago, the aim of the stress tests was to get a clearer understanding of vulnerabilities faced by the commercial banks. Moreover, all the tests utilized the amount of capital banks held as a gauge of the extent of resilience of banks to shocks. The regulators in the US, Europe and Ireland aimed to get specific information on capital shortfalls in order to require banks that fell short of the required levels to recapitalize, either on their own, or with public support. However, in the case of Trinidad and Tobago, the intention was not to get specific numbers on capital required but to ascertain the order of magnitude of any potential shortfall/excess.

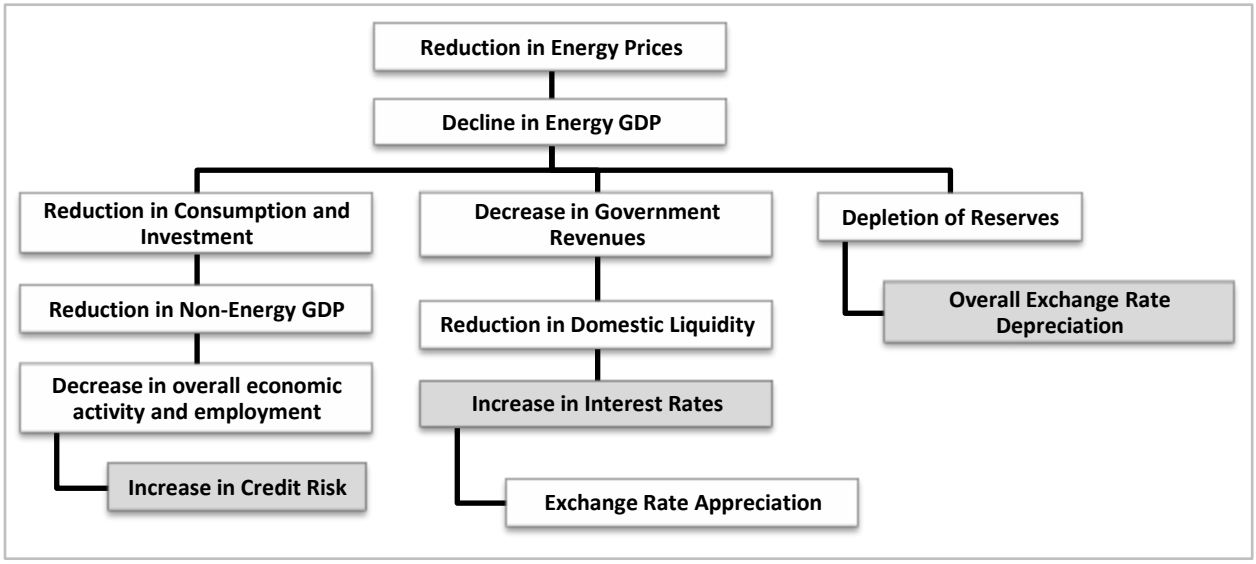
c. **Coverage:** The tests in Trinidad and Tobago covered all commercial banks, whereas in the US, EU and Ireland a subset of the banks was tested. Naturally, the 100 per cent coverage in Trinidad and Tobago was facilitated by the small size of the banking sector—8 banks in total—compared to the other countries. The US and EU tests included the largest banks that would cover most of the banking system assets and loans, so smaller less systemically important institutions were not directly tested. In Ireland, the focus was on four large banks that seemed particularly vulnerable and in possible need of capital injections, while 2 others that were already receiving substantial support were not included in the tests. A particular factor in Europe, which was not faced by the US, Ireland, nor Trinidad and Tobago, was the existence of several national regulatory authorities and sovereign nations which created complications of coordination, jurisdiction, cross-border standards etc.

d. **Basic methodology:** All of the stress tests involved severe but plausible shocks and, as noted earlier, concentrated on capital as a main indicator. For the US, EU and Ireland "baseline" scenarios were developed involving projections of key macroeconomic for about 2 years in order to determine how capital would evolve. This capital was then compared to the amount derived from projections based on more pessimistic assumptions in "more adverse" scenarios. In contrast, in the tests run by the Central Bank of Trinidad and Tobago, the initial capital at the base date (December 2009, June 2010 and January 2010) was not projected forward but retained as the basis for comparison with the post-shock capital levels.

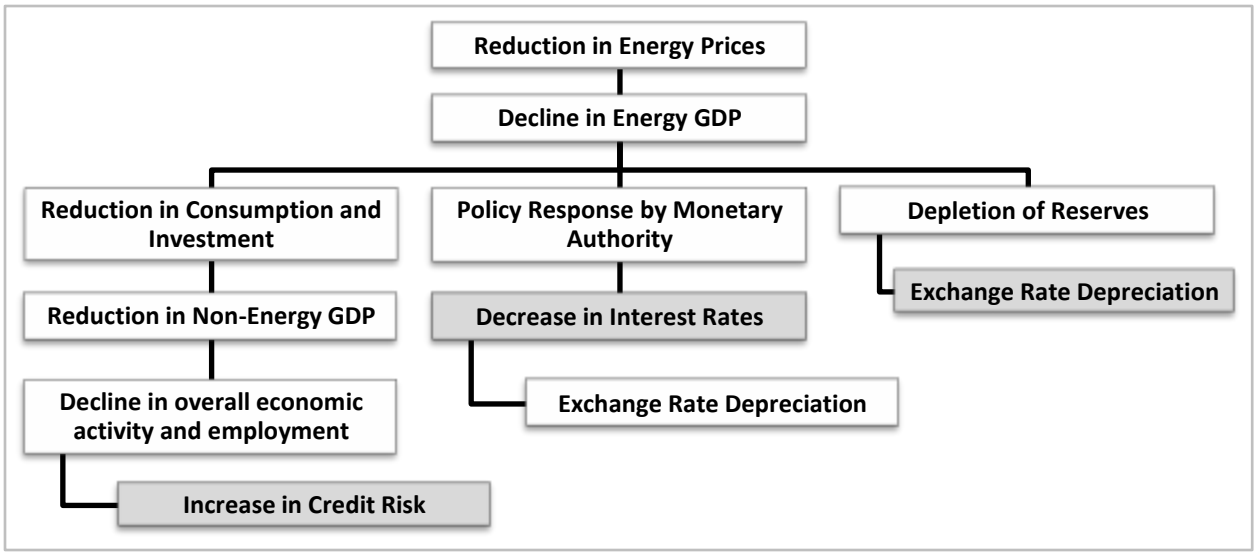
e. **Publication of results:** Bank-by-bank information was published in the US and Irish stress tests, as well as for Europe in the 2010 and 2011 tests (following more aggregated presentations of their 2009 results). The performance of individual institutions has added to market transparency, although there have been some concerns expressed that the extent of detail could exacerbate problems for certain banks. In contrast, while the Central Bank of Trinidad and Tobago has discussed the individual banks' results with the respective institutions, the findings of the stress tests have only been published on an aggregated basis.

Appendix 2: Central Bank of Trinidad and Tobago Scenario Tests: Transmission Mechanisms

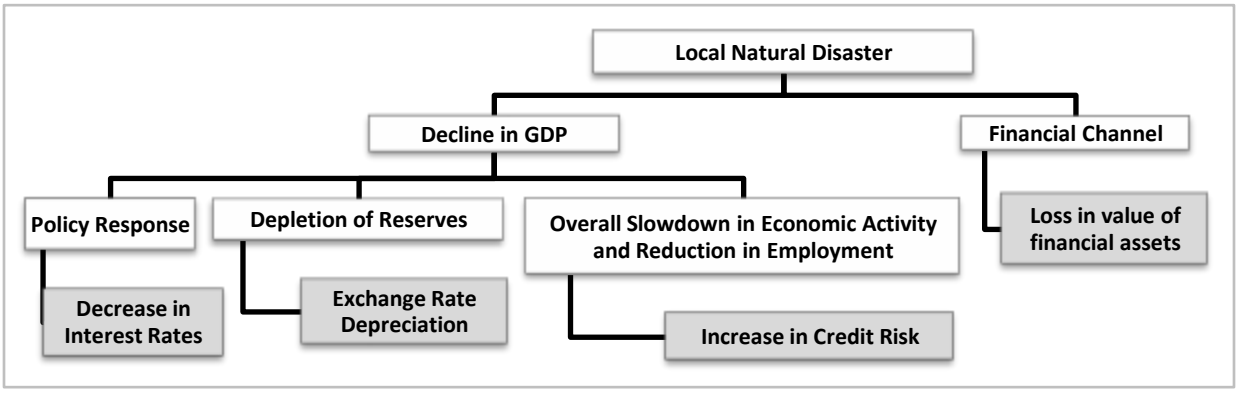
Energy Price Decline – No Monetary Policy Response



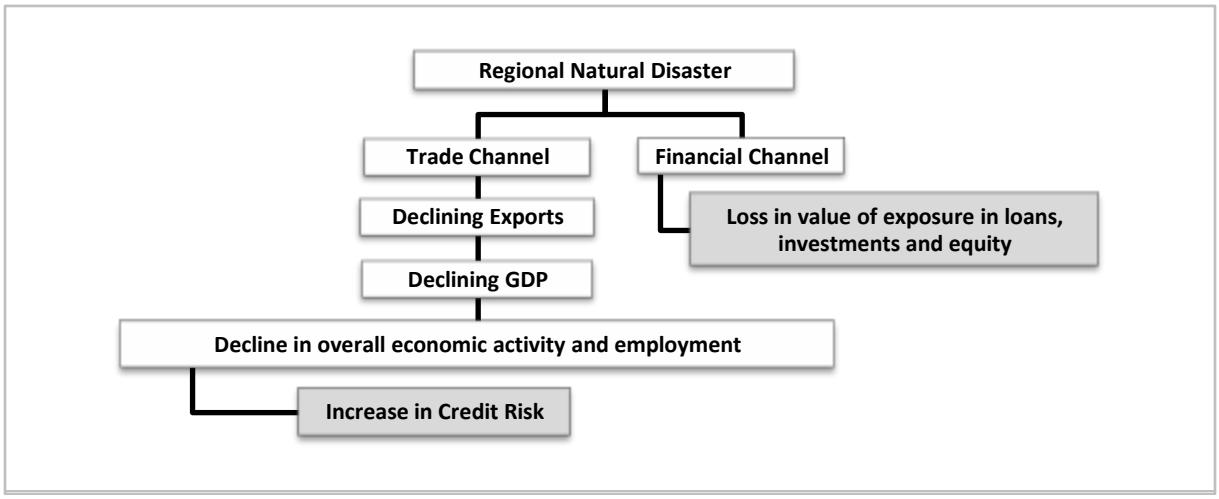
Energy Price Decline – Monetary Policy Response



Natural Disaster in Trinidad and Tobago



Natural Disaster in Regional Trading Partner Countries



Appendix 3: The Approach to Stress Testing Insurance Companies

Insurance companies are important players in the financial system in Trinidad and Tobago, holding approximately 13.3 per cent of system assets at the end of 2010. In 2008/09 a large life insurance company, CLICO, which was part of a major conglomerate that brought together several financial and nonfinancial firms, faced significant problems associated with mismanagement and a weakened economic environment. The spillover effect on the financial system in Trinidad and Tobago was contained, however, but only in the context of intervention and substantial liquidity and other support from the Central Bank and the Government. Outside of CLICO, recent financial soundness indicators (Tables 1 and 2 below) paint a generally favourable picture of the financial condition of insurers, although the Central Bank cautions that some general insurance companies face considerable challenges.[35]

The near-crisis involving CLICO uncovered major gaps in financial legislation governing insurance companies. In this regard a new Insurance Act is being drawn up, incorporating among other things a risk based capital adequacy requirement. Moreover, insurers would be required to submit annual Financial Condition Reports (FCRs) to their Boards of Directors as well as to the Inspector of Financial Institutions. The FCRs would include results from a range of stress tests and are intended to be forward looking, assessing the financial condition of an insurer in the future, including under some adverse economic, business or actuarial scenarios.[36]

The approach to stress testing of insurance companies using FCRs relies mainly on individual company submissions on the results of the tests run by actuaries. It differs from the 'top-down' exercise conducted for commercial banks in 2010/11 (as described in the body of this paper) where the Central Bank ran a range of common stress tests for the banks. In its June 2011 *Financial Stability Report*, the Central Bank did not however rule out running common stress tests for insurance companies in the future. Such tests could potentially be along the lines of those conducted by the European Insurance and Occupational Pensions Authority (EIOPA) in 2011 which incorporated scenarios comprising market, credit, insurance-related and sovereign risks.[37]

It should be noted that in its 2006 report,[38] the IMF did summarize the basic findings of some stress tests of domestic insurance companies, with the key message focused on the links with commercial banks and conglomerates: "*High levels of connected exposures across banking and insurance companies considerably increase the risk of contagion. These cross holdings mask the underlying low level of equity supporting both businesses within some conglomerates.*"

[35] Central Bank of Trinidad and Tobago, *Financial Stability Report Mid-Year Review*, June 2011.

[36] For the proposals on the Insurance Act see http://www.central-bank.org.tt/sites/default/files/Draft%20Insurance%20Bill%20as%20at%20August%202011.pdf.

[37] EIOPA's assessment was that overall the European insurance sector was well prepared for potential future shocks although approximately 10 per cent of participating groups and companies did not meet the future Solvency II Minimum Capital Requirements (MCR) under the adverse scenario of the tests. EIOPA identified the main drivers of the results as being adverse developments in equity prices, interest rates and sovereign debt markets. On the liability side, non-life risks were considered as more critical, and triggered by increased claims inflation and natural disasters. See EIOPA press release (July 4, 2011) https://eiopa.europa.eu/fileadmin/tx_dam/files/Press-Room/Stress-Test-Results-Release.pdf.

[38] See International Monetary Fund, *Trinidad and Tobago: Financial System Stability Assessment*, February 2006.

The 2010 FSAP report[39] also commented on stress tests done on Trinidad and Tobago insurers, making a distinction between the vulnerabilities faced by life as opposed to general insurance companies: *"Single factor stress tests confirm the relatively strong capital position of the largest life insurance companies (excluding CLICO). An assumed currency depreciation of 40 percent would actually strengthen the companies because they are net holders of assets in U.S. dollars. Conversely, a permanent decline in interest rates by 2 percentage points would reduce the average net worth of these companies sharply from 34 percent of assets to 21 percent. By comparison, a 30 percent drop in real estate prices would cause a decline in net worth of only 2 ½ percentage points on average.*

Some large general insurance companies are more exposed to severe insurance risks. The occurrence of a major natural disaster (or worse, two disasters in one year) or a sharp increase in insurance claims would prompt the net worth of some companies to fall below a level generally considered to be sound. By contrast, a change in interest and exchange rates is shown to have a smaller impact on general insurance firms."

Table 1:
Financial Soundness Indicators: Life Sector

	2006	2007	2008	2009	2010
Capital Adequacy					
Capital to Total Assets	26.5	25.5	25.1	25.4	24.2
Capital/Technical Reserves	39.0	36.4	35.2	36.6	34.1
Asset Quality					
(Real Estate+Unquoted Equities+Debtors)/Total Assets	23.5	22.1	12.7	11.2	10.6
Equity Holdings/Total Assets	23.5	22.1	12.7	11.2	10.6
Earnings and Profitability					
Expense Ratio = Expense (incl commissions)/Net Premium	50.7	47.6	43.6	40.7	36.1
Investment Yield = Investment Income to Investment Assets	6.2	6.6	6.3	6.8	6.2
Return on Equity (ROE) = Pre-tax Profits to Shareholders Funds	9.3	7.8	7.6	10.3	14.8
Liquidity					
Liquid Assets to Current Liabilities	27.6	31.5	42.1	38.9	29.2

[39] International Monetary Fund, *Trinidad and Tobago: Financial System Stability Assessment*, January, 2011.

Table 2:
Financial Soundness Indicators: Non-Life Sector

	2006	2007	2008	2009	2010
Asset Quality					
(Real Estate+Unquoted Equities+Debtors)/Total Assets	19.2	18.4	18.7	17.6	17.0
Debtors/(Gross Premiums + Reinsurance Recoveries)	18.6	15.5	12.9	11.1	12.1
Reinsurance and Actuarial Issues					
Risk Retention Ratio = Net Premiums Written/Total Gross Premiums	56.4	59.7	59.4	56.3	54.9
Net Technical Reserves/Average of Net Claims Paid in last 3 Years	n/a	147.3	129.4	124.0	140.9
Earnings and Profitability					
Expense Ratio = Expense (incl commissions)/Net Premium	43.3	40.9	42.1	45.1	48.8
Investment Income/Net Premium	8.3	11.9	9.3	10.7	8.4
Return on Equity (ROE) = Pre-tax Profits to Shareholders Funds	7.1	12.1	23.8	17.0	11.8
Return on Assets (ROA)(E)	3.9	6.4	7.8	6.9	4.7
Liquidity					
Liquid Assets to Current Liabilities	49.4	51.2	56.4	59.3	49.8