BANK OF JAMAICA
2015
FINANCIAL STABILITY REPORT

Contents

Abbreviations

ABM	Automated Banking Machine	JDX	Jamaica Debt Exchange
ACH	Automated Clearing House	JSE	Jamaica Stock Exchange
AFSI	Aggregate Financial Stability Index	LSCRI	Large-Value System Concentration Risk Index
AR	Absorption Ratio	MaFI	Macro-Financial Index
BOJ	Bank of Jamaica	MCCSR	Minimum Capital and Surplus Requirements
BPS	Basis Points	MCT	Minimum Capital Test
BSI	Banking Stability Index	MiPI	Micro-Prudential Index
CAR	Capital Adequacy Ratio	NDTFI	Non-Deposit-Taking Financial Institution
CDS	Credit Default Swap	NDX	National Debt Exchange
CISS	Composite Indicator of Systemic Stress	NIR	Net International Reserves
CRE	Credit Risk Exposure	NPL	Non-Performing Loan
CSD	Central Securities Depository	POS	Point-of-Sale
D-SIB	Domestic Systemically Important Bank	RAI	Risk Appetite Index
DTI	Deposit-Taking Institution	RTGS	Real-Time Gross Settlement System
FIA	Licensee under the Financial Institutions Act	SD	Securities Dealer
FSC	Financial Services Commission	SIFI	Systemically Important Financial Institution
FSR	Financial Stability Ratio	SIGI	Stability Index for General Insurers
GDP	Gross Domestic Product	SILI	Stability Index for Life Insurers
GOJ	Government of Jamaica	SISD	Stability Index for Securities Dealers
GWP	Gross Written Premium	SRI	Systemic Risk Indicator
HHI	Herfindahl-Hirschman Index	VIX	Volatility Index
IC	Insurance Company		

The maintenance of financial stability by the Bank of Jamaica (BOJ) primarily concerns the safeguard of conditions which ensure the proper and efficient functioning of the financial system and, consequently, the promotion of real economic activity. The financial system consists directly of three basic financial components: institutions, markets and infrastructure.[1] These components interact with each other as well as with other indirect participants in the system – such as households, nonfinancial corporations and the public sector – to allocate economic resources and redistribute financial risks.

Aside from the supervision of deposit-taking institutions, the BOJ is charged with the responsibility of ensuring that the overall financial system is robust to shocks and that participants are assured of its robustness. This entails making sure that financial institutions, in particular banks, are sound. The maintenance of financial stability by the Bank also involves overseeing the efficient and smooth determination of asset prices, making certain that participants are able to honour promises to settle market transactions and preventing the emergence of systemic settlement risk arising from various financial imbalances that may develop within individual institutions or the system.

The Financial Stability Report 2015 provides an assessment of the main financial developments, trends and vulnerabilities influencing the stability of Jamaica's financial system during the year. The Report covers:
i) an overall assessment of financial stability;
ii) macro-financial risks;
iii) financial system developments;
iv) financial system sectoral exposures;

v) risk assessment of the financial system; and
vi) payment system developments

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[1] Financial institutions include inter alia banks, securities firms, insurance companies, unit trusts, mutual funds and pension funds. Financial markets include inter alia foreign exchange, money and capital markets. Financial infrastructure refers to payment and settlement systems.

1. Financial Stability Overview

Systemic Risk Assessment

There was an overall improvement in systemic risk within the domestic financial system as reflected by the relative values of various systemic risk indicators (SRIs) monitored by the Bank of Jamaica (BOJ) during 2015 compared to 2014. With regard to the time dimension of systemic risk, the SRIs pointed to broad-based improvements for 2015 along with a benign financial cycle. In terms of the cross-sectional dimension, common exposures to financial markets, financial institutions and sovereign default generally also reflected low materialization of systemic risk.

Macro-Financial Environment

Global GDP growth declined in 2015 relative to 2014. This development partly reflected the weak economic performance of Canada, China and the UK. GDP growth was also partly constrained by lower oil prices, which curtailed investment in mining and construction. Economic conditions in the United States and other developed countries were however supported by accommodative monetary policies.

Despite lower global growth, financial stability improved in advanced economies but global risks continued to be skewed toward emerging markets. Sinking commodity prices, exchange rate pressures and the bursting of China's equity bubble has contributed to substantial imbalances and challenges for growth of some emerging nations.

The domestic macro-financial environment demonstrated favourable conditions in 2015 supported by four consecutive quarters of real economic expansion. Further, the country's continued strong performance under the EFF programme was reflected in improved financial market conditions and a reduction in the current

account deficit. There were improvements to liquidity and credit conditions for the year, which was demonstrated by increases in domestic credit growth, particularly in personal loans. In addition there were favourable liquidity conditions partly due to the reduction of the Bank's policy rate, buttressed by significant enhancements made to the Bank's liquidity facilities during 2015.

Financial System Developments

There was an expansion in the financial system asset base for 2015, driven by growth of both the deposit taking institution (DTI) and non-deposit taking financial institution (NDTFI) sectors. Further, growth in domestic asset prices exhibited significant deviation from trend. In this regard, the Jamaica Stock Exchange Main Index reached an unprecedented level during the year, increasing by 97.4 percent. This stock market trend was concurrent with sound earnings and dividend growth. In addition, yields on medium and long term Government of Jamaica (GOJ) bond tenors recorded declines in the context of thin trading of domestic bonds. However, stress tests carried out by the BOJ throughout 2015 confirmed the resilience of the financial system to a hypothetical large upward shift in the GOJ domestic bond yield curve.

DTIs' profitability measures showed improvements for 2015. This outturn was driven by larger net interest income. Liquidity measures decreased for the year but remained above statutory requirements. Along with larger profits, the DTI sector showed improvements in balance sheet indicators of capital to assets, deposits to loans and progressively declining non-performing loans (NPLs) over the year.

The size of NDTFIs' asset base increased for 2015 albeit at a slower pace than the DTI sector. This growth was dominated by an increase in the size of collective investment schemes and insurance companies (ICs) but subdued by a decline in total assets of the securities dealers (SDs) sector. The decline in the asset size of SDs was however coupled with an increase in the level of funds held under management.

SDs continued to be a significant player in the financial system accounting for 16.7 per cent of financial system assets. As at end-September 2015, the sector demonstrated little change in balance sheet asset composition. Investments for the sector accounted for 85.6 per cent of assets, 46.8 per cent of which were domestic currency investments, this compared to 82.7 per cent and 47.1 per cent respectively at end-September 2014. Despite a marginal decline from 2014, repo liabilities reflected SDs' main source of funding at 86.8 per cent of liabilities. Nonetheless operational and legal risks associated with the SD's 'retail repos' were significantly reduced consistent with the sector's successful transition to a Trust arrangement in 2015.

Financial System Exposures

During 2015, DTIs demonstrated growth in both household sector credit and corporate sector credit. The growth in household credit was predominantly driven by consumer loans but mortgage debt also showed strong growth. In the case of corporate sector credit, the manufacturing and tourism sectors accounted for a significant portion of debt issuance.

These positive trends in credit growth contributed to improvements in loan quality as reflected by a decrease in the ratio of NPLs to total household loans and the ratios of corporate sector NPLs to total corporate sector loans. Unlike private sector credit however, DTIs exposure to public sector debt declined for 2015.

Risk Assessment of the Financial System

The capital adequacy of financial institutions was robust in response to routinely applied hypothetical shocks during 2015. This resilience was largely due to continued strong capital positions, as the capital adequacy ratios (CARs) of DTIs and NDTFIs increased over the year.

For 2015, DTIs showed increased resilience to credit, foreign exchange and interest rate stress tests. DTIs also remained adequately capitalized after hypothetical shocks to deposit withdrawals, interest rates, foreign exchange rates and NPLs. DTIs did however demonstrate some increased exposure to liquidity risks relative to 2014, reflecting reductions in excess reserves of liquidity.

Similarly, stress test results for the 12 largest SDs showed that these institutions had sufficient capital to absorb the applied range of shocks. SDs demonstrated resilience to interest rate, liquidity and foreign exchange shocks. In addition, the sector was also robust to hypothetical mark-to-market losses from shifts in the yields of domestic GOJ securities.

Likewise, ICs showed resilience to stress tests involving declines in liquid liabilities and interest rate shocks. These results were largely attributable to improvements in capital and liquidity positions.

Payment System Developments

Activity in the gross settlement system increased in value for 2015 despite tight liquidity conditions early in the year. The proportion of payment

activity in the JamClear-RTGS system during 2015 was dominated by two participants. This performance demonstrates the persistence of concentration risks in payment systems.

Outlook

Global growth is projected to increase marginally in 2016 to 3.2 per cent for 2016 compared to 3.0 per cent in 2015. Further, continued strengthening in domestic economic conditions should provide opportunities for stronger profitability performance of the financial system. In addition it is expected that the financial institutions will maintain capital adequacy levels above statutory requirements during 2016.

Risks from both the global and the domestic economic environment include the uncertainties associated with a possible reversal of crude oil prices, monetary policy developments in the USA and prices in the Chinese equities market. Within the context of prior policy actions by the US Federal Reserve and other central banks, global asset prices remain vulnerable to sharp increases and potentially large volatility as they are currently underpinned by the continued low levels of long-term real interest rates. Domestically, potential loss of international correspondent banking relationships from the global derisking phenomenon could further disrupt access to international payment systems and services.

2. Macro-financial risks

2.1 Overview

During 2015 risks to financial stability remained low relative to 2014 as demonstrated by the BOJ's macro-prudential indicators. Specifically, the financial stability cobweb reflected improvements across all measured risk dimensions. In addition, the risk of excessive leverage as indicated by credit-to-GDP gap measures remained low. The generally favourable domestic environment augured well for all financial sub-sectors during the review year. Of note, the Aggregate Financial Stability Index (AFSI), Macro-financial Index (MaFI), Micro-prudential Index (MiPI) for the DTIs as well as the sectoral stability indices all recorded improvements.

Financial markets showed strong performance during 2015 relative to the previous year. In terms of risk emanating from joint activity across financial markets, lower values for the Composite Indicator of Systemic Stress (CISS) for 2015 relative to 2014 indicated reduced systemic risk in relation to institutions' common exposures across financial markets. However, regarding Absorption Ratio Shift measures, values at one and above in 2015 implied greater co-movement across DTIs' returns. Nevertheless, this outcome is interpreted to be reflective of broad-based improvements in financial and credit conditions as supported by the positive values of risk appetite indices for the money, bond and foreign exchange markets. Further financial institutions' counterparty default risk, as measured by the distance to default and credit risk exposure at default, declined significantly for the review period. Indicators of sovereign default risk also improved for 2015.

2.2 Global developments

Global GDP growth is estimated at 3.1 per cent for 2015 relative to 3.3 per cent for 2014. The outturn reflected economic challenges across several advanced and emerging economies (see **Figure 2.1**).[1] Nonetheless growth for these

[1] See IMF World Economic Outlook Update January 2016.

Figure 2.1 GDP growth rates of selected countries
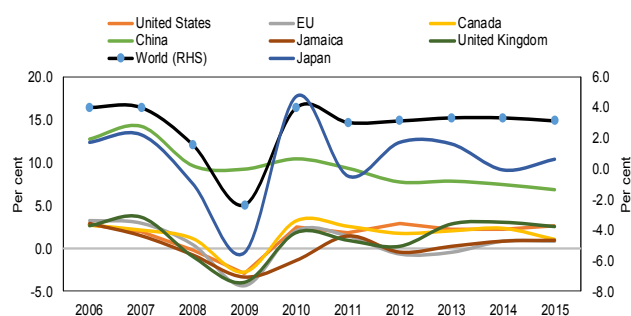
Source: Bloomberg, Bank of Jamaica, IMF World Economic Outlook

Figure 2.2 West Texas Intermediate oil prices
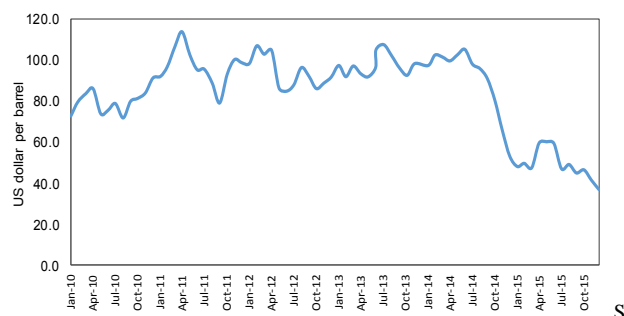
Source: Bloomberg

Figure 2.3 International financial market indicators
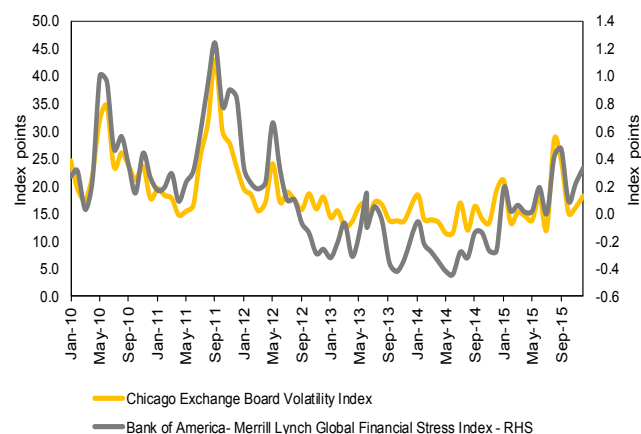
Source: Bloomberg

Note: The BAML-GFSI is a calculated, cross market measure of risk, hedging demand and investor flows in the global financial system. Values greater than 0 indicate more financial market stress than normal while values less than 0 indicate less financial stress than normal. The VIX reflects a market estimate of future volatility, based on the weighted average of the implied volatilities for a wide range of strikes. An increase in the VIX index indicates increased volatility.

Figure 2.4 5-year credit default swap prices for selected emerging markets
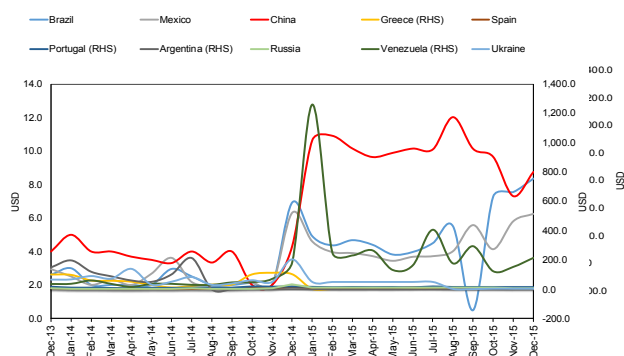
Source: Bloomberg

Figure 2.5 5-year credit default swap spreads for selected emerging markets
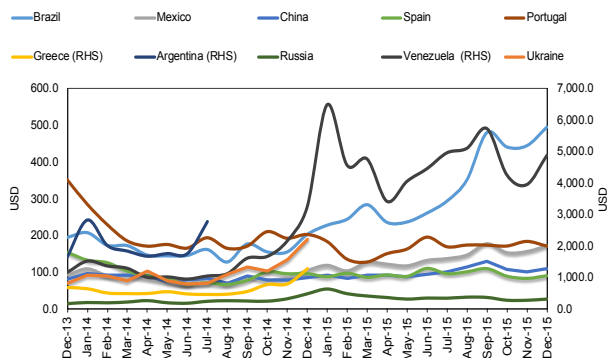
Source: Bloomberg

Figure 2.6 Selected domestic macroeconomic indicators
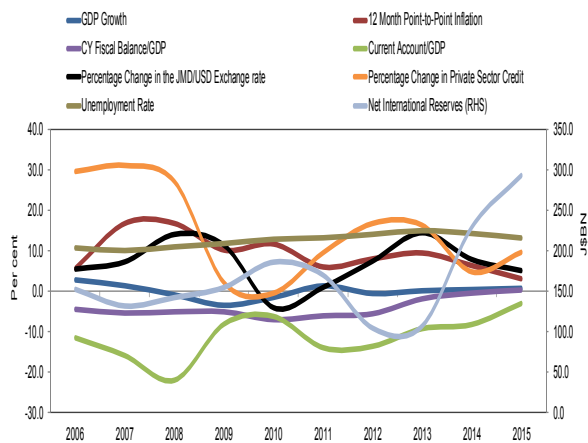
economies occurred against the background of accommodative monetary policies.[2] In particular, faster growth was evidenced in the USA and Japan while the Euro area continued to progress marginally.[3] On the other hand, there was deceleration in growth for the UK, Canada and China during 2015.[4]

A major development was the sustained and sharp decline in oil prices throughout the review year. Specifically, West Texas Intermediate oil prices fell by 30.0 per cent to US$37.04 per barrel at end-2015 relative to the start of the year (see **Figure 2.2**). This reduction continued to reflect weaker demand from large countries such as China and resilient existing and future supplies from oil producing countries since 2014.

During 2015 there was greater uncertainty and higher volatilities in the prices across a range of asset classes within global financial markets. This performance was reflected in increases in the Bank of America Merrill Lynch Global Financial Stress Index as well as the Chicago Board Options Exchange Volatility Index (see **Figure 2.3**). In particular, volatility in financial markets occurred against the background of a decline in global demand, the delay by the United States Federal Reserve in raising the short-term

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[2] Overall, financial conditions within advanced economies remained very accommodative while there were currency depreciations in many emerging market economies. Developing economies, on the other hand, experienced mix sentiments.

[3] Growth in the USA mainly reflected continued accommodative monetary policy stance by the United States Federal Reserve coupled with declining global oil and metal prices for most of 2015. However, in December 2015 the Federal Open Market Committee raised the target range for the federal funds rate by 0.25 percentage point in the context of improved labour market conditions leading to increased consumer expenditure and investment. Growth in Japan and the Euro area mainly reflected the impact of expansionary monetary policy measures as well as the reopening of the Japanese nuclear power plants in mid-2015.

[4] Slower growth in the UK mainly reflected weak exports coupled with the uncertainty surrounding the general election on 7 May 2015. The deceleration in the expected growth for China mainly reflected declining commodity prices, sharp decline in the equities market, margin-lending and exchange rate pressure. Against this background, the People's Bank of China devalued the Chinese Yuan relative to the US dollar by 3.5 percentage points in August 2015. Regarding Canada, the slowdown in economic activity was attributed mainly to the fall off in oil prices.

treasury rate and the sharp stock market decline in China.[5] Notably, high levels of volatility were observed for the August to September period largely related to the devaluation of the Chinese dollar relative to the US dollar.

For the review year, sovereign default and liquidity risks, as reflected in sovereign credit default swap (CDS) prices and spreads, increased for some of the key emerging market economies (see **Figure 2.4** and **Figure 2.5**). In particular, CDS prices and spreads increased for Brazil due mainly to the impact of declining commodities prices, a sovereign debt downgrade, domestic political tensions and a slow recovery from economic challenges. Similarly, lower oil prices, political uncertainty and lower risk ratings by international ratings agencies contributed to strong growth in CDS prices for Venezuela. The performances in CDS prices and spreads for Mexico reflected lower oil prices as well as weaker industrial production in the United States. In addition, growth in China's CDS spread reflected domestic economic challenges such as the sharp decline in of the equities market and margin lending bubbles as well as the fall off in global demand.[6] On the other hand, CDS prices and spreads for the remaining countries continued to decline consistent with macroeconomic improvements following fiscal consolidation in these jurisdictions.
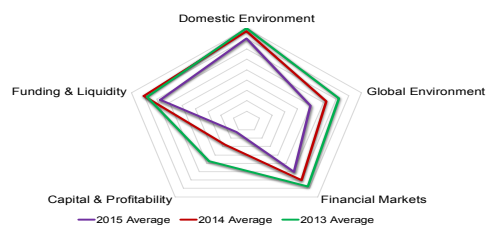
2.3 Domestic environment

The domestic macroeconomic environment continued to strengthen during 2015 in a context of improvements in key macroeconomic variables as well as the positive effects of the country passing the quarterly reviews under the EFF programme. Specifically, there were continued improvements in GDP growth, inflation, current account, fiscal position and the net international reserves (NIR) (see **Figure 2.6**). Of note, the economy is estimated to have grown by 0.8 per cent for 2015 relative to growth of 0.5 per

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[5] The performance of China's equity market along with depressed oil prices resulted in weaker performance in major stock market indices globally during 2015.
[6] Margin lending in the context of China is the use of borrowed funds to invest in shares. These funds are collateralize by the purchased shares in most instances.

**Figure 2.7** Financial stability cobweb*

Note: The domestic macroeconomic environment, financial market conditions and the global environment indicators identify the systemic shocks that would trigger major difficulties for financial institutions. The capital & profitability and the funding & liquidity indicators reflect the capacity of financial institutions to absorb a shock to either side of their balance sheets. Movements away from the centre of the diagram represent an increase in financial stability risks. Movements towards the centre of the diagram represent a reduction in financial stability risks. *The cobweb was adjusted relative to previous publications to reflect amendments to the indicators to more adequately capture the weighting of risks within each dimension.

Figure 2.8 Cyclogram ranging from 1 to 5
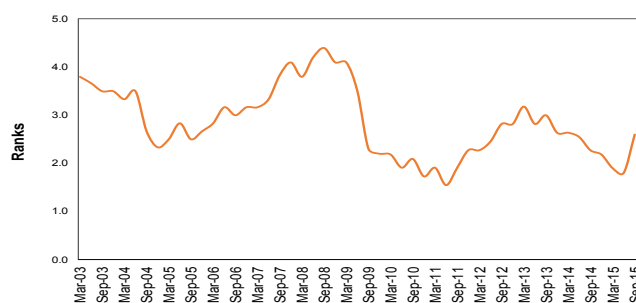
Note: The cyclogram is an aggregation of core variables that illustrate the build-up of macro-economic imbalances and financial cycles. Each indicator is evaluated against the distribution of its own historical values. A number between 1 and 5 is assigned to the actual value of the variable depending on its position in respective quantiles of its historical distribution. The simple average of the ranks for each variable is used to find the aggregate values for the cyclogram.

Figure 2.8 Cyclogram ranging from 1 to 5
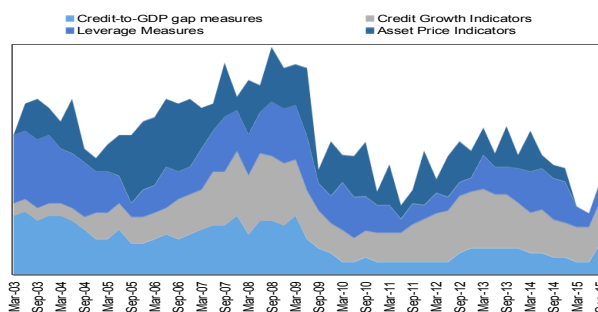
Note: The cyclogram consists of credit-to-GDP gap measures, year-on-year credit growth measures, leverage indicators as well as asset price measures.

Figure 2.10 Credit to GDP deviations from long-run trend *
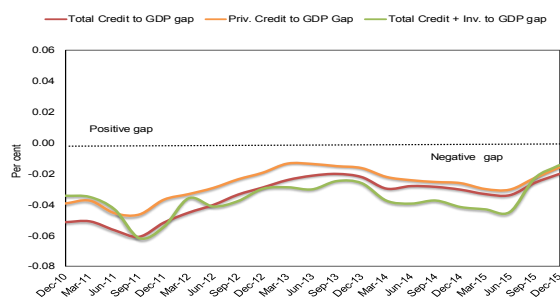
Note: Credit-to-GDP gaps were estimated by applying the one-sided Hodrick Prescott (HP) filter to quarterly data spanning the period 2000 to 2015 for all DTIs. *The credit gaps were adjusted relative to previous publications to reflect all deposit-taking institutions.

Figure 2.11 Share of private credit to GDP gap by borrower type

Figure 2.12 Credit standards and credit conditions survey indices

Note: The index is the average responses for changes in eight credit terms reported in the Credit Conditions Survey. Index values above 100 indicate an increase in the variable whiles values below 100 indicate a decline.

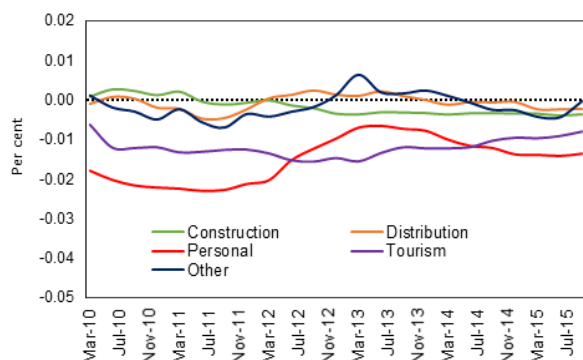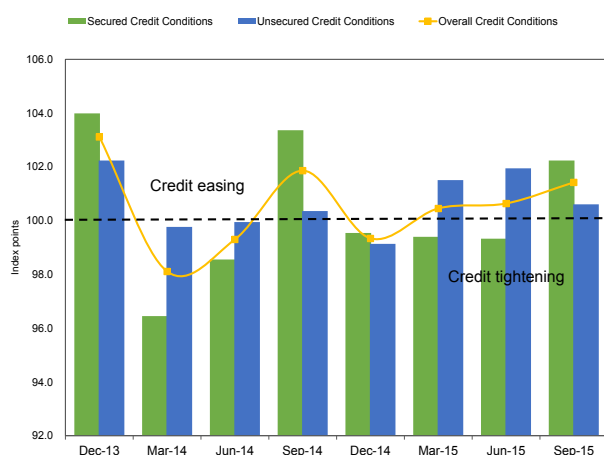cent for the previous year. Additionally, the depreciation of the Jamaica Dollar vis-à-vis the United States dollar was 5.0 per cent during 2015 relative to 7.8 per cent during the prior year. This deceleration partly reflected increased receipts from tourism and remittances coupled with lower net demand for imports. Additionally, there was increased confidence as a result of the issuance of two global bonds by the Government in July 2015 totaling US$2.0 billion.[7] Against this background, there was an increase in the NIR of US$0.44 billion to US$2.44 billion at end-2015.

2.4 Cobweb measure of financial stability

During 2015, risks to financial stability were lower relative to the previous year as reflected in the Bank's cobweb measure of financial stability. The risks as reflected across all measured dimensions declined on average relative to 2014 (see **Figure 2.7**). Specifically, the 'global environment' dimension reflected improved current account balances as well as continued favourable growth and lower unemployment rates for OECD countries. Improvements in the 'financial markets' dimension were largely attributable to the extraordinary growth in the stock market as well as the change in the in the 180-day Treasury bill rate subsequent to a more accommodative stance by the BOJ. Concurrently, the performance of the 'funding & liquidity' dimension mainly reflected DTIs' deposit growth while the "capital & profitability' reflected increased capitalization as well as significant improvements in asset quality. Improvement in the 'domestic environment' dimension was attributable to lower Kalman filtered output gaps, unemployment, current account deficits and a more favourable terms of trade.

2.5 Financial imbalances
2.5.1 Credit market assessment
2.5.1.1 Cyclogram
During the review period, there was a slight upswing in the financial cycle, as indicated by the Bank's measured

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[7] In July 2015, the Government successfully raised USD$2.0 billion on the international capital market at interest rates of 6.75 and 7.875 per cents, respectively. Of the total amount raised, USD $1.5 billion was utilised in the PetroCaribe debt buyback operation in July.

cyclogram (see **Figure 2.8**).[8] This compares to the prior year for which there was a downward trend in credit and leverage indicators. Further disaggregation of the cyclogram to its sub-components suggests that the credit-to-GDP gap measures were the main contributors, followed by credit growth indicators (See **Figure 2.9**). Of note, however, this increase in credit measures is reflective of a general improvement in the macroeconomic environment. As such, this increased credit extension does not suggest excessive risk taking.

2.5.1.2 Credit-to-GDP relative to long-term trend

Domestic credit grew by 8.8 per cent for 2015 which was 2.9 percentage points above the recorded growth for 2014. This occurred against the background of favourable domestic credit conditions partly reflecting the BOJ's continued easing of monetary policy and enhanced liquidity facilities provided by the Bank for 2015.[9] The expansion in private sector credit of 10.0 per cent outweighed the impact of contraction in credit to the public sector of 9.6 per cent for the reporting period.

For the period under assessment, despite the credit expansion, risks associated with excessive leverage within the domestic economy trended downwards (see **Figure 2.10**). Of note, private sector credit to GDP gap remained relatively low with reversion occurring during the latter part of 2015.[10] The widening in the private credit-to-GDP gap was driven mainly by a deviation in the personal credit to GDP gap, primarily for commercial banks. Additionally, the gaps for distribution and other economic sectors also widened, the impact of which was partly offset by the narrowing of the gap for tourism and construction.

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[8] For further information on the cyclogram see Rychtárik, Š. (2014), "Analytical background for the counter-cyclical capital buffer decisions in Slovakia", Biatec, No 4, Národná banka Slovenska, Bratislava.

[9] Domestic credit includes domestic loans and advances as well as corporate and government issues held by deposit taking institutions.

[10] The lower and upper threshold values prescribed by the Basel Committee on Banking Supervision are 2.0 and 10.0, respectively.

Figure 2.13 Credit demand and credit supply
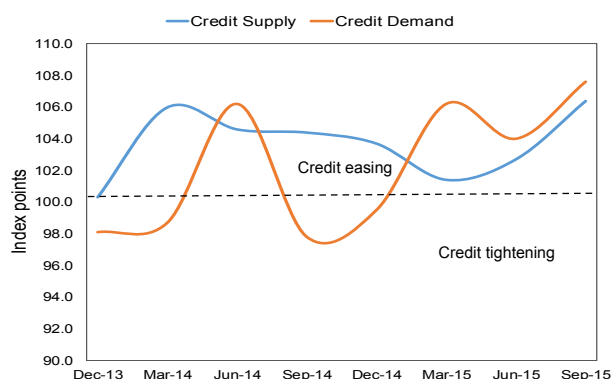
Figure 2.14 Aggregate financial stability index
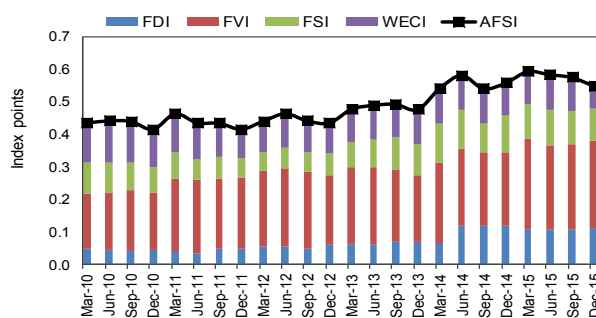
Note: The AFSI aggregates microeconomic, macroeconomic and international factors to form a single measure of financial stability. A higher value indicates increased financial stability while a lower value indicates deterioration in financial sector stability. Of importance microeconomic data captures information for DTIs. FDI - Financial Development Index, FVI - Financial Vulnerability Index, FSI - Financial Soundness Index, WECI - World Economic Climate Index.

Figure 2.15 Macro-financial index
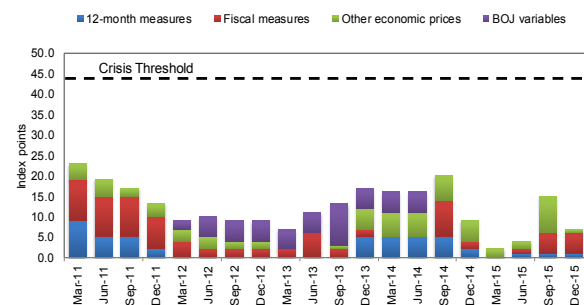
Note: The MaFI & MiPI are signal-based indices computed using scores for indicators based on the number of standard deviations of each indicator from its 'tranquil period' mean value. The tranquil period refers to an eight quarter period that precedes the beginning of a signaling window. The scores range from 0 to 5 with a score of 5 representing the most severe signal. Banking sector vulnerability at a point in time is determined by the trend in the aggregate score (or index) over the previous eight quarters (signaling window).

Figure 2.16 Banking stability index and its components
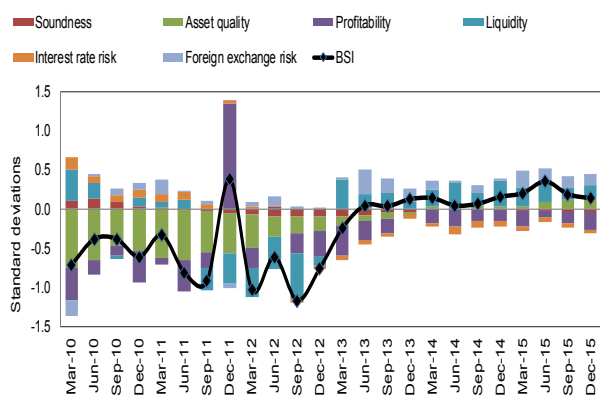
Note: The banking stability index is an aggregate indicator of the soundness of the DTI sector. It is constructed as a weighted average of indicators of capital adequacy, profitability, asset quality, balance sheet liquidity, foreign exchange risk and interest rate risk. An increase in the index value shows greater stability. The BSI is measured in standard deviations from the 10-year average. In the absence of a 10-year series, the available data is used.

Figure 2.17 Micro-prudential index for DTIs
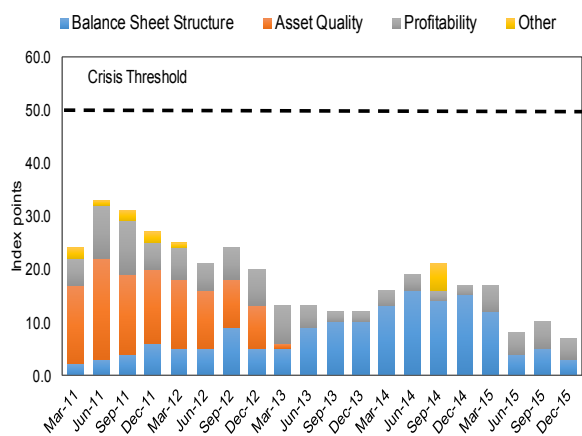
Figure 2.18 Z-score index for the DTIs
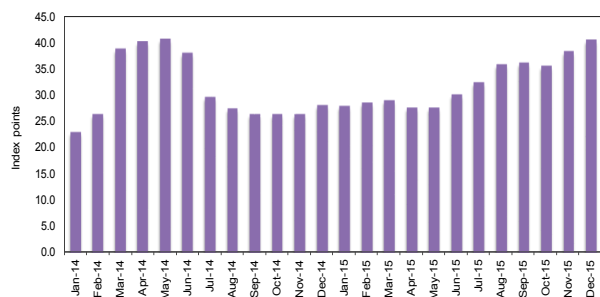
Note: The Z-score (insolvency risk) index is used as a measure of a bank's financial soundness. The Z-score is used to capture the likelihood of a bank's earnings in a given year becoming low enough to eliminate the bank's capital base and thus, the likelihood of the bank becoming insolvent. A higher Z-score implies a lower probability.

The impact of the deterioration of the private credit gap on the total credit-to-GDP gap was partly offset by marginal improvement in public sector credit. Specifically, the total credit-to-GDP gap, while trending below the zero mark, showed signs of reversion during the last two quarters of 2015. Similarly, total credit plus investment-to-GDP gap trended upwards and was due primarily to the increase of the commercial banking sub-sector investments-to-GDP gap.

2.5.1.3 Credit standards and credit conditions[11]
The improved credit conditions for the review period was also evident in the results of the BOJ's Quarterly Credit Conditions Survey (see **Figure 2.12**). Of note, the index of overall credit conditions increased steadily during 2015 to 101.4 at end-September 2015 relative to 99.3 at end-2014 indicating an easing in credit market conditions. Further disaggregation of credit conditions into secured and unsecured components indicated a general improvement in lending policies applied to unsecured lines of credit for most of 2015. These improvements occurred in a context of the increased use of the services offered by credit bureaus as well as the downward trend in market interest rates which increased the risk appetite of lending institutions. Of note, however, was the outturn for the September 2015 quarter in which there were improvements in lending policies applied to secured lines of credit for the first time since the September 2014 quarter. Specifically, lending institutions expanded their loan portfolios by offering lower interest rates, increasing the maximum loan-to-value ratios as well as extending the maximum size of credit lines.

The demand and supply for credit increased during the review year (see **Figure 2.13**). In particular, both the Credit Supply index and the Credit Demand Index were at their highest points during the September 2015 quarter. This mainly reflected the joint impact of aggressive loan promotion activities by institutions, increased borrowings by large corporates, which are very sensitive to interest rate adjustments, as well as increased demand across all business

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[11] The credit conditions survey is an online survey conducted by the BOJ to elicit qualitative information on changes in the demand and supply of credit to businesses and individuals.

segments from significant requests for loans for inventory & other working capital financing.

2.5.2 Aggregate Financial Stability Index

The AFSI grew by 4.1 per cent to a quarterly average of 0.6 relative to 2014 (see **Figure 2.14**). Growth in the index was mainly driven by improvements in financial vulnerability and financial development sub-components of the AFSI. Specifically there were positive developments in key macroeconomic variables such as the inflation rate and the current account deficit to GDP ratio. Additionally, improvements in the credit to GDP ratio, stock market capitalization and the Herfindal-Hirschman Index of concentration in DTIs asset base contributed to stronger performance of the financial development sub-component, while a reduction in the real effective exchange rate further contributed to the favorable outturn in the financial vulnerability sub-component of the Index. The improvement in the index, however, was partly offset by weaker global economic climate conditions which was supported by lower growth in global GDP for 2015 relative to 2014.

2.5.3 Macro-Financial Index

The BOJ's MaFI showed improvements in 2015 relative to 2014 with a reduction in the quarterly average value of the index to 7.0 points for 2015 from 15.0 points for 2014, remaining well below the 1996-1998 financial crisis threshold value of 44.0 points (see **Figure 2.15**). This outturn reflected improvements in the quarterly average value of all major components of the index, with the exception of fiscal measures which remained unchanged. In relation to specific weighted ratios, the strongest improvements were reflected in the average signals of the volatility in the exchange rate to 0.0 point from 5.0 points, the 12-month growth in private sector credit to 0.0 point from 4.0 points, M2 to NIR to 0.0 point from 2.0 points, the national debt to GDP to 0.0 point from 1.0 point and the US/Jamaica interest rate differential to 0.0 point from 1.0 point.

Figure 2.19   Large exposures between financial institutions (net credit exposure-to-capital)
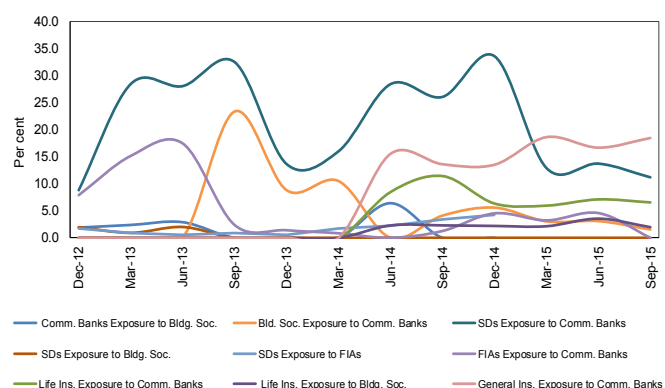
Figure 2.20 Network exposures between financial institutions (unsecured net credit exposures to capital) at end-September 2015
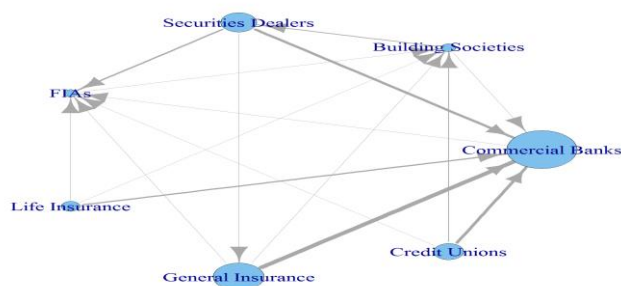
Note: Nodes represent the financial sub-sectors and the weighted net credit exposures between sectors represent links. Arrows directed towards a node indicates that the node is a net borrower while arrows directed outwards indicates that the node is a net lender. Nodes are weighted based on how connected a sector is relative to many other sectors within the network. Links are weighted by the size of net credit exposures to sector capital. Larger nodes represent most important nodes in the network and thicker links indicate larger exposures.

Figure 2.21 Network of exposures between financial institutions (unsecured net credit exposures to capital) at end-2014
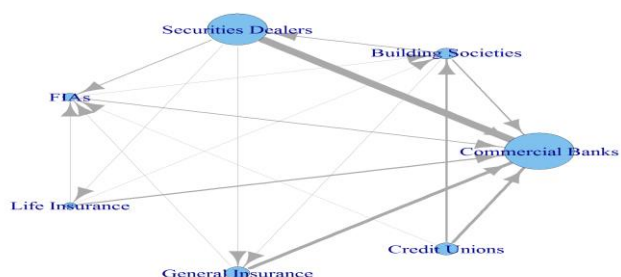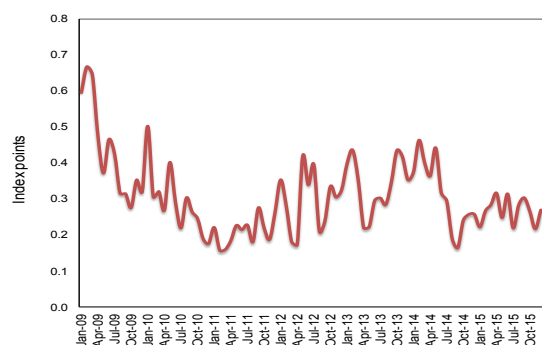
**Figure 2.22** Composite Indicator of Systemic Stress in Financial Markets

Note: The CISS measures the joint impact of activity in the money market, equity market, bond market and foreign exchange market. An increase in the CISS indicates a high degree of correlation between markets which aggravates systemic risk. When the correlation between markets is low the risk is reduced.

Figure 2.23 Daily annualized zero-coupon GOJ domestic bond yields
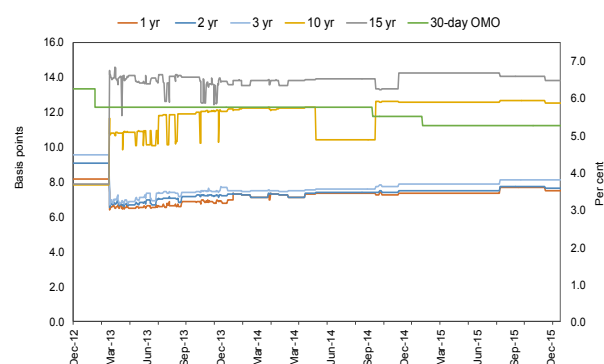
Source: Bloomberg

Figure 2.24 Jamaica global bonds and EMBI+ spread
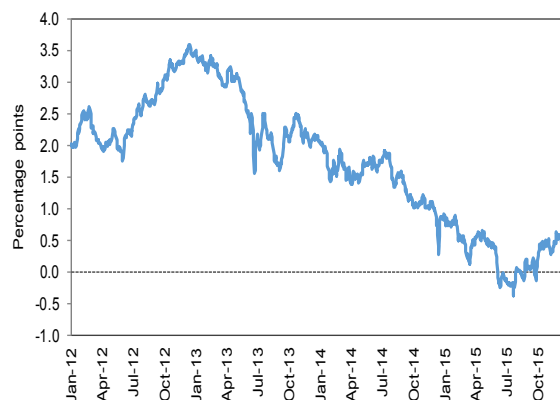
Source: Bloomberg

These improvements were, however, partly offset by the impact of increases in the average signal of the external debt to GDP ratio to 3.0 points from 2.0 points, as well as ratios measuring the volatility in both the inflation and interest rates, the 12-month growth in stock market index and the real Treasury bill to 1.0 point from 0.0 point.

2.5.4 Sectoral stability Indices

The BOJ's BSI indicated increased resilience of the banking sector during the review year (see **Figure 2.16**). Specifically, the BSI increased on average to 0.2 standard deviation above the prior 8-year average value of sub-index components for 2015 relative to 0.1 standard deviation above the prior 8-year average value for 2014. This was driven primarily by average improvements in asset quality, profitability, interest rate risk and foreign exchange risk indicators. In particular, non-performing loans to total loans recorded further declines on average during 2015 relative to 2014 while net open positions to tier 1 capital for the banking system improved relative to the previous year. However, the improvement in these indicators was partly offset by the impact from deterioration in the average values of soundness and liquidity indicators. Of note, the deterioration in liquidity measures was reflected in lower liquid assets to total assets and liquid assets to total deposit ratios on average in 2015 relative to 2014. Further, capital to risk-weighted assets also declined in 2015 relative to the prior year. Additionally, vulnerability of the ICs and SDs declined over the review period (see **Box 2.2**). Notably, this reflected improvements in the balance sheet indicators for the sectors in the context of a relatively favourable macroeconomic environment.

2.5.5 Micro-prudential Index

Similarly, improvements in banking sector stability was also reflected in the MiPI for DTIs. Of note, the average value of the Index decreased to 11.0 points for 2015 relative to 17.0 points for 2014 (see **Figure 2.17**).[12] The decrease in the Index for the DTI sector was largely due to an improvement

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[12] Indicators included in the micro-prudential index are weighted by asset size.

in signals from balance sheet structure indicators. In particular, the capital to assets, deposits to loans, deposits to assets and financial institutions loans to total loans improved. However, these improvements were partially offset by a slight deterioration in profitability indicators. Specifically, the average value of the interest income to assets indicator increased in signal severity to 5.0 points for 2015 relative to 3.0 points at for 2014.
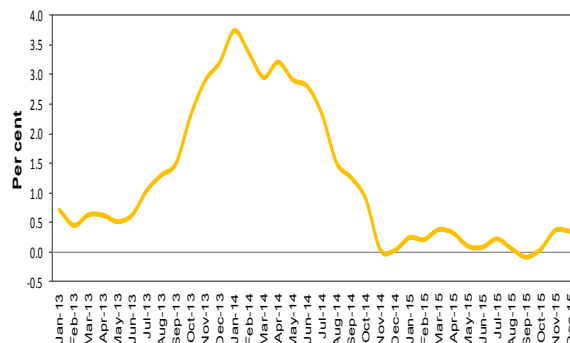
2.5.6 Z-score index of insolvency risk

There was a reduction in the vulnerability of the DTI sector to insolvency risk for the review period. Specifically, the Z-score index increased by 4.9 per cent to an average monthly value of 32.4 points for 2015 when compared to the average monthly value of 30.9 points for 2014 (see **Figure 2.18**).[13] The performance of the index mainly reflected lower volatility in the average monthly risk adjusted return on capital, as well as an increase in profits, which outperformed the average increase in capital.

2.6 Externalities: Interconnectedness
2.6.1 Interbank market

For the review period, the ICs, SDs and building societies were generally net creditors in the inter-bank market, as measured by positive net credit exposures-to-capital, while commercial banks continued to be the largest net borrowers (see **Figure 2.19**). This reflects non-bank deposits placed with commercial banks. Notably, the general insurance sub-sector recorded the largest counterparty exposures during 2015 in contrast to the SDs which recorded the largest exposures during the prior year.[14] In particular, general insurance companies' net credit exposure to commercial banks as a share of capital increased to 18.5 per cent at

[13] The Z-score (insolvency risk) index is calculated as: $z = \frac{RORAC + C/A}{STD\,DEV(RORAC)}$, where RORAC is the bank's return on risk adjusted capital, C/A is its regulatory capital to asset ratio and σRORAC is its standard deviation of return on assets computed over the sampling period. The Z-Scores are weighted based on the relative total assets of the sectors.

[14] A large exposure is one that exceeds 10.0 per cent of a lending institution's regulatory capital at the end of a period.

Figure 2.25 TRE spread

Note: The TRE spread measures the premium priced in the repo rate for default risk and is computed as the difference between the 30-day repo rate and the 30-day T-bill rate.

Figure 2.26 Jamaica money market, stock market and foreign exchange risk appetite indices
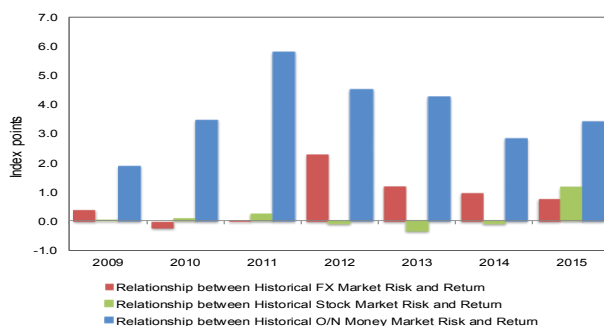
Note: The risk appetite indices are estimated based on the annual relationship between daily market returns and the corresponding volatility (estimated as the rolling standard deviation of market return over a one year period).

Figure 2.27 Amihud index of foreign exchange market depth

Figure 2.28 Monthly bid-ask spreads & annual average daily volume in J$/US$ exchange rate
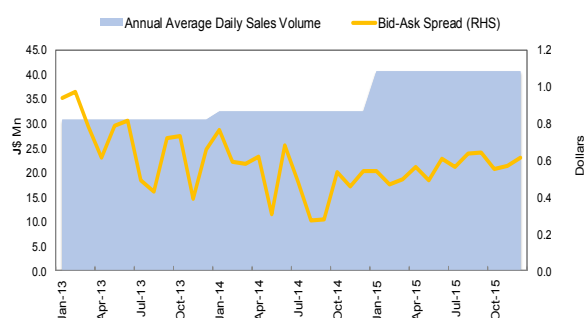
Figure 2.29 Amihud index of stock market depth
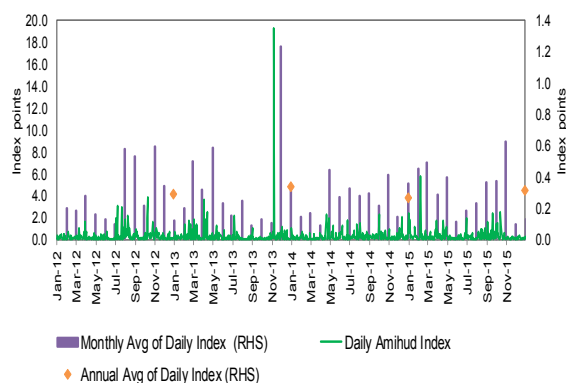
Figure 2.30 Shifts in the absorption ratio
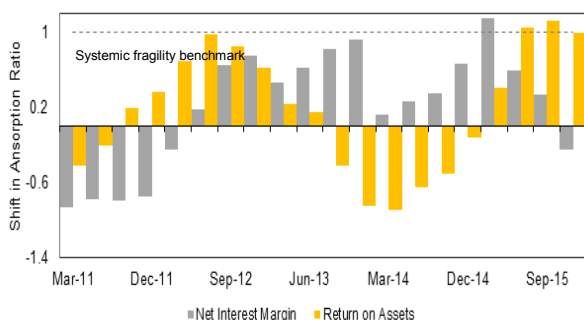
Note: The absorption ratio (AR) measures the fraction of the covariance in returns explained by the largest direction of covariance over the past 18 quarters. Increases in AR reflects stronger system-wide comovement of commercial bank returns. The shift in the AR is calculated as the difference between the 4 quarter average AR and the 12 quarter average AR as a share of the 12 quarter standard deviation of the AR. A shift in the AR approaching a magnitude of 1 is used as a benchmark for identifying periods of increased fragility.

end-September 2015 relative to 13.5 per cent at end-2014 (see **Figure 2.20** and **Figure 2.21**). SDs recorded the second largest net exposures albeit smaller relative to the end of the prior year. Of note, net credit exposure to commercial banks as a share of capital for the SDs declined sharply to 11.2 per cent at end-September 2015 relative to 33.6 per cent at end-2014.

2.7 Externalities: Common exposures
2.7.1 Exposure to financial markets
Domestic financial markets recorded improvements during the review year against the background of positive macroeconomic developments. Of note, the BOJ's CISS for financial markets recorded a further decline for 2015. Specifically, the monthly CISS declined to an average of 0.27 for 2015 relative to an average of 0.31 for 2014 (see **Figure 2.22).** This largely reflected lower materialization of systemic risk for 2015 regarding common exposures across financial markets.

During the review year, trading of domestic bonds on the secondary market remained relatively thin (see **Figure 2.23**). Notwithstanding the thinness of the market, yields on medium to long-term GOJ domestic bond tenors recorded declines for 2015. This may have reflected an improvement in investor confidence in the reduction of the Government's debt position over the medium- to long-term. In addition, there was increased investor confidence in GOJ global bonds during 2015 as evidenced by the low coupons associated with the Government's re-entry to the international capital market. This was shown by the average spread between GOJ global bonds composite index and the Emerging Market Bond Index (EMBI+) which was lower on average for 2015 relative to the previous period. The performance in the spread reflected increased financial vulnerability across emerging markets relative to GOJ global bonds (see **Figure 2.24**).

For the review period, money market liquidity improved relative to 2014 as depicted by the narrowed TRE spread (see **Figure 2.25**). The average monthly TRE spread was 0.2

per cent which was 1.9 percentage points lower than 2014. Specifically, during the first quarter of the review period, liquidity conditions tightened as reflected by the uptick of the TRE spread. Subsequent to this period, the Bank reduced its policy rate by 50 basis points (bps) during 2015 ending at a rate of 5.25 per cent.[15] In addition, the Bank also implemented enhancements to its liquidity facilities. Of note, the interest rate corridor was narrowed to boost liquidity in the market.[16] Further, to enhance the efficiency of the liquidity allocation process, the Bank introduced a weekly fixed volume competitive bid auction repo facility.[17] The introduction of this facility resulted in increased take-up from other existing liquidity facilities such as the Standing Liquidity Facility (SLF) as well as increased demand pressures on the cost of borrowing at the short-end. These increased pressures were also reflected in the Money Market Risk Appetite (RAI) which increased during the review year (see **Figure 2.26**). In fact, this was the first time there has been a positive relationship between risk and return, as reflected by the RAIs, in the money, foreign exchange and equities market since the 2008 global financial crisis.

Foreign exchange market pressures were lower during the review period as the rate of depreciation decelerated relative to 2014. This deceleration partly reflected increased supplies coupled with lower net demand. Additionally, the market was also bolstered by increased confidence as a result of the Government bond issue in July 2015. This general improvement in foreign exchange market liquidity was also

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[15] The decrease in the policy rate reflected the Bank's outlook for lower near and medium-term domestic inflation, improvements in macroeconomic conditions, growth in net international reserves and a strengthening of the current account position.

[16] The rates on the Bank's lending facilities such as the Standing Liquidity Facility, bi-monthly repurchase operations (BROs) and excess funds rate were lowered by 125 bps, 200 bps and 125 bps, respectively, during 2015. Additionally, as part of its monetary policy framework, the Bank also introduced an Occasional Term Repo Operations (OTROs), which provided liquidity to deposit-taking institutions for 90 days at a rate of 9.15 per cent.

[17] The Bank implemented a weekly fixed volume competitive bid auction repo facility in October 2015. Key benefits of the facility were increased access to liquidity, market determined interest rates through true price discovery as well as increased market confidence.

Figure 2.31 Quarterly distance-to-default for DTIs and non-deposit taking financial institutions*
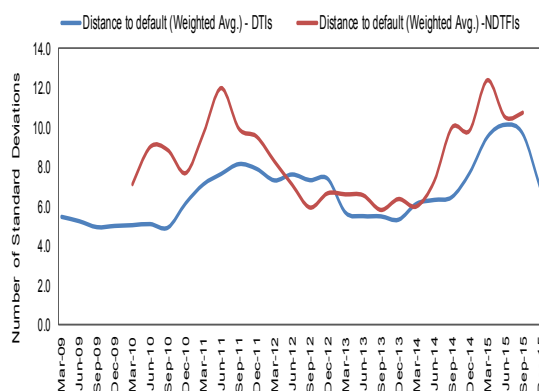
*The distance to default measures were adjusted relative to previous publications to reflect the listing and de-listing of institutions.

Figure 2.32 Ratio of holdings of total GOJ debt by DTIs, SDs and life insurance companies to capital

Figure 2.33 Credit risk exposure (CRE) at default of DTIs, SDs and life insurance companies to capital and evolution of probability of default

evident in the Amihud Index and the foreign exchange RAI, which both declined for the review period (see **Figure 2.26** and **Figure 2.27**). Notwithstanding the improvement in fo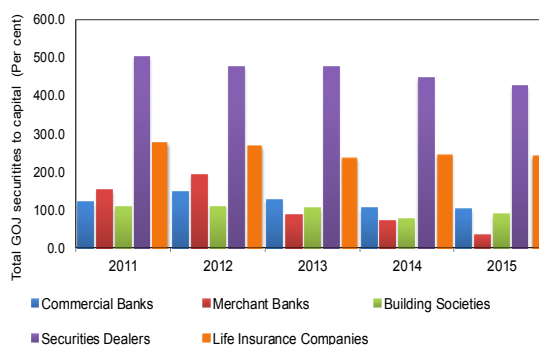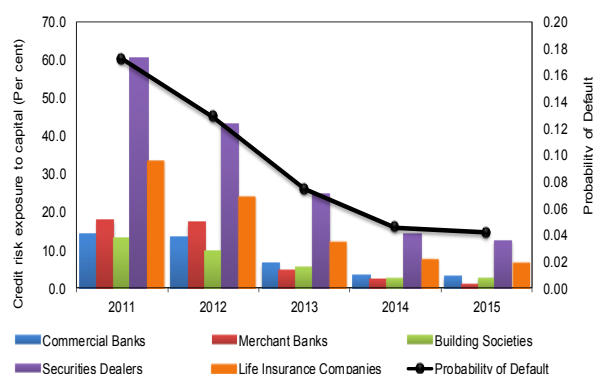reign exchange liquidity, the monthly average bid-ask spread increased on average to $0.6 for 2015 relative to an average of $0.5 for 2014. This mainly reflected marginally higher costs of executing transitions in the foreign exchange market, particularly during the September quarter (see **Figure 2.28**).[18]

For the review year, there was significant improvement in the stock market relative to 2014. Of note, the Jamaica Stock Exchange Main Index increased by 97.4 per cent in 2015 in sharp contrast to a decline of 5.3 per cent in 2014. The outturn in the stock market was mainly attributed to improved macroeconomic conditions, increased investor confidence as well as higher profits and dividend to price ratios for the review period. The performance of the stock market was also evidenced by an improvement in the stock market RAI. However, liquidity conditions in the stock market deteriorated as reflected by the Amihud Index of stock market depth. The Index recorded an average increase to 0.32 for 2015 when compared to 0.27 for 2014 (see **Figure 2.29**). This was mainly attributable to the impact of greater price movements as a result of market developments relative to traded volumes for 2015.

There was an increase in the AR of commercial bank returns for the review period relative to 2014 reflective of favourable conditions across credit and financial markets during 2015.[19] Shifts in the AR based on both return on assets (ROA) and net interest margin (NIM) both showed an average increase in the mean quarterly value relative to 2014. Based on the ROA, quarterly shifts in the AR averaged 0.8 in 2015 compared to a mean quarterly shift of negative 0.5 in 2014 (see **Figure 2.30**). Similarly, quarterly shifts in the AR based on NIM averaged 0.5 in 2015 compared to mean quarterly shift of 0.4 in 2014. During 2015 shifts in the AR based on both measures exceeded benchmark values associated with the conditions to support increased systemic fragility. These results reflect tightening in the joint movement of commercial banks' profitability based on performance for 2015.

2.7.3 Exposure to financial institutions default risk
The risk of default for DTIs and NDTFIs to default risk, as measured by the distance to default, continued to decline during 2015 (see **Figure 2.31**).[20] This suggests that the market anticipated DTI and NDTFI assets to be sufficient to repay debt obligations over a one-year time horizon. Notably, the distance-to-default for DTIs increased to a quarterly average of 9.1 standard deviations during 2015 when compared to 6.7 standard deviations recorded for 2014. This improvement mainly reflected an increase in the market value of assets relative to liabilities.

Similarly, the distance to default for the NDTFIs declined for the review period. Of note, the distance-to-default for NDTFIs increased to a quarterly average of 11.2 standard deviations for calendar year to September 2015 relative to 8.3 standard deviations for 2014. The improvement was mainly driven by increased market value of assets as well as a reduction in the implied volatility of assets for a large player in the market.

2.7.4 Exposure to sovereign debt default risk[21,22]
For 2015, sovereign debt default risk of the financial system declined. Of note, the holdings of GOJ total debt to total

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[18] Movements in spread were mainly attributed to demand for foreign exchange during the September quarter reflecting the increased demand in non-fuel imports coupled with a reduction in non-traditional exports.

[19] The AR uses principal components analysis to measure the fraction of the covariance in returns explained by the largest direction of covariance over the past 18 quarters. Increases in the AR reflects stronger system-wide comovement of commercial bank returns. As such, shifts of the absorption ratio are used to gauge changes in potential common risk exposure over time. Conceptually, as the covariance among commercial bank returns leans towards a specific principal direction there is a greater potential for an undesirable performance outcome being reflected in all banks. The analysis uses return on assets and net interest margin as two separate measures of returns for commercial banks.

[20] Default barrier = short-term + ½*(long-term liabilities)

[21] The probability of default is estimated using a logit-model with data from 36 countries over the period 1986 to 2005. It evaluates the likelihood of a debt-rescheduling event contingent on developments in the macro-economic environment.

[22] The credit risk exposure (CRE) is a product of the holding of GOJ total debt by institutions, the probability of default (PD) and the loss given default (LGD).

capital were approximately 100.5 per cent, 35.1 per cent, 86.8 per cent for commercial banks, FIA licensees, building societies, respectively, at end-2015. For SDs and life insurance companies, holdings of GOJ total debt to total capital were 425.7 per cent and 241.5 per cent, respectively at end-September 2015. Relative to end-2014, these exposures represented respective declines of 4.0 percentage points, 36.9 percentage points, 21.1 percentage points and 4.0 percentage points for the commercial banks, FIA licensees, SDs and life insurance companies, respectively (see **Figure 2.32**). On the other hand, the exposure for the building societies increased by 13.1 per cent relative to end-2014.

Concurrently, the BOJ's estimate of the probability of sovereign debt default declined over the review period to 4.2 per cent at end-2015 relative to 4.7 per cent end-2014 (see **Figure 2.33**). Of note, with the exception of the building societies, the exposure of the financial system to sovereign credit risk, as measured by credit risk exposure (CRE) at default, also declined for 2015. The CRE for commercial banks and FIA licensees declined as a per cent of capital to 2.9 per cent and 1.0 per cent, respectively, at end-2015. Similarly, the CRE for SDs and life insurance companies declined as a per cent of capital to 12.4 per cent and 7.0 per cent, respectively, at end-September 2015. This compares to 3.3 per cent, 2.3 per cent, 2.4 per cent, 14.2 per cent and 7.8 per cent for commercial banks, FIA licensees, building societies, SDs and life insurance companies, respectively, at end-2014.

Box 2.1   A Synopsis of The Bank of Jamaica (Amendment) Act, 2015.

The BOJ was assigned institutional responsibility for the overall stability of Jamaica's financial system with the passage of the 'Bank of Jamaica (Amendment) Act, 2015' in October 2015.[1] The Amendment was compelled by the global financial crisis of 2008 which demonstrated that systemic financial crisis can occur even with the presence of apparently sound institutions. Financial system stability, in relation to the Amendment, means the orderly operation of financial institutions, financial markets and the payment and settlement infrastructure, and the capability of these components that make up the financial system to absorb internal and external shocks without substantial impairment to the financial system and the real economy.

The Amendment formally establishes a macro-prudential approach to financial oversight that will be used to complement, and not replace, the traditional institutions-based micro-prudential approach of the BOJ, Financial Services Commission (FSC) and other regulatory authorities for financial services operating in Jamaica. The macro-prudential approach to financial system oversight primarily involves the detection, monitoring, evaluation and mitigation of various sources of systemic risk in order to ensure the proper and efficient functioning of the financial system and, consequently, the promotion of real economic activity.

Implications

The Amendment to the BOJ Act legislates some essential criteria for the monitoring of this systemic risk. Within the context of the existence of multiple supervisory agencies it creates a mandate for the BOJ to oversee the links and address the risks that may arise from different kinds of financial activity. Some of the critical components of the amendment include:

- The *establishment of the Financial System Stability Committee* to perform the functions of macro-prudential assessment, promoting the regular exchange of information, international cooperation in support of financial system stability objectives, providing periodic and exceptional reports to the Minister of Finance and Planning on financial stability oversight, as well as making recommendations to the BOJ for the carrying out of the financial stability mandate. The Committee shall consist of six *ex-officio* members as well as two members appointed by the Minister on the recommendation of the Governor.[2]

- The *provision of additional powers to the BOJ for conducting macro-prudential oversight of financial institutions*. In regards to macro-prudential oversight, these include: (i) power to request the inspection of any financial institution; (ii) power to request information from other regulators or government agencies or persons; (iii) power to issue rules, standards and codes to address gaps and imbalances in the financial system that could threaten stability.

- *Expressly allowing for the provision of emergency liquidity assistance to financial institutions on discretionary terms* in the event of a threat to financial system stability.

- The *establishment and maintenance of a central financial system database* by the BOJ to be made available to Committee members.

- The *publication an annual financial stability report* to support its accountability on matters relating to the stability of the financial system.

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[1] Available at: http://www.japarliament.gov.jm/

[2]The ex-officio members of the Committee shall be: (a) the Governor, who shall be the chairman; (b) the Senior Deputy Governor or the Deputy Governor or other senior officer of the Bank, with assigned responsibility for the Bank's financial system stability mandate; (c) the Financial Secretary; (d) the Deputy Supervisor of Banks and Financial Institutions; (e) the Executive Director of the Financial Services Commission; and (f) the Chief Executive Officer of the Jamaica Deposit Insurance Corporation.

Box 2.2   Stability Indices for Non-Deposit Taking Financial Institutions

The asset size of the NDTFIs ($868.5 million) relative to that of DTIs ($1.3 billion) coupled with the increased interlinkages between these two sets of institutions underscores the importance of the Bank's establishing and monitoring stability indices for NDTFIs.[1] With the Bank of Jamaica (Amendment) Act 2015which gives the BOJ institutional responsibility for financial stability in Jamaica, the Bank has expanded its surveillance capability to include composite indices of the country's insurance and securities dealer sectors.

Index methodology

Stability indices for both the SDs and the ICs were developed using methodology similar to that of the BOJ's BSI. This was done by incorporating selected financial soundness indicators within the banking sector's CAMELS framework as well as incorporating sector-specific adjustments to more adequately reflect the nature of operations in both sectors. [2]

Stability Indices for Insurance Companies

With regards to the insurance sector, reinsurance and actuarial indicators were added to the CAMELS framework. This CARAMELS framework incorporates several indicators from the IMF's Core Financial Soundness Indicators for general and life insurers, taking into account variations in risk profiles within the sector in an effort to maximize the robustness of the composite index.[3]

With the assimilation of banking-type activities by life insurers as well as the growing linkages between banks and insurance companies, may become susceptible to potential threats to financial stability. Specifically,

insurers are confronted by risks associated with the nature of their business including underpricing risk arising from premiums being too low to cover claims, the risk associated with unforeseen or inadequately understood events as well as deviation risk where actual developments deviate from actuarial assumptions. Insurers are also impacted by asset price risk which affects the value, performance, returns, liquidity and structure of their investment portfolios. Additionally, insurers also face further risk associated with the rest of the financial sector such as contagion risk as well as operational, economic and management risk.

In light of the differences in risk exposures emanating from factors such as product offerings as well as varying investment portfolios, the stability of the insurance sector is assessed based on a disaggregation of the sector into general and life insurers.

Stability Index for General Insurers[4]

Over the period September 2012 to September 2015 there was significant fluctuation in the SIGI (see **Figure 1.0**). The worst performance of the sector over the period was observed for the September-2013 quarter. This was primarily due to deterioration in indicators related to reinsurance, actuarial, management soundness, earnings and profitability components. The impact of these movements were, however, offset by improvements in the capital adequacy, asset quality and liquidity components. A comparison of the average level of the SIGI in 2015 relative to 2014 showed an improvement in the stability of the general insurance sector. Notably, the Index value increased to 0.5 standard deviation above the prior 4-year historical average from 0.4 standard deviation above the prior 4-year average. This

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[1] Total Assets for NDTIs are as at end-September 2015.
[2] CAMELS: **C**apital Adequacy, **A**sset Quality, **M**anagement Soundness **E**arnings and Profitability, **L**iquidity and **S**ensitivity to Market Risk.

[3] CARAMELS: **C**apital Adequacy, **A**sset Quality, **R**einsurance and **A**ctuarial Issues, **M**anagement Soundness **E**arnings and Profitability, **L**iquidity and **S**ensitivity to Market Risk.
[4] The composite index for general insurers does not include the sensitivity to market risk due to the nature of their operations.

improvement was primarily due to improvements in all areas except profitability.

Figure 1.0: Stability Index for General Insurers
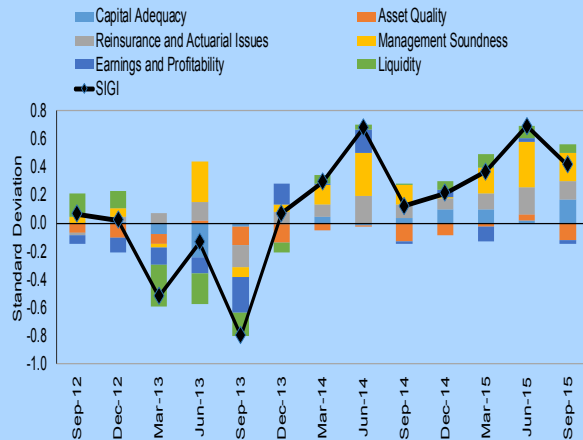
*Stability Index for Life Insurers*

For life insurers, there were also significant fluctuations in the SILI over the four year period. The worst performance of the sector over the period was observed in the March 2013 quarter and was due to deteriorations in all components of the Index except the sensitivity to market risk component (see **Figure 2.0**). In this period companies experienced losses associated with the NDX due to large exposures to sovereign debt. This resulted in a contraction of 32.0 per cent of the sector's net investment income for the quarter. For the calendar year to September 2015 the average level of the index showed an improvement in the stability of the life insurance sector in 2015 relative to 2014. In particular, the Index value increased to 0.6 standard deviation above the prior 4-year average from 0.2 standard deviation above the prior 4-year average for 2014. The improvement in the index was primarily due to increases in all components except the reinsurance and actuarial issue component.

Stability Index for Securities Dealers

Similar to DTIs, SDs in Jamaica typically engage in maturity transformation activities by using 'retail repurchase' agreements to fund long-term fixed income assets. Especially since prudential requirements are not

as robust as those in the banking sector, the sector is exposed to potentially large liquidity and systemic risks.

Figure 2.0: Stability Index for Life Insurers
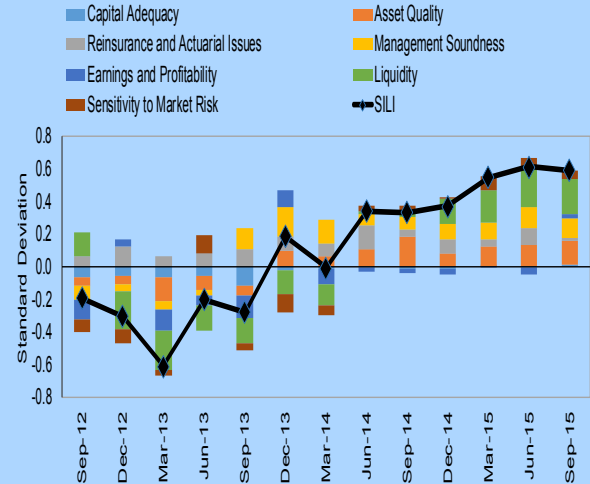
Over the period September 2012 to September 2015 there was significant fluctuation in the SISD (see **Figure 3.0**). The worst performance of the sector over the period was observed in the March-2013 quarter. This was due to the deterioration in the capital adequacy, profitability and foreign exchange risk components of the Index.

Figure 3.0: Stability Index for Securities Dealers
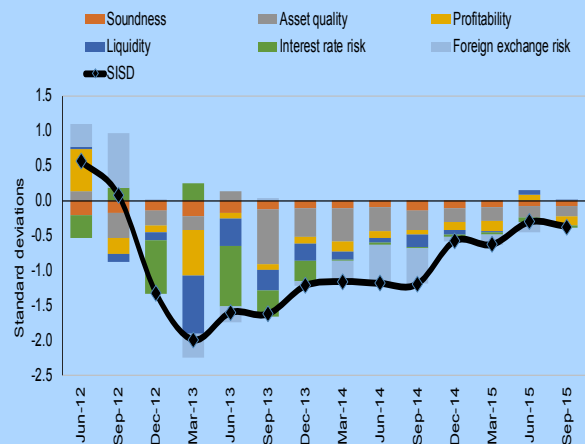
In this period SDs' net interest income as well as other income were impacted by the national debt exchange (NDX). Since then, there has been steady improvements in the SISD. The average level of the SISD improved to

0.4 standard deviation below the prior 4-year average for 2015 from 1.2 standard deviation below the prior 4-year average for the prior year. This was due to increases in all components except sensitivity to market risk, more specifically, the sector's exposure to interest rate risk.

3. *Financial System Developments*

3.1 Overview

During 2015, the asset base of the Jamaican financial sector expanded, largely driven by the performance of the commercial banks. For the DTI sector, these institutions continued to maintain adequate levels of capital and liquidity while there was continued improvement in profitability and asset quality during the review period.

Regarding the NDTFIs, as it relates to the SD sector, there was strong growth in the funds under management of the major securities dealers. Additionally, there was improvement in the capital adequacy ratio for the sector. The asset base of the insurance sector also expanded while the sector maintained strong levels of solvency and capital adequacy. Nonetheless, despite the growth in the asset base of the sector, insurance penetration has remained low. Furthermore, there is still underlying systemic risk related to the concentration in activity by three Domestic Systemically Important Bank (D-SIB) groups.

3.2 The Financial System

There was improvement in the depth of financial intermediation in Jamaica during 2015, as measured by total financial institutions' assets as a share of GDP (see **Figure 3.1**). The ratio increased marginally to 196.5 per cent at end-2015 relative to 191.1 per cent at end-2014. This increase in the ratio during 2015 was primarily due to faster growth in the financial system's asset base relative to growth in GDP. This indicator increased for Barbados to 226.0 per cent at end-2015, relative to 214.4 at the end of the previous year (see **Figure 3.1**).[1] The outturn for Barbados was due to an increase in financial institutions' assets. However, Barbados maintained its position as the country with the highest depth of financial intermediation in the Caribbean.

Figure 3.1 Depth of financial intermediation *(assets of financial corporations as % of GDP)*[2, 3]
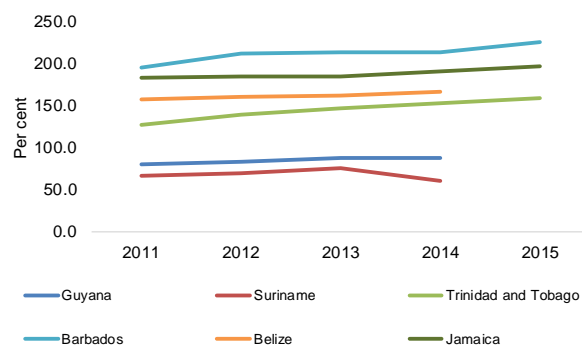
Source: Regional Central Banks

Figure 3.2 Growth in market shares in DTI and credit union assets *(growth between end-2014 and end-2015)*[4]
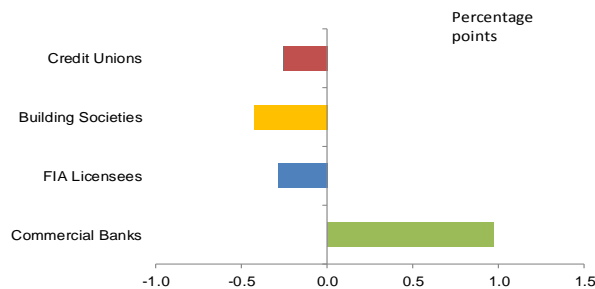
Figure 3.3 Market share in financial system assets [5]

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[1] NDTFIs' assets are as at end-September 2015.
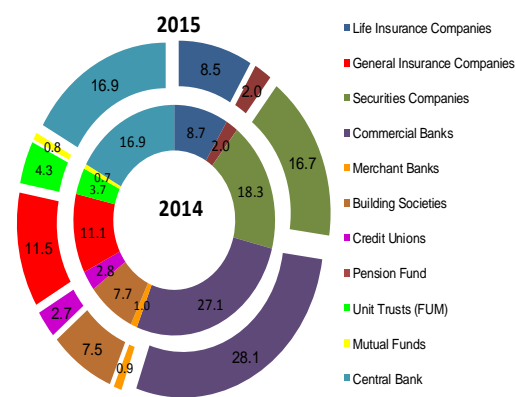
[2] Assets for Barbados excludes those of Securities Dealers. Equally, assets for Trinidad and Tobago excludes credit union assets,

[3] Data for the following countries were not available as at end-December 2015: Belize, Guyana and Suriname.

[4] DTIs include commercial banks, building societies and FIA licensees.

[5] Assets are defined as total balance sheet assets.

Figure 3.4 Distribution of major asset categories as a share of total DTIs' assets
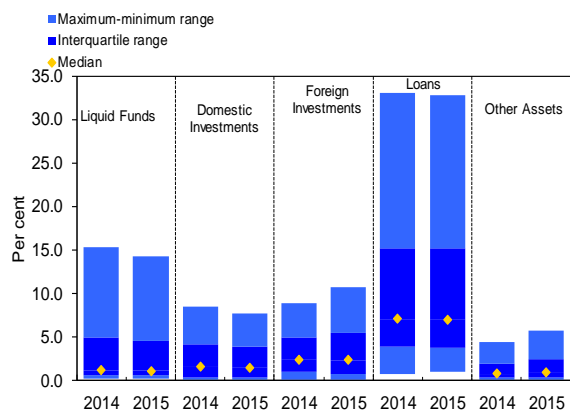

Figure 3.5 Major components of DTIs' aggregate balance sheet as end-2014 and end-2015
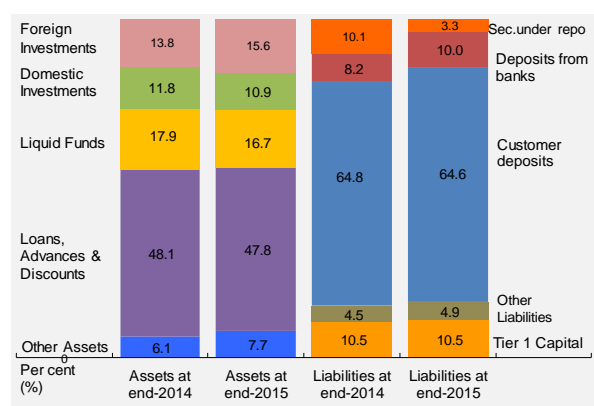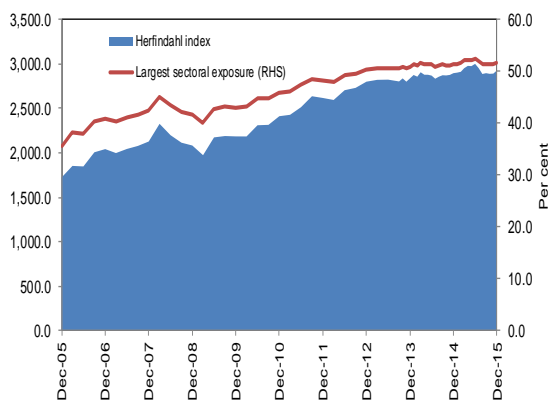

Figure 3.6 Concentration of DTIs' loan portfolio to private sector   (HHI 0-10,000)

Correspondingly, the depth of financial intermediation in Trinidad and Tobago increased to 159.6 per cent at end-2015 relative to 153.0 per cent at end-2014.

3.3 DTIs and Credit Unions
3.3.1 Market share of DTIs and Credit Unions

Commercial banks remained dominant within the DTI sector. The market share of commercial banks, in terms of asset base, increased to 71.1 per cent at end 2015, relative to 70.2 per cent at end 2013. Conversely, the market share of building societies, FIA licensees and credit unions declined by 0.4 percentage point, 0.3 percentage point and 0.3 percentage point to 19.6 per cent, 2.4 per cent and 6.9 per cent, respectively (see **Figure 3.2**). Additionally, commercial bank assets as a percentage of overall financial system assets increased to 28.1 percent at end-2015 (**Figure 3.3**).

3.3.2   DTIs balance sheet position

Most DTI subsectors recorded growth in their asset base with the exception of the FIA licensees' subsector. DTI total assets grew by 9.4 per cent to 1 260.9 billion at end-2015 relative to growth of 10.7 per cent the previous year. The asset growth for the review year was due primarily to a 13.1 per cent increase in the holdings of investments. Growth in this category reflected growth in foreign investments and domestic investments of 23.8 per cent and 0.7 per cent respectively. The increase in foreign investments largely reflected the continued depreciation of the domestic currency (see **Figure 3.4**). In addition, *Loans, Advances & Discounts* increased by 8.9 per cent, which reflected an increase of 9.7 per cent in domestic loans and an increase of 5.9 per cent in foreign currency loans.

Loans, Advances & Discounts comprised the largest share of DTIs' asset base, despite falling to 47.8 per cent at end-2015 relative to 48.1 per cent at end-2014 (see **Figure 3.4 and Figure 3.5**). Furthermore, the ratio of foreign currency loans to total loans declined to 21.3

per cent at end-2015, relative to 21.9 per cent at end-2014. Concurrently, DTIs net open position to capital decreased by 15.3 percentage points to 3.5 per cent.

The Herfindahl-Hirschman Index (HHI), used to measure concentration in private sector lending, increased by 1.1 per cent to 2 929.4 at end-2015 (see **Figure 3.6**).[6] Moreover, DTIs continued to have considerable exposure to the domestic household sector, and this sector represented the DTIs' largest exposure to the private sector during 2015. More specifically, household sector loans as a proportion of total loans increased marginally by 0.3 percentage point to 51.72 per cent at end-2015 (see **Table 3.1**). Furthermore, the DTIs' other significant exposures in the lending market were to *Distribution* (9.7 per cent), *Tourism* (6.5 per cent), *Overseas Residents* (5.9 per cent) and *Construction* (5.6 per cent) at end-2015 (see **Table 3.1**).

DTIs' asset quality, as measured by NPLs as a share of total loans, continued to improve during 2015. This development was largely due to an 11.9 per cent decline in NPLs relative to a decline of 2.2 per cent the previous year (see **Figure 3.7**). Furthermore, sectoral asset quality varied across all sectors. In addition, the construction sector had the highest NPL ratio despite having the most significant dollar value decline in NPLs (see **Figure 3.8**).

Table 3.1 Concentration of DTIs loan portfolio

Per cent	2011	2012	2013	2014	2015
AGRICULTURE & FISHING					
CONSTRUCTION & LAND DEV.					
DISTRIBUTION					
ELECTRICITY					
ENTERTAINMENT					
FINANCIAL INSTITUTIONS					
MANUFACTURING					
MINING, QUARRYING & PROC.					
PERSONAL NON BUS. LOANS TO INDIVS.					
PROFESSIONAL & OTHER SERVICES					
OVERSEAS RESIDENTS					
TOURISM					
TRANSPORT , STORAGE & COMM.					
PUBLIC SECTOR					

Figure 3.7 NPLs in the DTI sector

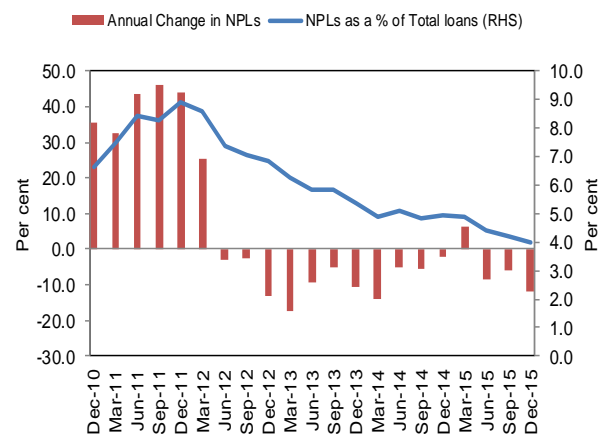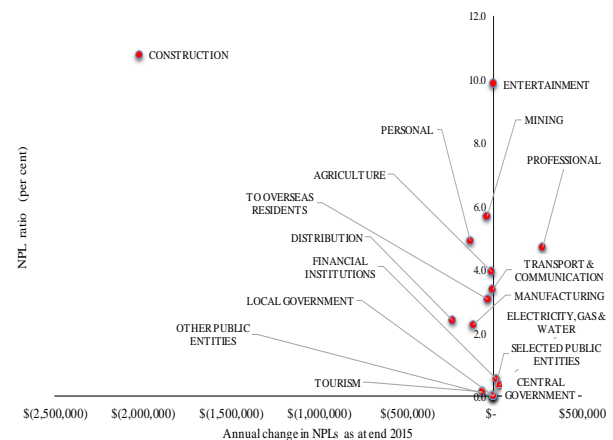**Figure 3.8** Sectoral asset quality of DTIs

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[6] The Herfindahl-Hirschman Index (HHI) is an indicator used to measure concentration. In this case, it is used to measure loan concentration within the private sector and is calculated by squaring the loan share of each sub-sector within the private sector loan market, and then summing the resulting numbers. The HHI index can range from close to zero to 10 000.

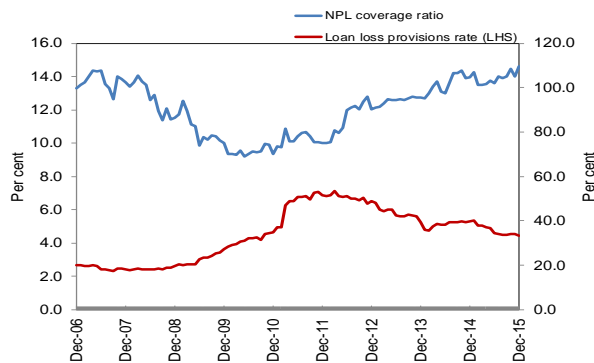**Figure 3.9** Loan loss provisioning rate and NPL coverage DTIs

Figure 3.10 Distribution of NPL coverage ratio in the domestic DTI sector (min, max and median)
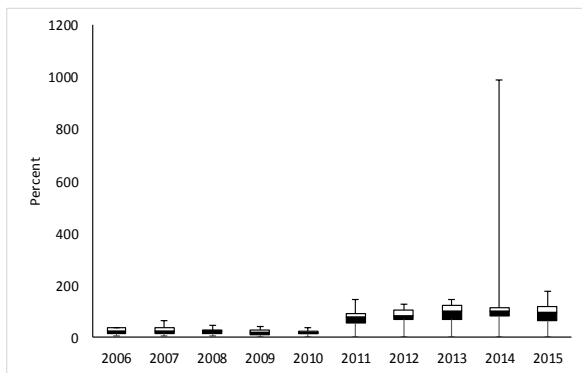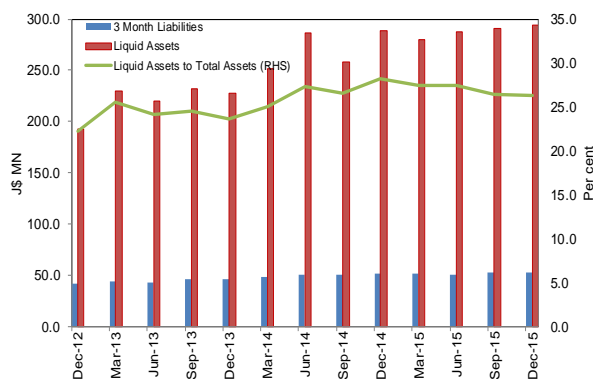

Figure 3.11 Liquidity conditions in the DTI sector

The NPL coverage ratio increased to 109.5 per cent at end-2015 from 104.7 per cent at end-2014 and continued to remain well above the full coverage of 100 per cent.[7] In contrast, there was a decrease in the median NPL coverage ratio to 95.5 per cent at end-2015 relative 99.3 per cent at end-2014 (see **Figure 3.9** & **Figure 3.10**). Loan loss provisions as a percentage of total loans decreased to 4.4 per cent at end-2015, relative to 5.3 per cent at end-2014. The reduction in loan loss provision was due to increased write-offs over the review period (see **Figure 3.9**).[8]

DTIs continued to maintain adequate levels of liquidity for 2015 despite liquid asset reserves in excess of the minimum statutory requirements decreasing by 44.7 per cent for 2015, relative to an increase of 115.8 per cent for the previous year.[9] Correspondingly, the ratio of liquid assets to total assets decreased to 26.3 per cent at end-2015 relative 28.2 per cent at the close of the previous year. The decrease in the ratio was due mainly to DTIs' slower pace of growth in liquid assets relative to the asset base, particularly within the building societies sub-sector **(see Figure 3.11).**

Consistent with the maintenance of relative stability in funding risk over the review period, funding from deposits continued to represent DTIs' main source of asset financing. Total deposits increased by 12.9 per cent to $771.8 billion, representing 72.4 per cent of total liabilities at end-2015 relative to 69.9 per cent at end-2014. In addition, total loans as a share of deposits

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[7] NPL coverage ratio measures a bank's ability to absorb potential losses from its non-performing loans. It is calculated as provision for impairment under the International Financial Reporting Standards plus prudential provisions for expected losses based on regulatory criteria as a ratio to NPLs.

[8] Loan loss provisions are net new allowances that DTIs make in the period against bad or impaired loans. This is done based on their judgement as to the likelihood of losses. It is calculated provisions of impairment under the International Financial Reporting Standards plus prudential provisions as a percentage of total loans.

[9] DTIs are required to hold reserves amounting to 26.0 per cent of their average liabilities in the form of liquid assets at the Bank of Jamaica.

decreased to 78.0 per cent at end-2015 relative to 81.0 per cent at end-2014 (see **Figures 3.12** and **3.13**).

The CAR for DTIs increased during 2015. Of note, the mean CAR increased to 19.0 per cent at end-2015 relative to 17.7 per cent at end-2014 (see **Figure 3.14**). The quality of regulatory capital, as measured by the ratio of Tier 1 capital to total regulatory capital, declined marginally to 100.4 per cent at end 2015 relative to 100.5 per cent at end 2014. This performance largely reflected a reduction of non-distributable retained earnings which remained the largest component of Tier 1 capital, totaling 55.0 per cent at end-2015 relative to 48.2 per cent at end 2014. In contrast, the Tier 1 capital to risk weighted assets ratio decreased to 15.5 per cent from 16.7 per cent the previous year.

3.3.3 DTIs' earnings and profitability

For 2015, the DTIs recorded net profits of $23.6 billion reflecting an increase of 6.5 per cent relative to 2014 (see **Figure 3.19**). Conversely, operating profits decreased during 2015 to 4.7 billion relative to 5.2 billion for 2014. The decrease in this ratio was primarily due to an increase in operating expenses (see **Figure 3.15**). Similarly, the sector's return on equity (ROE) decreased by 4.3 percentage points to 12.7 per cent for the year. A decomposition of the ROE showed increases in the operating margin and the risk weighted assets density ratio (see **Figure 3.16**).[10] Importantly, DTIs leverage ratio as measured by tier 1 capital as a percentage of total assets decreased during 2015.

[10] Operating margin is equal to net profit as a percentage of gross income. The risk weighted assets density ratio is calculated as risk weighted assets as a percentage of total assets. Equity multiplier is equal to total assets as a proportion of capital & reserves.

Figure 3.12 Distribution of DTIs' funding sources as a share of total liabilities as at end-2015 and end-2014
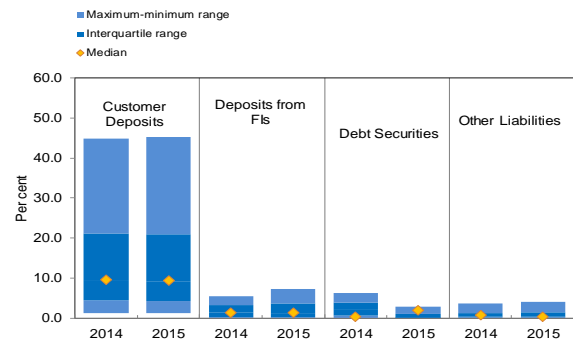

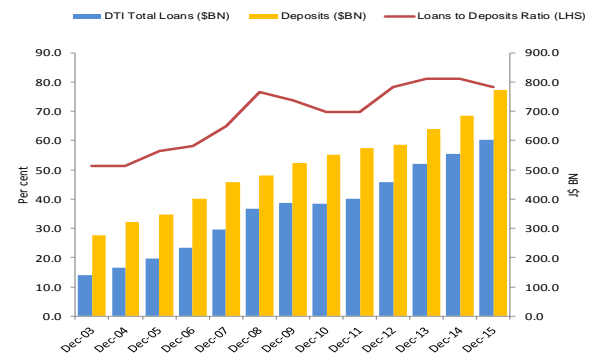**Figure 3.13** Trends in loans and deposits of the DTI sector

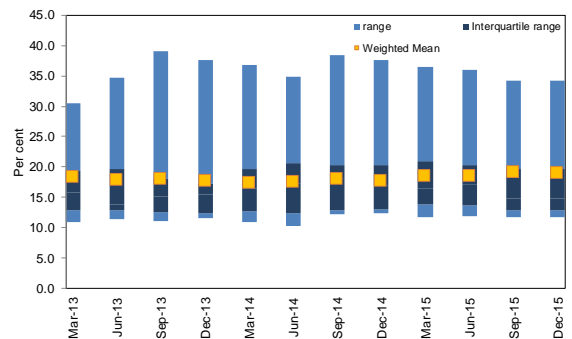
Figure 3.14 Distribution and average of capital adequacy ratio

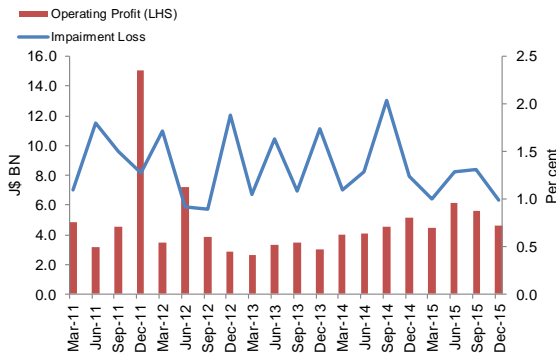**Figure 3.15** Operating profit and impairment losses for DTIs

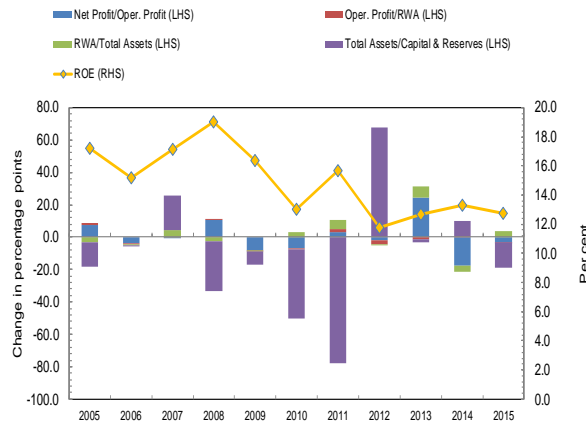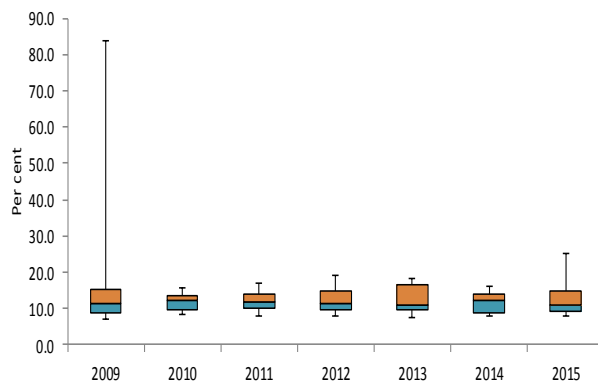**Figure 3.16** Decomposition of DTIs' ROE

Figure 3.17 Distribution of DTIs' leverage

Notably, the median leverage ratio decreased to 10.9 per cent relative to 12.1 per cent at end-2014 consistent with the decline in ROE for 2015 (see **Figure 3.17**).

In addition, DTIs' ROA remained relatively constant at 2.0 per cent as at end-2015. Moreover, the median ROA increased to 1.3 per cent in 2015 relative to 1.0 as at end-2015 (see **Figure 3.18**). This reflected an increase in net interest income of 8.0 per cent for DTIs during 2015, which was largely due to increases in *Loans Advances & Discounts*. Conversely, interest expenses decreased by 5.0 per cent for 2015, primarily as a result of a decrease in borrowing expenses (see **Figures 3.19** to **3.21**). Furthermore, net interest margin for DTIs was 4.5 per cent at end 2015 relative to 4.3 per cent at end 2014 (see **Figures 3.20**).[11]

3.4 Non-Deposit-Taking Financial Institutions (NDTFIs)

The asset base of NDTFIs increased for the calendar year to end-September 2015. The sector's asset base expanded by 4.0 per cent for the review period, relative to 10.3 per cent growth for 2014. The expansion in the sector's total assets was influenced by increases in assets of all NDTFI subsectors, with the exception of securities dealers (see **Figure 3.3** & **Figure 3.23**).[12] Within the NDTFI sector, the asset base of collective investment schemes (CIS) reflected the most significant growth for the review period. The asset base of these schemes increased by 22.0 per cent for the nine-month period ending September 2015, relative to an increase of 73.0 per cent for 2014. Regarding life insurance and general insurance companies, the asset base of these institutions grew by 4.5 per cent and 9.1 per cent, respectively, relative to growth rates of 7.6 per cent and 3.6 per cent for the previous year. However, securities

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[11] Net interest margin is equal to net interest income/average earning assets.

[12] Non-deposit taking financial institutions include pension funds, collective investment schemes, securities dealers, life insurance and general insurance

dealers' asset base declined by 2.5 per cent for the calendar year to end-September 2015, relative to growth of 4.4 per cent for 2014. At end-September 2015, the assets of securities dealers, pension funds and life insurance companies represented shares of 38.0 per cent, 26.3 per cent, and 19.5 per cent, respectively, of the asset base of the NDTFI sector.

3.4.1 Securities Dealers

Securities dealers' asset base was $532.2 billion as at end-September 2015, relative to $545.9 billion for end-2014. The decline in the asset base is largely due to the cessation in the operations of one major SD. In addition, there was a sharp decline in *Liquid Assets* of 41.9 per cent relative to end-2014. Regarding off-balance sheet assets, the funds under management (FUM) of the major SDs increased to $870.4 billion at end-September 2015 relative to $794.1 billion at end-2014 (see **Figure 3.24**).[13] The sector's increase in FUM for the review period was driven by a 28.7 per cent increase in holdings of assets classified as *Other Assets* to $541.0 billion at end-September 2015, as well as an increase of over 200.0 per cent in *Foreign Securities* relative to end-2014.

Risk-weighted assets of the SDs fell by 2.6 per cent to $299.0 billion at end-September 2015 (see **Figure 3.22**). This decrease, coupled with a marginal decrease in regulatory capital influenced an increase in the sector's CAR to 21.5 per cent at end-September 2015 (see **Figure 3.25**). Similarly, the sector's primary ratio, measured as regulatory capital to total assets, increased by 0.3 percentage point to 12.8 per cent at end-September 2015. This was largely due to a reduction in the total asset base of the major securities dealers of 3.4 per cent to $501.1 billion. Regulatory capital decreased by 0.6 per cent to $64.3 billion.

Figure 3.18 Distribution of DTIs' return on assets (ROA)
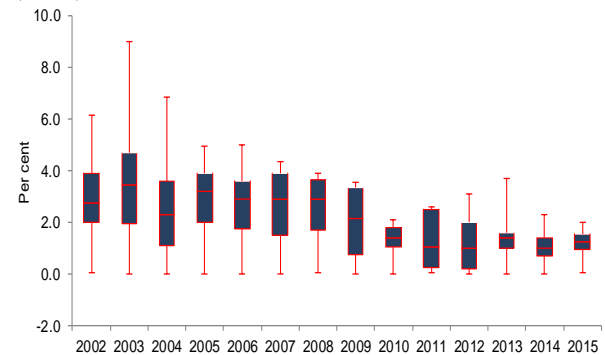

Figure 3.19 DTIs' sources of revenue, charges for provisions and net profit (JMD billions)
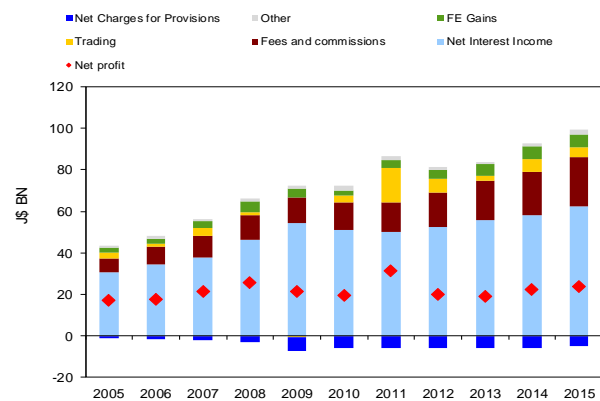

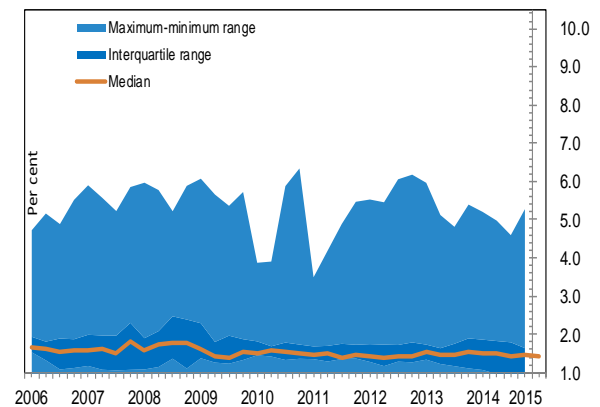**Figure 3.20** Interest margin for retail operations of DTIs

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[13] Major securities dealers are the twelve largest securities dealers that account for 70.0 per cent of total securities dealers' assets.

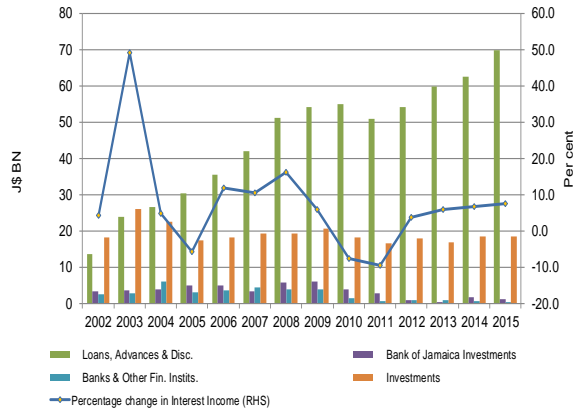**Figure 3.21** DTIs' sources of interest income

Figure 3.22 Risk-weighted assets (Two largest banks vs banking sector; securities dealers (SDs))
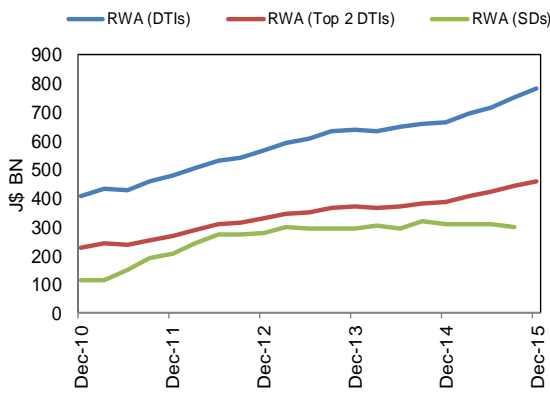

Figure 3.23 Change in market share in NDTFIs assets (change between end-2014 and end- September 2015)
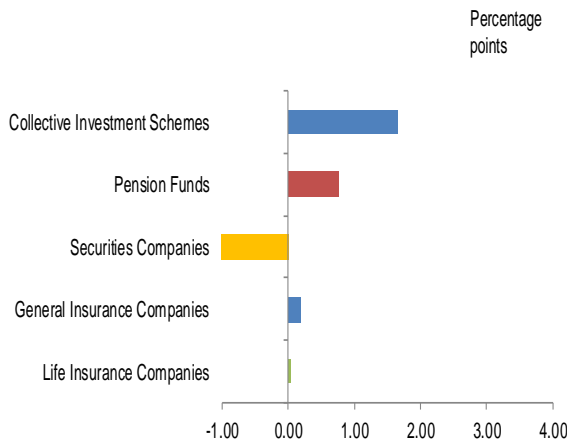
SDs' sensitivity to foreign exchange risk, as measured by the net open position to capital ratio decreased to 11.8 per cent end-September 2015 relative to 12.9 per cent at end-2014 (see **Figure 3.26** and **Table 3.4A**). The decline in the ratio largely reflected a decrease of 8.5 per cent in the net open position for the review period.

For the calendar year to September 2015, the SDs' reflected a ROA of 1.3 per cent and an ROE of 10.0 per cent (see **Figure 3.27** and **Table 3.3**). The sector's leverage ratio, which is measured as total liabilities divided by total assets, was 86.7 per cent at end-September 2015. Furthermore, the liquidity ratio, which is computed as the sector's holdings of liquid assets to current liabilities was 7.0 per cent at the close of the same period.

3.4.2   Insurance Companies

The insurance sector continued to be dominated by life insurance companies, which accounted for 80.7 per cent of the sector's assets. The life insurance sub-sector consists of five companies, with the two largest companies accounting for 64.2 per cent of the sub-sector's total assets as at end-September 2015, compared to 63.6 per cent as at end-2014. The general insurance sub-sector consists of nine companies with the three largest companies accounting for 50.8 per cent of the subsector's assets as at end-September 2015 which is a marginal improvement of 0.2 per cent, relative to end-2014.

Similar to DTIs, there was growth in the insurance sector's asset base for the calendar year to end-September 2015. Asset growth for the insurance sector was 5.4 per cent, lower than growth of 6.9 per cent for 2014 (see **Figure 3.28**). In particular, there were respective increases in the asset base for life and general insurance companies of 4.5 per cent and 9.1 cent. For life insurance companies, asset growth was driven predominantly by an increase in *Total Equity*

Investments of 13.2 per cent. The increase in the asset base of general insurance companies was influenced by growth of 4.5 per cent in *Total Investments.*

Investments in government securities accounted for 53.5 per cent of the total assets of insurance companies, relative to 54.1 per cent in the previous year of life insurance assets and general insurance assets, respectively, at end-September 2015, relative to 59.8 per cent and 30.6 per cent at end-2014 (see **Figures 3.29** and **3.30**). As at end-September 2015, real estate, unquoted equities and debtors as a share of total assets for life insurance and general insurance companies decreased to 82.4 and 30.7 per cent, respectively, relative to 83.0 per cent and 36.3 per cent, the previous year, representing a reduced degree of asset risk for these sub-sectors.[14] In regards to insurance sub-sectors, government securities accounted for 58.9 per cent and 30.7 per cent

Despite growth in the sector's asset base, insurance penetration continued to be low as at end-September 2015 (see **Figure 3.31** and **Table 3.5**).[15] Insurance penetration for life insurance companies declined by 0.6 percentage point to 1.9 per cent of GDP. Similarly, insurance penetration for general insurance companies decreased by 0.3 percentage point to 1.9 per cent of GDP at end-September 2015 relative to end-2014. These developments suggest that the market continues to be relatively underdeveloped and was further indicated by an insurance density which remained flat at 0.001 per cent at end-September 2015.[16]

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[14] Real estate, unquoted equities and debtors are asset classes within the insurance sector which have the largest probability of being impaired. This is largely due to the fact that real estate and unquoted equities are illiquid assets, while debtors expose the sector to credit risk.

[15] Insurance penetration is defined as ratio of premium volume to GDP. It measures the importance of insurance activity relative to the size of the economy.

[16] Insurance density is the ratio of total gross premiums to total population.

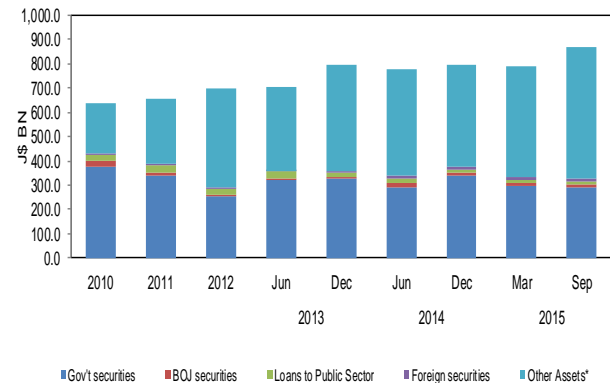**Figure 3.24** Securities dealers' fund under management (FUM) (J$ billions)

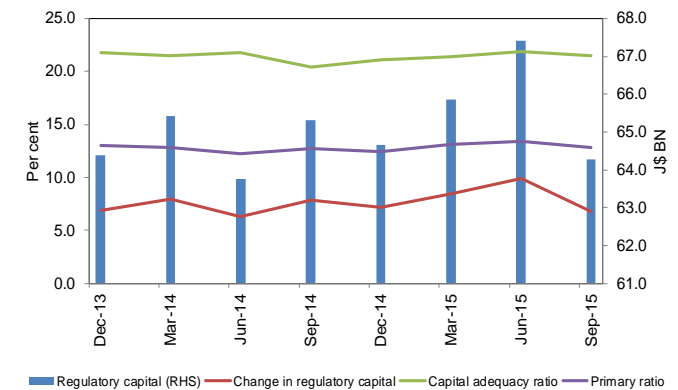**Figure 3.25** Securities dealers' regulatory capital, capital adequacy and primary ratios

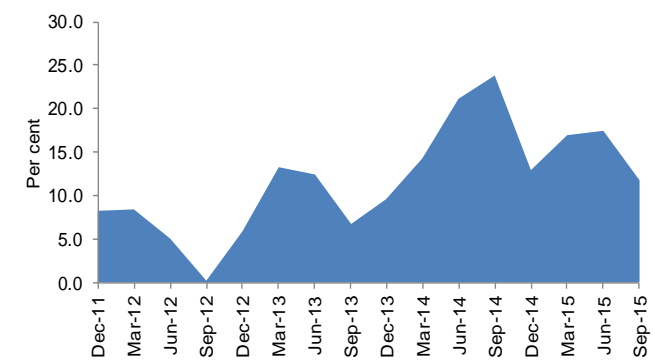**Figure 3.26** Securities dealers' net open position to capital

Figure 3.27 Securities dealers' return on assets and return on equity

Figure 3.28 Total assets of insurance companies

Figure 3.29 Distribution of assets of life insurance companies

The total gross written premium (GWP) income of insurance companies was $62.4 billion for the calendar year end-September 2015 (see **Figure 3.32**). Furthermore, for general insurance companies, the GWP was $31.1 billion during the review period. Claims incurred by the life insurance subsector totaled $10.2 billion while claims incurred by general insurance companies amounted to $6.76 billion (see **Figure 3.33**). The claims ratio, which is measured as the ratio of claims to earned premiums for general insurance companies, was 21.6 per cent at end-September 2015.[17,18]

Net investment income of the insurance sector amounted to $23.34 billion for the review period (see **Figure 3.34**). In addition, profit before tax and extraordinary expense for the insurance sector was $15.56 billion for the review period, relative to $17.23 billion as at end-2014. The lower profits were attributable to the profit performance of the general insurance sub-sector, which totaled $2.89 billion for the calendar year to end-September 2015 relative to $4.25 billion for 2014 (see **Figure 3.35**).

The insurance sector's overall profitability declined relative to the previous year. The ROA and ROE of the life insurance sector decreased to respective values of 4.7 per cent and 20.7 per cent at end-September 2015, relative to values of 5.1 per cent and 21.2 per cent at end-2014. Similarly, the ROA for the general insurance sector decreased to 4.7 per cent while the ROE decreased to 13.2 per cent at end-September 2015, relative to respective values of 7.3 per cent and 21.2 per cent at end-2014.

The capital adequacy and solvency of the insurance companies remained at adequate levels up to end-September 2015. In particular, the sector's median solvency ratio, as measured by available capital to total

[17] Earned premium is GWP adjusted by the unearned premium provisions at the beginning and end of the accounting period.
[18] The breakdown of data required for the calculation of this ratio is not available for life insurance companies.

liabilities, decreased to 147.7 per cent relative to 153.0 per cent end-2014 (see **Figure 3.36**).

The MCT ratio for the general insurance sub-sector was 294.7 per cent.

The re-insurance retention ratio exhibited mixed results for the review period.[19] At end-September 2015, the retention ratio for life insurance companies increased marginally to 98.0 per cent relative to 97.8 per cent at end-2014. However, general insurance companies' retention ratio decreased to 39.7 per cent at end-September 2015 from 60.4 per cent for end-2014 (see **Figures 3.38** & **3.39**).

3.5 Banking Groups

3.5.1 Domestic Systematically Important banking Groups (D-SIB)

A D-SIB framework was used to analyze banking groups in Jamaica which include DTIs and their affiliate securities dealers and insurance companies. The results showed that the number of D-SIB groups remained at three at end-September 2015, relative to end-2014. At end-September 2015, NCB group attained the highest score of 1.24, while BNS group and Sagicor group attained scores of 0.94 and 0.40, respectively. NCB group scored higher than BNS group in all categories, except non-substitutability, which measures the extent to which a banking group is a market participant and client service provider. The difference in the scores within this category was largely due to higher lending to the Government by the commercial bank within the BNS group. Notwithstanding, the 'interconnectedness' category accounted for the largest

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[19] Reinsurance retention ratio measures the amount of risk being absorbed by an insurer rather than passing it on to a reinsurer. Measured as the ratio of net premiums written to gross premiums, the ratio captures the net amount of risk which the reinsurer keeps for his own account. The lower the ratio, the more the company is able to avoid financial distress following a large claim.

Figure 3.30 Distribution of assets of general insurance companies
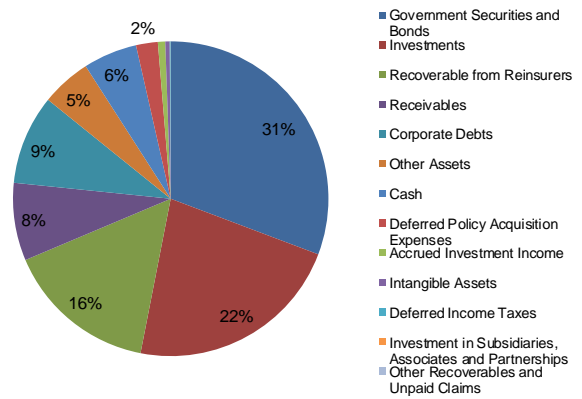
Figure 3.31 Insurance penetration (% of GDP)
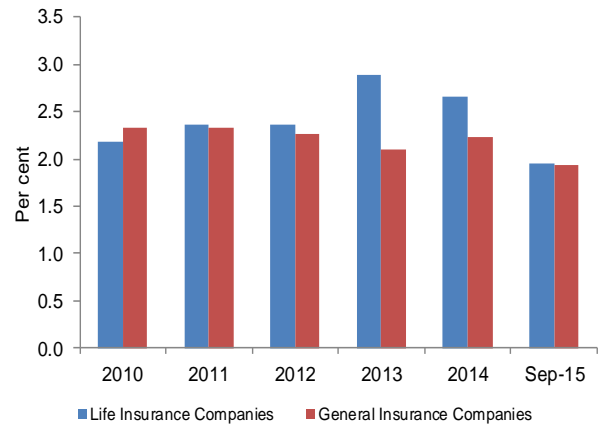
Figure 3.32 Premium income and growth of insurance companies
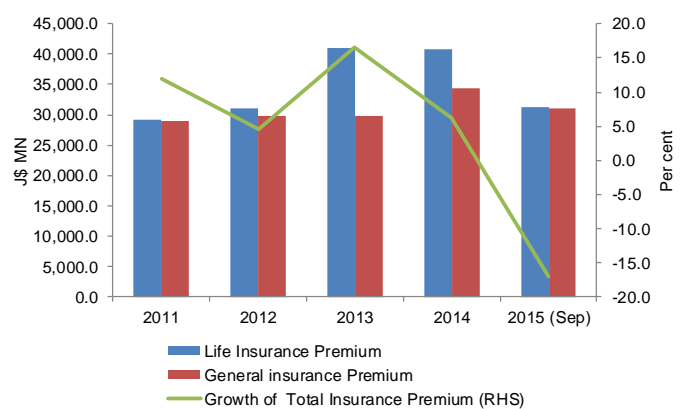
difference in scores between NCB group and BNS group, mainly reflecting differing levels of interconnectedness between the commercial banks. NCB group attained a higher overall score of systemic relevance at end-September 2015, relative to end-2014, while the scores BNS group and Sagicor group reflected a decline in systemic relevance. The higher score for NCB group was mainly due to a significant increase in 'interconnectedness', while the reverse was true for BNS group.

3.5.2 Interconnectedness in the Interbank Market

The standard measure of connectivity in the interbank market, continued to reflect relatively sparse interconnection due to a concentration of liquidity, particularly within the D-SIBs. The end-quarter average number of relationships among DTIs and SDs in Jamaica decreased to 4 for 2015, from 5 for 2014, with the maximum possible number of relationships being 300.[20]

There was also an increase in the ratio of capital to total assets to 21.9 per cent at end-September 2015 from 20.6 per cent at end-2014 (see **Figure 3.37**). All life insurance companies surpassed the minimum regulatory capital requirements with respect to the Minimum Continuing Capital and Surplus Requirements (MCCSR) ratio. The MCCSR ratio for the life insurance sub-sector was 265.1 per cent in comparison to the minimum requirement of 150.0 per cent. Similarly, all general insurance companies exceeded their minimum capital regulatory requirement of a Minimum Capital Test (MCT) ratio of 250.0 per cent.

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[20] The number of relationships refers to the number of financial institutions with which a particular DTI or securities dealer conducts interbank transactions.

Figure 3.33 Earned premium, claims incurred and claims ratio of general insurance
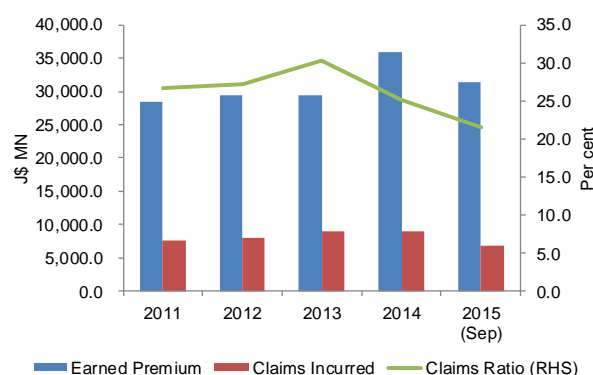
Figure 3.34 Total income (GWP + investment income) of the insurance sector
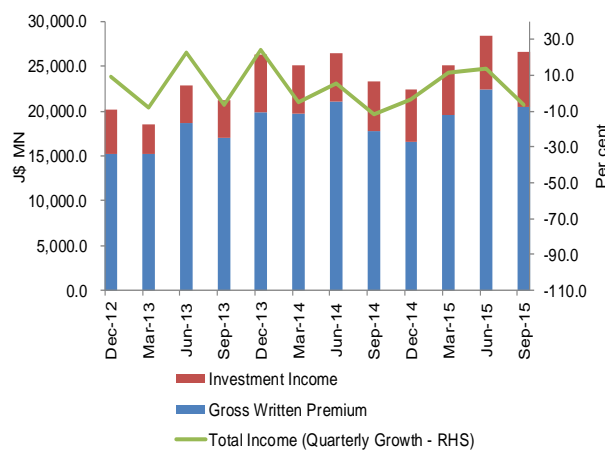
Figure 3.35 Profit before tax and growth of insurance companies

In addition, the end-quarter average connectivity in the banking system decreased to approximately 1.3 per cent during 2015, relative to 1.7 per cent for 2014, for the 25 financial institutions assessed (see **Figure 3.40**).[21] Despite the low connectivity within the interbank market, six DTIs remained extremely vulnerable to their subsidiaries. These institutions recorded an average net exposure of $1.8 billion for 2015. Meanwhile, the three DTIs that form part of the D-SIB groups had a higher average net exposure to their subsidiaries of $3.6 billion. However, there was a decrease in the average end-quarter value of net exposures among DTIs and SDs (see **Figure 3.41**). During 2015, the average quarterly net exposure was $1.08 billion relative to $1.4 billion in 2014. [22,23]

Figure 3.36 Distribution of the solvency of insurance companies (available to required solvency ratio)
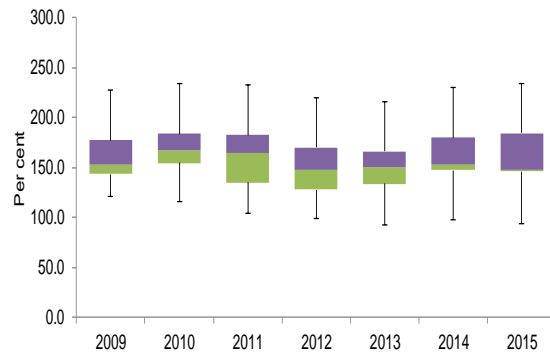
Figure 3.37 Capitalization of the insurance sector
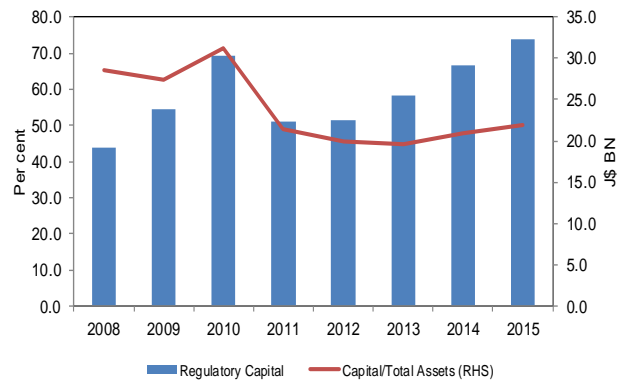
Figure 3.38 Life insurance retention ratio

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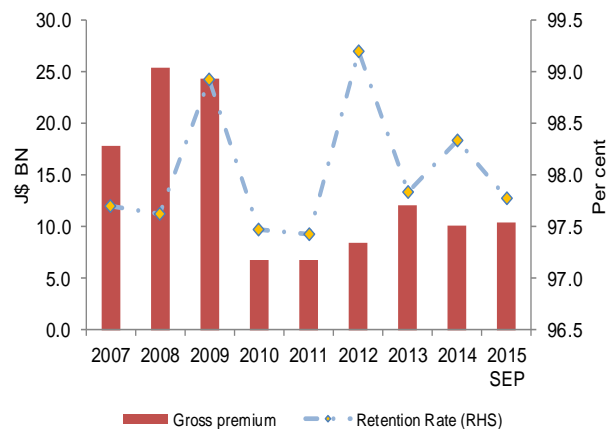
[21] The connectivity for each institution is calculated as the number of relationships with the other institutions relative to the maximum number of relationships (24 in this case). It thus ranges between 0 per cent and 100.0 per cent. The average connectivity is the average for all institutions.
[22] This includes the exposure of institutions to their subsidiaries.
[23] The quarterly average for 2015 captures the December 2014 to September 2015 quarters.

Figure 3.39 General insurance retention ratio
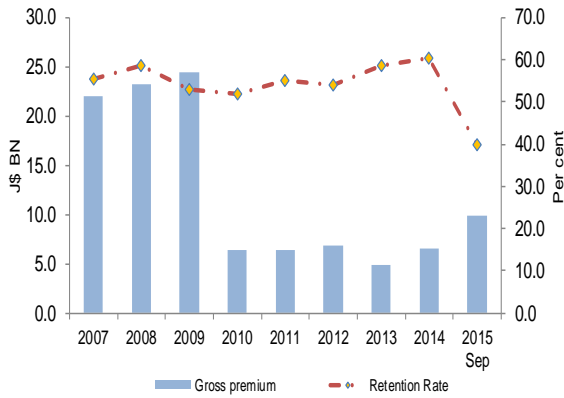
Figure 3.41 Interbank exposure ratios for 2015[25]
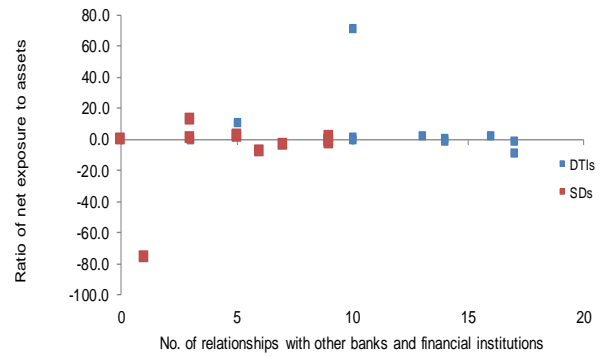
Figure 3.40 Debtor and creditor positions in DTIs and securities dealers for 2015[24]
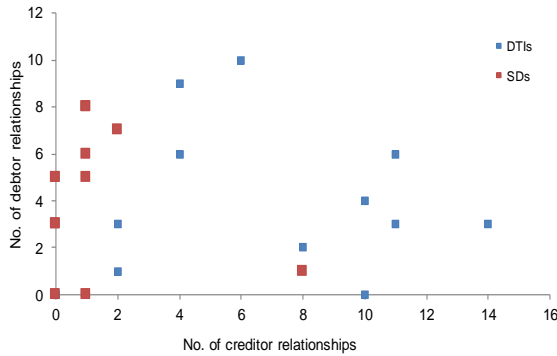
Table 3.2 Systemic importance of Jamaican banking groups

Rank	Institution Name	Size	Interconnectedness	Non-Substitutability	Complexity	TOTAL SCORE
1	NCB Group	0.26	0.47	0.29	0.21	1.24
2	BNS Group	0.22	0.22	0.37	0.12	0.94
3	Sagicor Group	0.15	0.06	0.06	0.13	0.40
4	JNBS Group	0.08	0.02	0.08	0.10	0.28
5	VMBS Group	0.05	0.03	0.04	0.17	0.29
6	JMMB Group	0.09	0.03	0.02	0.09	0.23
7	FCIB Group	0.04	0.12	0.09	0.01	0.26
8	FGB Group	0.03	0.01	0.03	0.02	0.09
9	GLI Group	0.04	0.01	-	0.04	0.08
10	Other	0.04	0.04	0.01	0.11	0.20
	Total Sum	**1.00**	**1.00**	**1.00**	**1.00**	**4.00**

indicates importance within a category

indicates overall systemic importance

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[24] Points in the chart represent the end-quarter average for individual institutions.

[25] Points indicate individual institutions.

Table 3.3 Financial Soundness Indicators for Deposit-Taking Institutions[1]

Indicator (%)	Categories	Dec-14	Mar-15	Jun-15	Sep-15	Dec-15
Core Indicators						
Regulatory capital to risk-weighted assets	Capital adequacy	16.0	15.7	15.6	15.1	15.0
Tier 1 capital to risk-weighted assets	Capital adequacy	16.1	15.8	15.7	15.2	15.1
Non-performing loans (net) to capital	Capital adequacy	11.4	11.8	10.7	10.2	9.4
Non-performing loans to total loans	Assets quality	4.9	4.9	4.4	4.2	4.0
Return on assets	Earnings & Profitability	0.6	0.5	0.6	0.6	0.5
Return on equity	Earnings & Profitability	3.9	3.3	4.1	3.7	3.0
Interest margin to income	Earnings & Profitability	50.7	51.4	53.6	52.9	52.0
Non-interest expenses to income	Earnings & Profitability	24.8	25.8	25.0	24.3	27.4
Liquid assets to total assets	Liquidity	28.2	27.4	27.4	26.5	26.3
Duration on assets -Domestic Bonds	Sensitivity to Market Risk	1.1	1.1	1.3	0.8	0.0
Duration on assets- Global Bonds	Sensitivity to Market Risk	2.8	2.7	2.8	2.8	0.0
NOP to capital	Sensitivity to Market Risk	18.8	1.1	0.5	4.7	3.5
Encouraged Indicators						
Capital to assets	Capital adequacy	14.8	15.4	15.4	15.3	15.2
Trading income to total income	Earnings & Profitability	10.7	10.7	9.6	9.7	9.8
Personnel expenses to non-interest expenses	Earnings & Profitability	38.1	38.5	40.2	38.3	37.6
Spread between lending & deposits rates [2]	Earnings & Profitability	12.8	13.7	14.0	13.9	13.9
Deposits to total (non-interbank) loans	Liquidity	138.4	137.0	141.9	141.6	142.5
Foreign-currency-denominated loans to total loans	Foreign Exchange risk	24.5	23.0	23.2	24.3	23.7
Foreign-currency-denominated liabilities to total liabilities	Foreign Exchange risk	37.5	38.0	41.6	41.2	41.2
Net open position in equities to capital	Foreign Exchange risk	20.8	19.9	21.7	21.1	20.9
Household debt to GDP	Household sector leverage	20.9	16.6	16.7	17.1	6.7
Residential real estate loans to total loans	Exposure to real estate	24.1	24.5	24.9	24.3	20.9
Commercial real estate loans to total loans [3]	Exposure to real estate	0.2	0.2	0.2	0.2	0.2

Notes:

[1] Deposit-taking Institutions (DTIs) include commercial banks FIA licensees and building societies.

[2] Weighted by assets size.

[3] Represents data for building societies only.

Table 3.4 **Financial Soundness Indicators for Securities Dealers and Insurance Companies**

Indicator (%)	Categories	Dec-14	Mar-15	Jun-15	Sep-15
A. Securities Dealers [1]					
Regulatory capital to risk-weighted assets	Capital adequacy	21.1	21.4	21.9	21.5
Tier 1 capital to risk-weighted assets	Capital adequacy	18.1	18.8	19.4	19.3
Non-performing loans (net) to capital	Capital adequacy	1.6	1.7	1.3	0.6
Non-performing loans to total loans	Assets quality	21.8	22.8	22.1	21.2
Return on assets	Earnings & Profitability	0.4	0.3	0.6	0.4
Return on equity	Earnings & Profitability	3.0	2.6	4.7	2.8
Interest margin to income	Earnings & Profitability	29.4	30.8	29.8	30.9
Non-interest expenses to income	Earnings & Profitability	29.5	33.5	26.2	29.4
Liquid assets to total assets	Liquidity	13.3	11.3	12.4	12.4
Duration on assets -Domestic Bonds	Sensitivity to Market Risk	1.7	1.8	1.4	1.4
Duration on assets- Global Bonds	Sensitivity to Market Risk	5.5	5.7	5.3	5.1
NOP to capital	Sensitivity to Market Risk	12.9	16.9	17.4	11.8
B. General Insurance					
Net premium to Capital	Capital adequacy	22.5	21.5	22.1	20.6
Capital to Assets	Capital adequacy	29.8	29.5	28.0	29.6
(Real estate + unquoted equities + debtors) to total assets	Assets quality	7.4	8.6	10.3	6.9
Receivables to gross premiums	Assets quality	49.2	44.7	47.6	32.9
Equities to total assets	Assets quality	2.0	2.0	1.9	1.9
Net technical reserves to net claims paid in last 3 years	Reinsurance & acturial issues	572.6	427.2	469.5	429.8
Risk retention ratio (net premium to gross premium)	Reinsurance & acturial issues	60.3	42.3	34.6	39.7
Gross premium to number of employees J$(000)	Management Soundness	5.6	7.9	10.1	8.4
Assets per employee J$(000)	Management Soundness	50.3	52.5	56.1	54.9
Net Claims to net premium (loss ratio)	Earnings & Profitability	35.2	58.9	52.7	53.7
Total expenses to net premium (expense ratio)	Earnings & Profitability	98.1	105.4	91.4	98.3
Combined ratio (loss + expense ratio)	Earnings & Profitability	133.2	164.2	144.2	152.0
Investment Income to net premium	Earnings & Profitability	11.3	15.9	17.8	16.0
Return on Equity	Earnings & Profitability	5.5	3.4	6.3	5.9
Liquid assets to total liabilities	Liquidity	84.1	85.9	85.5	84.5
C. Life Insurance					
Capital to technical reserves	Capital adequacy	76.4	79.1	77.0	81.5
(Real estate + unquoted equities + debtors) to total assets	Assets quality	2.5	2.7	2.7	2.9
Receivables to gross premiums	Assets quality	53.4	57.6	56.3	62.5
Equities to total assets	Assets quality	1.8	1.9	2.1	1.9
Net technical reserves to net premium paid in last 3 years	Reinsurance & actuarial issues	830.4	855.8	955.2	796.2
Risk retention ratio (net premium to gross premium)	Reinsurance & actuarial issues	97.8	98.1	98.0	98.0
Gross premium to number of employees J$(000)	Management Soundness	5.2	5.4	5.5	5.4
Assets per employee J$(000)	Management Soundness	134.6	136.6	139.6	140.7
Expenses to net premium (expense ratio)	Earnings & Profitability	50.5	63.6	52.6	50.0
Investment Income to investment assets	Earnings & Profitability	2.1	2.0	2.2	2.2
Return on Equity	Earnings & Profitability	1.7	1.1	1.1	3.0
Liquid assets to total liabilities	Liquidity	24.4	26.5	29.2	29.3
Duration on assets -Domestic Bonds	Sensitivity to market risk	1.1	1.1	1.1	1.1
Duration on assets- Global Bonds	Sensitivity to market risk	6.6	7.7	7.5	7.4

Notes:

[1] Includes the top-12 securities dealers.

Table 3.5 Sectoral Indicators of Financial Development

Sub-sector	Indicator	2011	2012	2013	2014	2015
Banking	Total number of DTIs	13	13	12	11	11
	Number of branches and outlets	173	173	166	165	165
	Number of branches/thousands population	0.06	0.06	0.06	0.06	0.06
	Bank deposits/GDP (%)	41.7	44.5	45.1	44.4	47.6
	Bank assets/total financial assets (%)[1]	34.9	36.6	37.2	35.8	36.7
	Bank assets/GDP (%)	63.8	66.2	67.8	69.5	72.4
Insurance	Number of insurance companies	14	14	14	15	14
	Gross premiums/GDP (%)	4.5	4.6	5.0	4.9	4.9
	Gross life premiums/GDP (%)	2.3	2.4	2.9	2.7	2.6
	Gross non-life premiums/GDP (%)	2.2	2.3	2.1	2.2	2.3
	Insurance assets/GDP (%)	18.8	19.6	21.0	20.7	20.7
	Insurance assets/total financial assets (%)	10.0	10.3	10.8	11.0	10.7
Pensions	Types of pension plans					
	# Defined Benefit plan	116	116	111	110	107
	# Defined Contribution plan	347	347	333	319	308
	Pension fund assets/total financial assets (%)	12.2	12.4	11.9	11.4	11.5
	Pension fund assets/GDP (%)	22.3	22.4	21.6	22.2	22.6
Mortgage	Mortgage assets/total financial assets (%) [2]	4.1	4.3	4.5	4.2	4.3
	Mortgage assets/GDP (%)	8.7	7.8	8.2	8.2	8.5
Securities Dealers	Total number of securities dealers	31	29	29	30	28
	Securities dealer's/total financial assets (%)	21.7	21.5	20.2	18.3	16.7
	Securities dealer's assets/GDP (%)	39.6	39.0	36.8	35.4	32.8
Credit Union	Total number of credit unions	43	43	38	37	37
	Credit union's assets/total financial assets (%)	3.2	3.0	3.0	2.8	2.7
	Credit union's assets/GDP (%)	4.8	5.4	5.4	5.3	5.4
Foreign exchange markets	Adequacy of foreign exchange (reserves in months of imports)	4.7	3.3	3.2	4.6	4.0
	Foreign exchange reserves as ratio to short-term external debt (%)	196.8	281.0	139.3	283.3	365.8
Capital markets	Number of listed securities (equities)[3]	55	50	55	55	57
	Number of new issues (equities)[4]	6	4	14	7	1
	Number of new issues (bonds) [5]	19	24	2	0	0
	Value of new issues (equities) J$Bn	3.0	0.4	45.0	1.4	0.25
	Value of new issues (bonds) J$Bn	105.1	77.8	1.7	0	0.0
	Market capitalization/GDP (%)	48.9	44.7	34.6	19.0	37.3
	Value traded/market capitalization (%)	3.4	3.1	2.9	4.4	3.4
Collective investment funds	Unit trust funds under management (J$BN)[6]	32.4	49.7	58.0	111.0	136.4
	Number of unit trusts	4	9	10	11	12
	Unit trust FUM/total financial assets (%)	1.4	2.1	2.2	3.7	4.3
	Mutual funds (value of units held by Jamaicans)US$MN	164.5	122.0	165.0	177.0	200.9
	Mutual funds/total financial assets(%)	0.6	0.5	0.7	0.7	0.7

Notes:

[1] Financial system assets include assets for banks, insurance companies, credit unions, securities dealers, pension funds, unit trust FUM and mutual funds.

[2] Includes data for building societies, commercial banks & National Housing Trust

[3] Includes Junior market listings

[4] Includes preference shares

[5] Government of Jamaica bonds

[6] Unit trust portfolios are composed mainly of fixed income securities,equities and real estate investments

Box 3.1 Credit Concentration

The credit portfolio of DTIs in Jamaica reflected high concentration levels at end-2015 with 73.5 per cent of credit extended to the private sector being channeled to four main economic sectors, namely *Distribution, Tourism, Construction* as well as *loans to the household sector (or personal loans).* More specifically, 51.7 per cent of private sector credit fell within *Personal loans.* Furthermore, credit supplied to certain sectors remained concentrated within only a few DTIs.

The Lorenz curves shown in Figure 1 plot the distribution of credit by DTIs within these four sectors using data over a five-year interval, spanning end-2015 relative to the close of 2010. The chart shows that 27.3 per cent of DTIs operating in Jamaica, that is, three DTIs, continued to supply more than 65.0 per cent of credit to each of these sectors at end-2015. As it relates to personal loans, there was a slight improvement regarding the number of DTIs supplying credit to this loan category within the five-year time period which was examined (see **Figure 1.0**).

Furthermore, loans of the three DTIs that extended the largest share of credit as a share of overall private sector credit increased to 65.3 per cent at end-2015 relative to 60.0 per cent at end-2010. The increase was particularly significant for *Distribution* where the share of the DTIs providing the most credit increased by 16.5 per cent. Conversely, the share of DTIs extending credit for *Tourism* decreased by 21.9 per cent over the review period (see **Figure 2.0**).
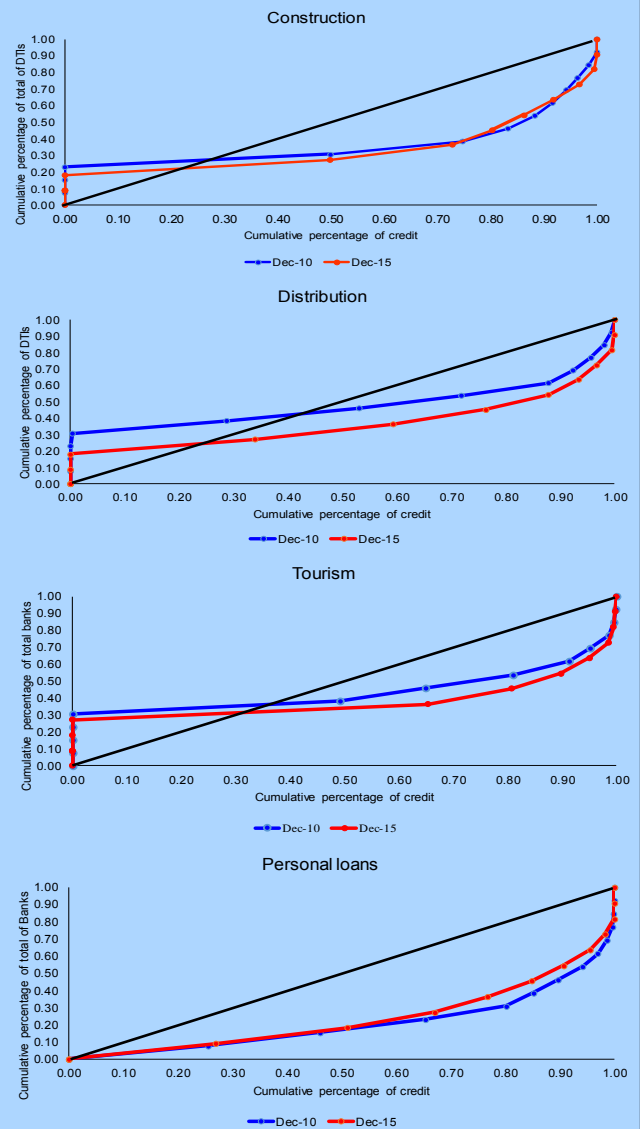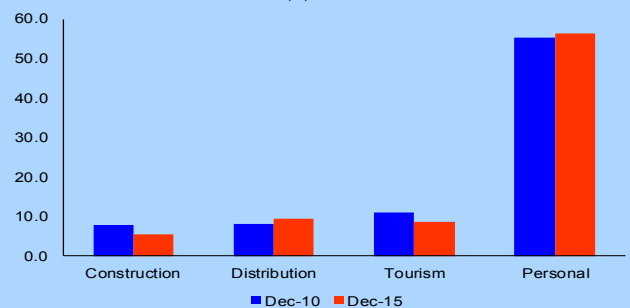
Figure 1.0: Distribution of credit by DTIs

Figure 2.0: Share of Private Sector Credit by top three (3) DTIs

Box 3.2 A Technical Examination of the Recent Jamaica Stock Exchange (JSE) Main Index Appreciation

Overview

During 2015 the JSE Main Index increased by 97.0 per cent to an unprecedented level while the value of stocks traded increased by 400.0 per cent to $64.6 billion from $12.8 billion (see Figure 1). The majority of this value change, 71.0 per cent, occurred in the last three months of the year (Figure 2).[1]
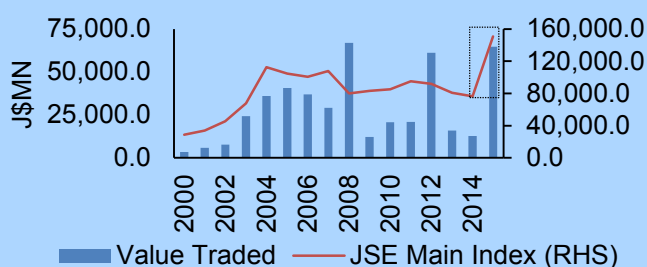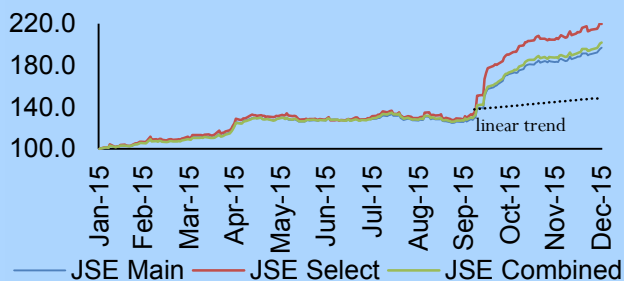
Figure 1.0 Time trend in the JSE Main

Figure 2.0 One year trend in JSE Indices[2]

Note: Continuing along the linear trend for the first 3 quarters of 2015 would have left the JSE Main Index value at 113,941 compared to 150,692 at end- 2015.

The strong growth spurt in JSE stock market prices for the calendar year, raises the question as to whether the upswing has been predominantly driven by sound economic fundamentals or fuelled by investor speculation.

[1] Source: Jamaica Stock Exchange.
[2] Each index value is rebased to 100 in January 2015.
[3] The value of a financial asset can be functionally described below: $P_t = E_t[\beta_{t+1} r_{t+1}]$. Today's asset price, P_t, is determined by today's expectation, E_t, of the discounted return ($\beta_{t+1} r_{t+1}$) provided by the asset in the future. In the case of the stock market, prices should broadly reflect the future

Asset prices and bubbles

Financial asset prices influence the allocation of economic resources over time and across markets, which underscores the importance of monitoring asset price movements in the assessment of financial stability. In this regard, policy makers would be interested in the emergence of stock market price bubbles in their assessment of asset price developments. A stock market bubble can be defined as significant growth in value of the stock index that is not justified by changes to the aggregate fundamental value of the underlying stocks.[3] A number of factors could create a stock price bubble but two common causes often prevail which include a sudden influx of funds in the financial system and herding behaviour based on market speculation on future price increases.

Bubble-driven stock price growth creates undesirable consequences for the economic system. When this bubble "bursts" there tends to be a reversal of initial wealth effects for investors that continue to hold shares, lowering consumption spending and reducing the ability to repay debt. This will weaken economic activity oftentimes to levels below what existed prior to the formation of the bubble. On the whole, the magnitude of any negative spillover effects to the real sector from this asset price reversal will largely depend on the degree of leverage used to fuel stock purchases.

Statistical test for stock price bubbles

Many statistical tests exist to assess the existence of asset bubbles. However, these tests have had varying levels of success in terms of predicting asset price busts. Recent advancements which have yielded promising results are the Sup Augmented Dickey-Fuller (SADF) and Generalized Sup Augmented Dickey-Fuller (GSADF) tests, proposed by Phillips et al. (2013).[4]

profitability and, as a result, potential dividends offered by the participating businesses. Stock prices should also be influenced by the discount factor (β_{t+1}) which itself is determined by, among other things, the inflation rate, the risk premium, level of liquidity, and investors' time preference of consumption.
[4] Phillips, Peter CB, Shu-Ping Shi, and Jun Yu. "Testing for multiple bubbles: Historical episodes of exuberance and collapse in

These tests essentially provide evidence of a bubble if there is a significant measurable divergence between stock prices and dividend payments. In regards to the SADF test, the procedure is applied sequentially in which an initial sample is extended forward until the entire sample is included in the test. The SADF test is particularly effective if there exists evidence of a single bubble over a sample period. However, in the case where multiple bubbles may have occurred in the sample period, the SADF test may not detect subsequent bubbles if the first bubble was relatively significant. The GSADF extends the SADF procedure enabling the testing of multiple bubbles by testing a sequential sample in a recursive manner, whereby the initial period is also extended forward. In practice both the SADF and GSADF tests have been successful in identifying speculative bubbles as they emerge.

GSADF test results

Data on end-of-quarter stock prices and the total quarterly dividends by all firms on the JSE Main were used to calculate price to dividend ratios for each quarter from the March 2000 quarter to the December 2015 quarter. Rolling window lengths of 12 quarters were used for recursive testing.

Table 1.0 GSADF procedure summary results

|		
Included observations: 64		Sample : 2000Q1 2015Q4
Alternative hypothesis: Price to dividend ratio demonstrates explosive behaviour		
Lag length=2		
Window size: 12		
GSADF Test Statistic:		2.74**
Critical values:	99% level	3.31
	95% level	2.22

Test results show evidence of one stock price bubble at the 95% level of significance over the entire 15-year sample period (see Table 1.0). However, a backward 'date stamping'

approach is used to identify the actual bubble period. Based on this technique, the explosive price to dividend behaviour is 'date stamped' for the 1st to 3rd quarters of 2006 (see Figure 3).

Figure 3.0 Backwards SADF sequence
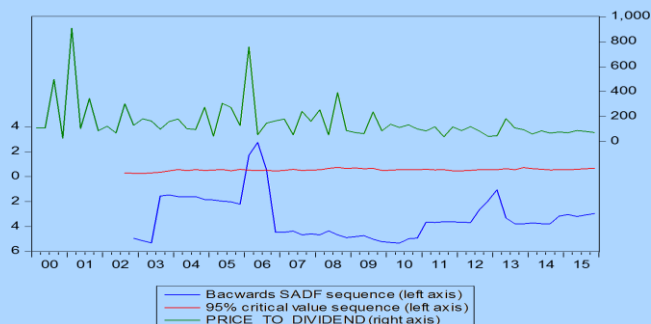
As results of the GSADF test did not provide any evidence of a stock bubble in the most recent periods, as a robustness measure, the sample period is resized to exclude the 2000 to 2006 period. The GSADF procedure is then estimated using quarterly price to dividend ratios from the December 2007 to December 2015 (see Table 2).
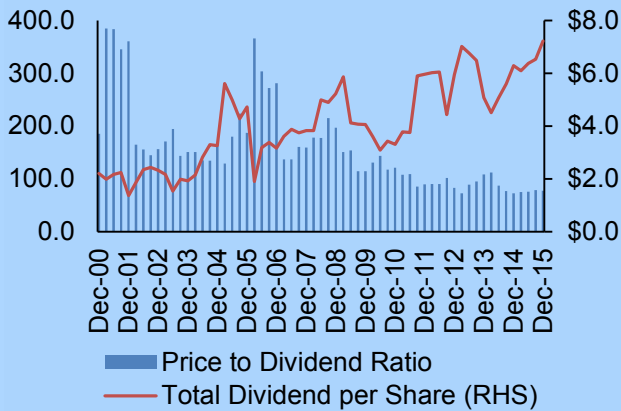
Table 2.0 GSADF procedure summary results

Included observations: 33		Sample : 2007Q4 2015Q4
Alternative hypothesis: Price to dividend ratio demonstrates explosive behaviour		
Lag length=2		
Window size: 8		
GSADF Test Statistic:		-0.91
Critical values:	99% level	3.32
	95% level	2.24

Test results based on this adjusted sample provide no evidence that the recent stock appreciation in 2015 reflects an asset price bubble. Moreover these findings are consistent

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the S&P 500." (2013). Philips et al. (2013) recursively estimates over a rolling sample window:

$$\left(\frac{p}{d}\right)_t = \mu + \delta\left(\frac{p}{d}\right)_{t-1} + \Sigma_i^p\, \varphi_i \Delta\left(\frac{p}{d}\right)_{t-1} + \varepsilon_t \text{ and}$$

tests H_0: $\delta=1$ versus H_a: $\delta>1$. Where $\left(\frac{p}{d}\right)_t$ is the market price to dividend ratio at time t. Rejection of the null hypothesis provides evidence of the existence of a bubble over specific intervals.

with observed stock price growth that has been out-paced by growth in dividends since the 1990s (see Figure 4).[5]

Figure 4.0 Price to dividend ratio of JSE Main

Conclusion

Developments in the JSE Main Index over 2015 could create capital "crowding in" and positive wealth effects supported by improvements in macroeconomic conditions. These developments help create a supporting environment for continued economic expansion.

Some caveats for these possibilities do hold however. Although showing a trend increase since inception, the JSE remains fairly small relative to the size of the economy, in which stock market capitalization is 38% of GDP (see Figure 5).

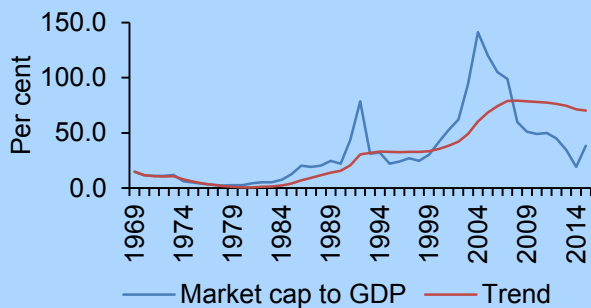**Figure 5.0 Market capitalization to GDP ratio**

As a result, the impact of positive wealth effects on economic conditions may be relatively weak. The small size of the market further leaves stock prices susceptible to inherent volatility, including from the influence of non-domestic market factors.

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[5] The price to dividend ratio in each quarter is calculated as the sum of end of quarter stock prices as a share of the sum of dividend paid per share during the quarter. The diagram plots the 4 quarter moving average of both series.

Box 3.3 Implications of International Correspondent Bank De-risking

The financial and economic system depends on a global network of correspondent banking relationships (CBRs) that enables international business activity. Specifically, CBRs permit the carrying out of cross-border transactions related to international trade, investment, international fund transfers, settlements, and other similar types of activity in jurisdictions in which the local bank has no presence.

Global standards for international banking

Global banking activity is guided by a set of general principles set by various standard setting multilateral bodies and are accepted as important for a stable, sound and safe banking system. The Financial Stability Board, Financial Action Task Force (FATF) and International Accounting Standards Board are some of the key bodies.

Since 1990, the FATF has developed a set of Anti-Money Laundering and Counter Financing of Terrorism (AML/CFT) standards. In 2012, the FATF strengthened these which, among other things, identified money service businesses (MSBs) as high risk entities. Banking supervisors for large correspondent banks, in the United States, Canada, the United Kingdom and others, have since demonstrated greater and more rigorous focus on this risk category.

AML/CFT standards require that financial institutions acting as correspondents need to implement additional control measures for entities designated as high risk. Correspondent banks also depend on respondent banks having a robust set of AML/CFT and Know Your Customer (KYC) frameworks for supervision of business transactions. Additionally, at the country level, banking regulators are encouraged to identify, assess and understand the specific money laundering and terrorist financing risks of their jurisdiction and have in place proper resources for its mitigation.

Recent developments

The practice of de-risking by correspondent banks, which is the termination or restriction of business relationships with categories of clients in order to avoid, rather than manage, risk has been rapidly expanding across the globe. Latin America and the Caribbean is being most heavily affected. In a World Bank study, 60.0 per cent of banking authorities surveyed in the region have reported either a significant or some decline in CBRs. [1] In addition 16 of the 20 large international banks stated that they de-risked over the past three years by terminating all CBRs with certain jurisdictions.

The threat of significant changes to Jamaica's CBR network became apparent since 2012. In that year some Jamaican banks received notice from two correspondent banks that transactions for the benefit of cambios would not be permitted through their accounts. Between 2014 and 2015 de-risking trends continued to rise as more correspondent banks voiced concerns about cash activity associated with the cambios and remittance services, subsequently resulting in the cessation of some CBRs.

During 2015 the impact of de-risking in Jamaica's financial system was largely contained. De-banked institutions have identified replacement CBRs or have been utilizing the banking relationships of other local banks. In an effort to maintain correspondent accounts, respondent banks have been restricting their cash acceptance from some cambios. As a result, some small volume cambios are now unable to deposit foreign currency cash with local commercial banks but have been able to sell excess foreign bank notes to the private sector.

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[1] World Bank (2015), "Withdrawal from correspondent banking. Where, why and what to do about it." Available at: http://www.worldbank.org/

These developments create the potential for an increased concentration in financial activity, which so far is observable in the participation of cambios in the foreign exchange market. Compared to June 2014, the proportion of the total non-inter-dealer purchases and sales made by cambios as at October 2015 has declined to 34.0 per cent and 32.0 per cent from 43.0 per cent and 44.0 per cent respectively.[2] Similarly with regard to sales to the BOJ the US$168 million sold in October by cambios stood at 39.0 per cent of the total, compared to the US$212 million sold in June 2014 which represented 44.0 per cent of the total.

Some action plans on the way forward

1) Key standard setting bodies are collaborating on striking a balance between banks complying with AML/CFT requirements and the achievement of greater access to financial services through targeted financial inclusion policies These bodies are also recommending that the supervisory agencies of correspondent banks ensure that the recommended "risk-based approach", which requires a managed approach for high risk clients, to AML/CFT management is being undertaken as opposed to broad indiscriminate de-risking.

2) Enhanced AML/CFT standards have implicitly increased the potential costs in CBRs, lowering the reward to risk ratio, particularly in smaller jurisdictions in which margins on these services are small. In light of the costs associated with AML/CFT due diligence, industry use of KYC utilities and legal approaches to facilitate cross border information sharing has been recommended by respective stakeholders.

3) Local respondent banks need to continually ensure and demonstrate that there are strong AML/CFT internal controls. Further the supervisory agencies need to confirm the effective implementation and practice of such controls in order to reduce institutions' international AML/CFT

risk profile. In addition the completion and publication of national risk assessments will demonstrate a national commitment to AML/CFT standards.

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[2] None the less, the quantity of purchases and sales has remained relatively steady at US$245 million and US$234 million respectively, compared to June 2014.

4. Financial System Sectoral Exposures

4.1 Overview

The general improvement in economic conditions was reflected in the level of macro-prudential risks emanating from the household, corporate and public sectors. Real annual growth in household, corporate and public sector debt remained below pre-global financial crisis average levels. Nonetheless, DTIs' and NDTFIs exposure to household and corporate sector debt, as measured by debt to assets was mixed for 2015. Notably, DTIs' exposure increased, largely reflecting the outturn in performance for commercial banks. On the other hand, NDTFIs experienced a reduction in exposure to private sector debt. Despite this, however, DTIs and NBFIs recorded an improvement in loan quality outturn in comparison to the previous year.

Regarding sovereign risk, DTIs and NDTFIs recorded lower exposures to public sector debt. The decline in exposure occurred in the context of the continued absence of the GOJ from the domestic bond market. Furthermore, there was a decline in public sector debt relative to GDP for 2015 relative to 2014.

4.2 Household debt and DTIs' exposure

Growth in household sector debt incurred with DTIs accelerated for 2015.[1] Real annual growth in household sector debt grew by 6.1 per cent relative to a 2.5 per cent increase for the previous year. Nonetheless, the growth for 2015 was notably below the pre-global financial crisis levels (see **Figure 4.1**).[2] The expansion in real household sector credit was mainly driven by consumer loans as mortgage credit remained fairly stable. Specifically, real consumer loans grew by 5.8 per cent for 2015 relative to 1.0 per cent for 2014. Similarly, real mortgage debt grew by 6.5 per cent relative to 4.6 per cent for the prior year. This growth occurred within a context of lower mortgage rates among building societies and commercial banks during the review period (see **Table 4.1**). However, while there were declines in the nominal mortgage rates, real mortgage rates increased for 2015 relative to 2014,

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[1] Household debt incurred with DTIs is proxied by the sum of residential mortgage loans and consumer loans (which includes credit card receivables).

[2] Prior to the global financial crisis in 2008, household sector debt averaged 13.7 per cent growth for the period 2003-2007.

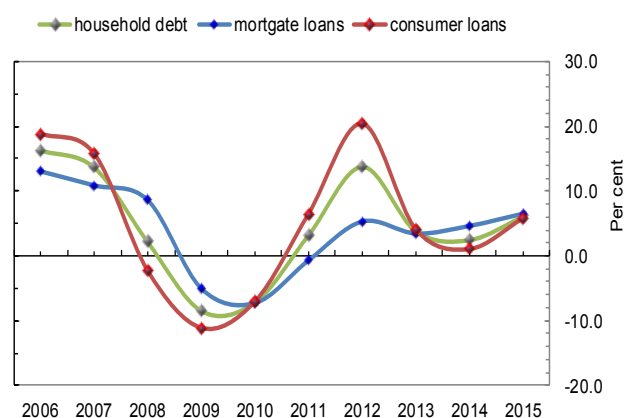**Figure 4.1** Real growth in household debt and its sub-components for DTIs

Table 4.1 Selected interest rates & housing data

	2010	2011	2012	2013	2014	2015
Sectoral Interest Rates (per cent)						
Building Societies						
Real Mortgage Loans Rate*	-0.1	3.3	3.1	0.6	3.1	5.6
Mortgage Loans Rate	12.5	11.1	10.2	10.0	9.7	9.5
Bridging Loans Rate	16.4	12.5	11.1	12.8	13.4	13.2
Average Weighted Loan Rate	12.4	11.0	10.1	9.9	9.7	9.5
Commercial bank						
Real Mortgage Loans Rate*	-3.9	2.8	2.8	0.5	3.1	5.7
Mortgage Loans Rate	8.2	10.5	9.9	9.9	9.7	9.6
Installment Credit Rate	20.8	19.2	17.9	16.8	16.1	15.2
Personal Credit Rate	25.9	21.7	25.2	24.8	25.6	26.2
Commercial Credit Rate	16.3	14.6	12.9	12.8	12.9	12.9
Average Weighted Loan Rate	20.4	18.0	18.4	17.5	17.2	16.9
FIAs						
Installment Credit Rate	19.1	16.6	13.6	11.8	12.0	11.7
Personal Credit Rate	25.9	25.2	19.6	13.8	17.4	14.7
Commercial Credit Rate	16.8	15.8	14.3	10.1	11.3	11.6
AverageWeighted Loan Rate	18.0	16.6	14.1	11.4	11.9	11.7
Housing Data						
# of Mortgages [1/,p/]	8 292	14 090	11 684	17 308	13 428	-
Value of Mortgages J$BN [1/,p/]	24.7	28.0	28.7	37.7	34.2	-
Housing Completion [2/,p/]	2 999	3 644	4 334	5 560.0	2 283	-
Housing Starts [2/,p/]	2 674	6 405	1 790	2 896.0	2 034	-

* Annual Average Inflation rate used to compute the real mortgage rate.
[1/] Includes NHT, NHDC, building societies and non-specialized agencies
[2/] Includes public sector & private sector

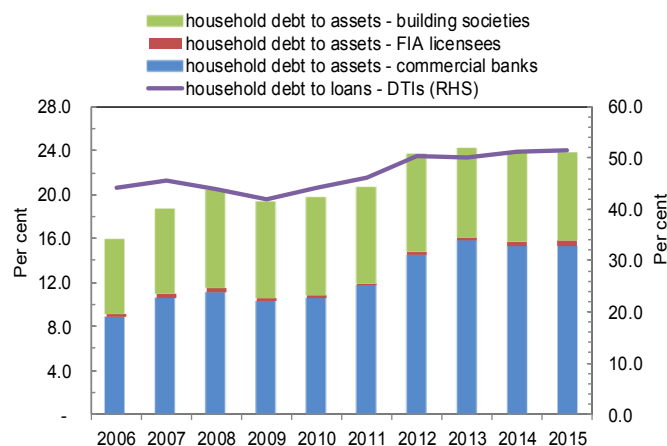**Figure 4.2** Household debt as a share of DTIs loans & assets

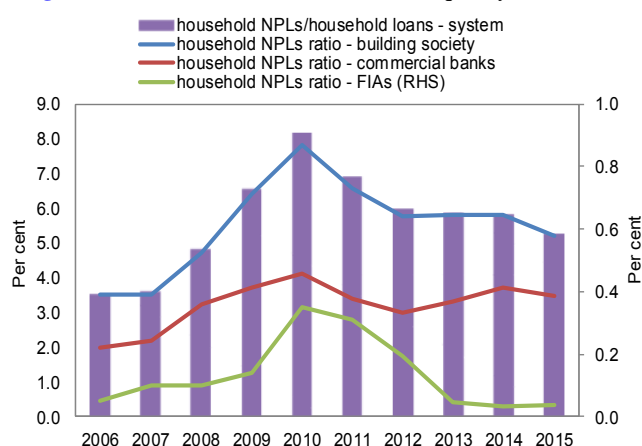**Figure 4.3** DTIs' household sector loan quality

Figure 4.4 DTIs' loan loss provisioning to household sector NPLs & household NPLs to DTIs' capital base
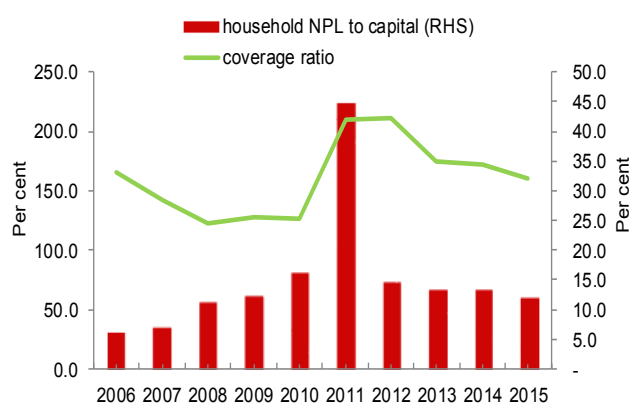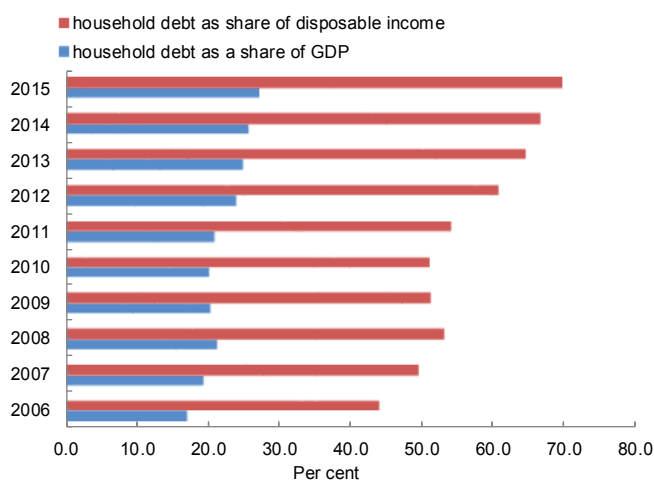

Figure 4.5 Household debt as a share of disposable income and nominal GDP

reflective of the faster pace of decline in the annual inflation rate relative to nominal mortgage rates.

DTIs' exposure to the household sector as measured by household debt to assets increased slightly for 2015. This ratio increased to 23.9 per cent, relative to 23.8 per cent at end-2014, mainly reflecting the performance of the commercial banks (see **Figure 4.2**). The increased exposure of the DTIs to the household sector occurred, however, against the backdrop of an improvement in loan quality for 2015. Specifically, household non-performing loans (NPLs) as a share of total household loans for DTIs decreased to 5.3 per cent at end-2015 relative to 5.8 per cent at end-2014. The improvement in the ratio was, however, not reflected in the outturn for FIA licensees (see **Figure 4.3**). Furthermore, the performance of the ratio for 2015 was partly influenced by continued net loan write-offs.[3] Notably, for 2015, net loan write-offs amounted to $3.7 billion, a 111.5 per cent increase in comparison to the previous year, largely reflecting the faster pace in growth in charged-off loans.

Notably, DTIs' household coverage and capital ratios both declined for 2015 relative to 2014.[4] The household coverage ratio fell to 160.2 per cent for 2015 from 171.9 per cent at end-2014, reflecting a faster pace of decline in NPLs relative to provisioning (see **Figure 4.4**). The capacity of banks to withstand losses arising from NPLs, as measured by the ratio of household sector NPLs to regulatory capital, however, improved to 12.2 per cent at end-2015 relative to 13.5 per cent at end-2014.

4.2.1 Household sector performance

The debt servicing capacity of the household sector, as measured by the ratio of total real household debt to real disposable income, deteriorated by 3.0 percentage points to 69.5 per cent at end-2015 relative to end-2014 (see **Figure 4.5**).[5,6] This outturn was primarily as a result of the faster

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[3] Net loan write-offs is computed as charge-off loans less bad loans recovered.

[4] Coverage ratio is measured as the ratio of loan loss provisions plus prudential provisioning to non-performing household loans.

[5] Total household debt is proxied by the sum of residential mortgage loans, consumer loans (which includes credit card receivables) and National Housing Trust loans.

pace of increase in household debt of 7.8 per cent relative to growth in disposable income of 3.2 per cent for the review period. Furthermore, the debt servicing ratio was notably well above the global pre-crisis average level of 40.1 per cent.[7]

4.3 Corporate sector debt and DTIs' exposure

Real growth in corporate sector debt held by DTIs increased to 4.8 per cent for the review period relative to a decline of 2.2 per cent for 2014 but remained below an average real growth of 8.9 per cent for the 5-year pre-global financial crisis period (see **Figure 4.6**). Notably, the stronger pace of growth mainly reflected the impact of lending for private commercial purposes as this category represented 95.5 per cent of total corporate sector loans at end-2015.[8] Furthermore, the growth in corporate sector lending was reflected in all economic sectors. Of note, the *Manufacturing, Tourism, Distribution* and *Professional & Other Services* sectors recorded the highest increases (see **Figure 4.7**). However, DTIs' exposure to the corporate sector as measured by corporate sector debt to DTIs' assets declined to 17.2 per cent at end-2015 relative to 17.4 per cent at end-2014 (see **Figure 4.8**).[9]

4.3.1 Corporate sector loan quality

There was continued improvement in the loan quality ratio for the corporate sector for 2015. The ratio of corporate sector NPLs to total corporate sector loans declined to 3.6 per cent at end-2015, relative to 5.2 per cent at end-2014 (see **Figure 4.9**). The improvement in the asset quality ratio for the corporate sector was mainly reflected in the loan portfolio of the commercial banking and building societies' sub-sectors. In examining the delinquency rate by sector, the loan quality ratio for all economic sectors with the exception of *Transportation, Electricity, Gas & Water, Entertainment and*

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[6] Disposable income for 2015 was based on BOJ's projection. It is computed as gross personal income less statutory deductions. Gross personal income is proxied as the sum of compensation to employees domestically and from the rest of the world. Current transfers and operating surplus of the household sector is excluded from personal income due to data availability.

[7] The average was calculated over the period prior to the global financial crisis in 2008, that is, between the period 2003 and 2007.

[8] Corporate sector debt includes loans for commercial purposes, loans to other financial institutions and notes & debenture holdings of DTIs.

[9] Vulnerability is measured as the ratio of corporate sector debt to DTIs' assets.
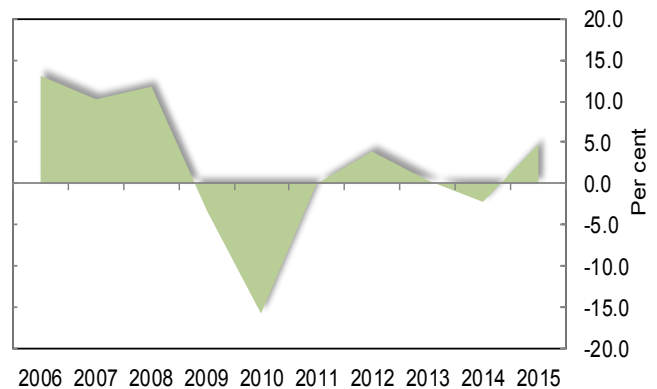
Figure 4.6 Real growth in corporate sector debt held by DTIs

Figure 4.7 DTIs' exposure to corporate sector loans

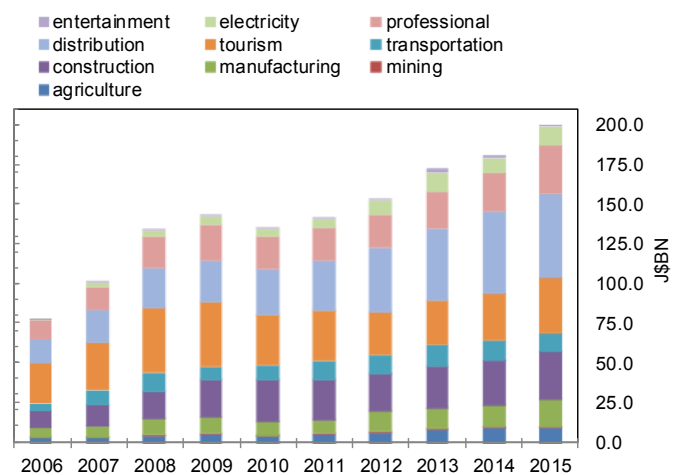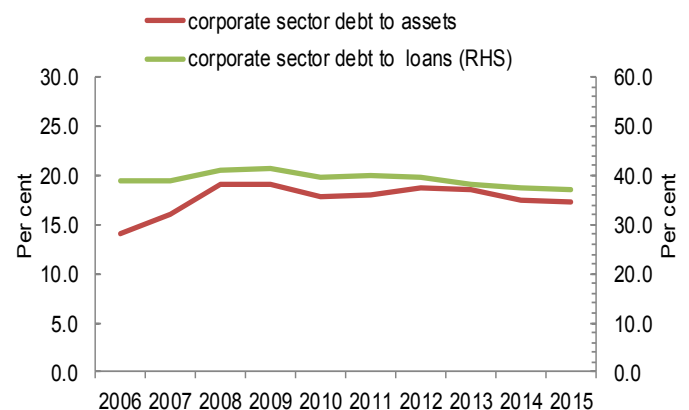**Figure 4.8** Corporate sector debt as a share of DTIs' assets and loans
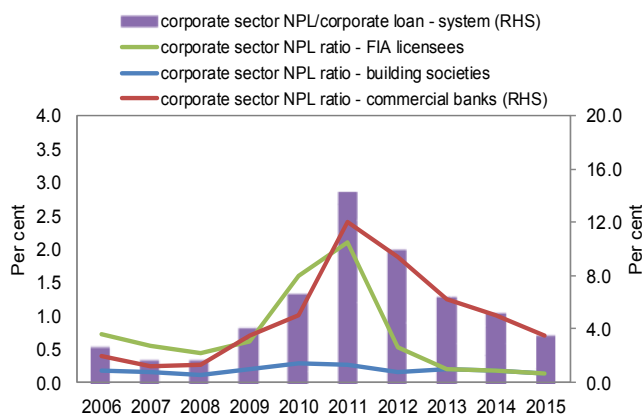
Figure 4.9 Corporate sector loan quality

Figure 4.10 Ratio of corporate sector NPLs to corporate sector loans-DTIs
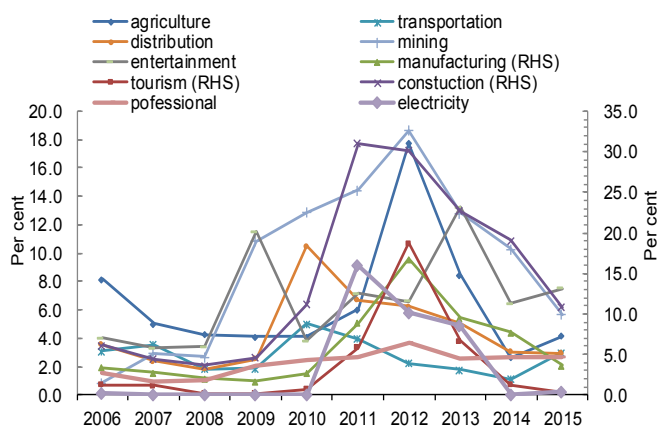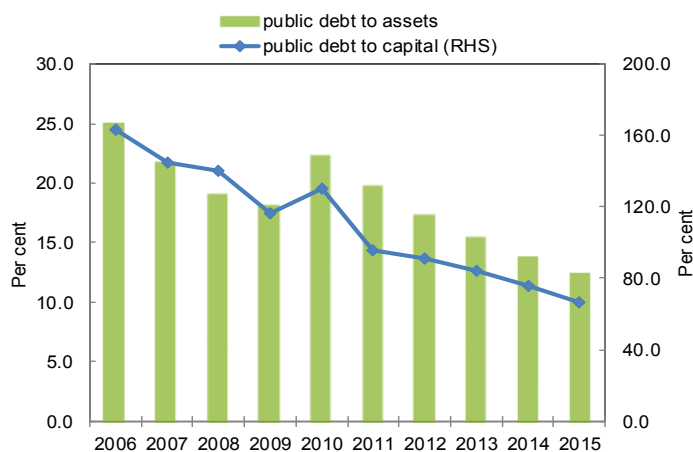

Figure 4.11 Public sector loans and securities to assets & capital - DTIs

Professional Services improved for 2015 relative to the previous year. Notably, there were strong improvements in the ratios for *Mining* and *Construction* (see **Figure 4.10**).

4.4. Public sector debt & DTIs' exposure

DTIs' exposure to public sector debt declined for 2015 relative to 2014. The decline occurred in a context in which the GOJ remained absent from the bond market.[10] Furthermore, the reduction in DTIs' exposure to public debt was reflected by a decline in the ratio of public sector loans and securities to DTIs' assets to 12.5 per cent at end-2015, relative to 13.8 per cent at end-2014 (see **Figure 4.11**).[11] The performance for 2015 was mainly influenced by a 9.7 per cent increase in DTIs' assets for the review period.

4.4.1 Public sector indebtedness & performance

Public sector debt as a share of GDP declined to 129.6 per cent at end-2015 from 132.4 per cent at end-2014, reflecting a slower pace of growth in public sector debt relative to GDP (see **Figure 4.12**). For 2015, the domestic debt stock declined by 17.8 per cent, while external debt grew by 25.1 per cent (see **Figure 4.13**). The decline in the domestic debt stock primarily reflected the repayment of loans to the PetroCaribe Development Fund, amounting to US$1.7 billion during 2015.

The fiscal stability ratio (FSR) which captures the stability of government finances remained flat in 2015. Specifically, the FSR stood at 1.0 at the close of the review period.[12] This performance occurred against the background of a curtailment in expenditure which resulted in a lower fiscal deficit relative to the previous year. As it relates to other debt sustainability indicators, there were mixed results for 2015. In particular, interest payment to GDP improved. However, debt servicing to budgetary revenues and external

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[10] The GOJ continued to reduce its presence in the domestic market as there were no domestic debt issues for 2015.

[11] Exposure to public sector debt is measured by public sector loans and securities as a share of DTIs' assets. The public sector comprises public entities and central government.

[12] The FSR is computed as the ratio of the overall fiscal balance as a per cent of total revenue less 1 (one). The closer the FSR is to zero indicates more stable government finances.

debt to exports of goods and services deteriorated (see **Figure 4.14**).

There was a shortening of the maturity profile of domestic debt profile for 2015. More specifically, the proportion of domestic debt due to mature in 5 years or less increased to 48.2 per cent at end-2015 from 41.6 per cent at end-2014, reflecting increased refinancing risk for the Government (see **Figure 4.15**). Additionally, domestic fixed rate instruments as a share of the total debt stock declined to 60.8 per cent relative to 67.7 per cent at end-2014 (see **Figure 4.16**). On the other hand, there was an increase in domestic variable rate instruments as a share of the total debt stock.

4.5. Non-deposit-taking financial sector exposure
4.5.1 Private sector debt & securities dealers' exposure
The exposure of the twelve largest SDs to private sector debt continued to be low as at end-September 2015.[13] The ratio of private sector debt to assets for the SDs declined marginally to 1.9 per cent at end-September 2015 relative to a ratio of 2.2 per cent at end-2014 (see **Figure 4.17**). Furthermore, private sector debt held by SDs as a proportion of capital was 13.5 per cent at end-September 2015 which represented a decline of 3.55 percentage points, relative to end-2014. This was largely attributable to a larger decrease in private sector debt relative to the increase in capital. Notably, of the twelve SDs, only seven institutions had exposure to private sector debt.

SDs' loan quality ratio, as measured by private sector NPLs to private sector loans, decreased to 16.7 per cent at end-September 2015, relative to 21.8 per cent at end-2014 (see **Figure 4.18**). The improvement in the loan quality ratio for the top twelve SDs, largely reflected the operations of one institution. Similarly, the coverage ratio for SDs improved to 79.8 per cent at end-September 2015 relative to 58.7 per cent at end-2014. This increase was due to a faster pace of decrease in NPLs relative to the increase in loan loss provisioning.

[13] Private sector loans include loans to corporate sector entities and personal (household) loans.
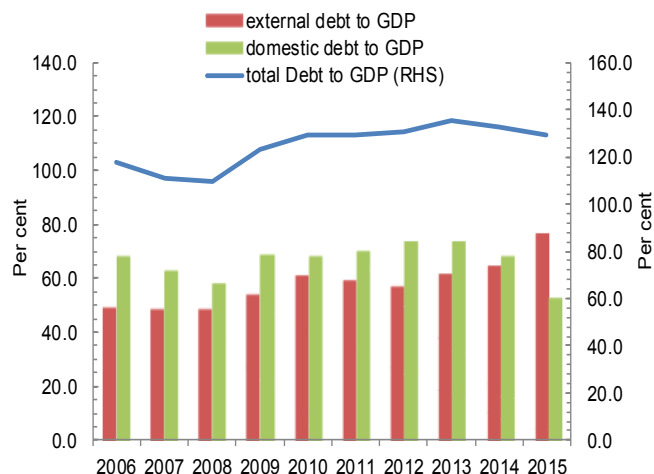
Figure 4.12 Debt to GDP ratios
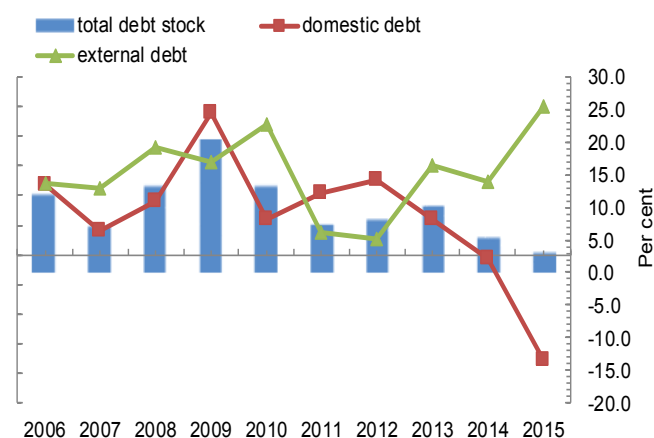

Figure 4.13 Growth in public sector debt stock

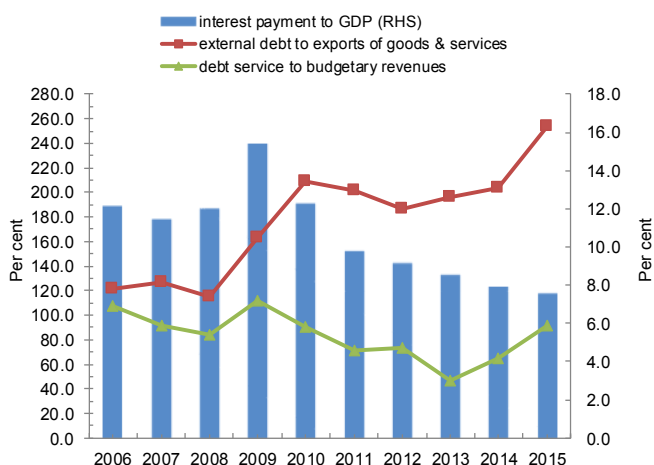**Figure 4.14** Debt sustainability indicators

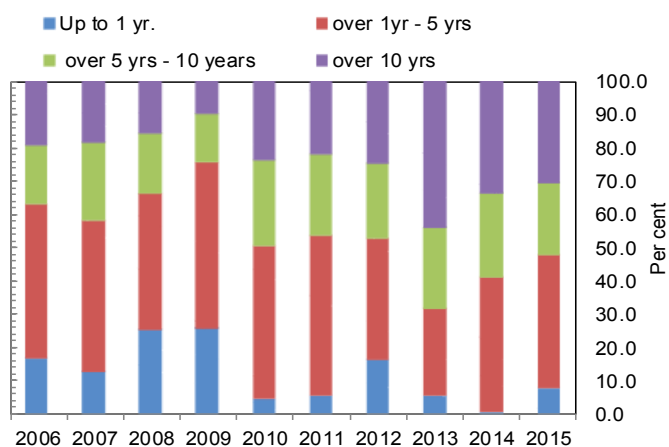**Figure 4.15** Domestic debt by maturity

Figure 4.16 Share of domestic debt by instrument type
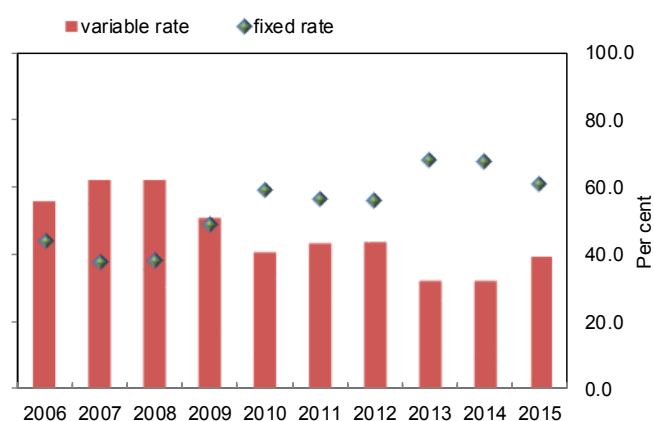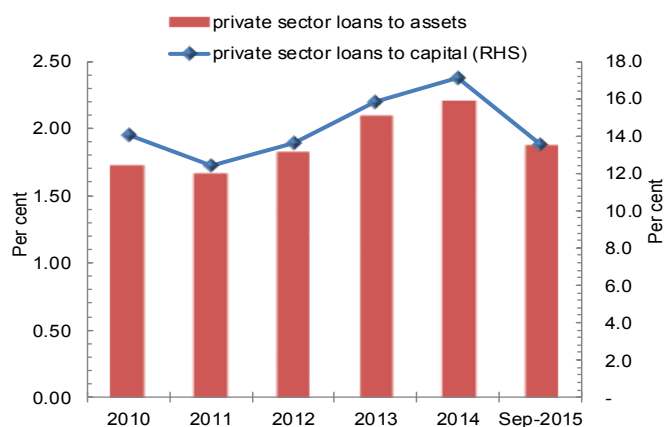

Figure 4.17 Private sector loans to assets & capital for the 12 largest securities dealers

4.5.2 Public sector debt & securities dealers' exposure

Within the context of the continued retail-repo phase-down as well as the reduced presence of the GOJ in the domestic bond market, SDs' exposure to public sector debt declined as at end-September 2015 relative to end-2014.[14] The ratio of public sector debt to SDs' assets declined marginally to 34.4 per cent at end-September 2015 from 34.9 per cent at end-2014 (see **Figure 4.19**). Furthermore, this outturn was largely in keeping with the reforms in the sector aimed at reducing risks emanating from SDs to the wider financial system. Similarly, public sector debt holdings to capital declined to 249.5 per cent at end-September 2015 from 271.8 per cent at end-2014.

4.5.3 Public sector debt & insurance sector exposure

Similar to the SDs, exposure to public sector debt declined for the insurance sector as at end-September 2015 relative to emd-2014. The ratio of public sector debt holdings to insurance assets declined marginally to 46.7 per cent at end-September 2015 relative to 47.0 per cent at end-2014 (see **Figure 4.20**). Of note, this ratio was 49.6 per cent and 34.6 per cent for the life and general insurance companies, respectively, at end-September 2015 relative to respective ratios of 48.8 per cent and 39.3 per cent at end-2014. As a proportion of capital, public sector debt holdings for the insurance sector declined to 188.6 per cent at end-September 2015 relative to a ratio of 202.6 per cent at end-2014, mainly influenced by the general insurance sector (see **Figure 4.21**).

4.6 Other asset exposure

Exposure to other asset categories remained largely subdued across the financial system for 2015. With the exception of DTIs, there was a marginal increase in exposure to equity investments. In particular, the ratio of equity investments as a proportion of assets increased to 6.7 per cent and 1.1 per cent as at end-September 2015 relative to 6.3 per cent and 1.0 per cent for SDs and insurance companies, respectively. On the other hand, the DTIs maintained the same level of investment in equities, recording a ratio of 0.6 per cent,

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[14] Public sector debt is measured as the sum of public sector loans and public sector securities, while exposure is defined as public sector debt as a proportion of assets.

similar to that obtained at end-2014. Regarding real estate investments, there was an increase in exposure for the insurance sector as at end-September 2015. Notably, the ratio of real estate investments to assets for the sector increased marginally to 0.8 per cent relative to 0.7 per cent at end-2014, largely reflecting activities within the life insurance sub-sector (see **Figure 4.22**).

4.7 Pension industry exposure to government's securities, equities & real estate[15,16]

Relative to other investment classes, the pension industry continued to record higher exposures to *Investments in Equities, Investment Arrangements* and *Other Investments* (see **Table 4.2**).[17,18,19] At end-September 2015, exposures to these categories of investment were 11.1 per cent, 31.2 per cent and 14.4 per cent, respectively. This compares to values of 9.3 per cent, 29.5 per cent and 14.1, respectively, at end-2014. Regarding the growth in exposures in equities, this could be attributed to increased investor confidence in the domestic economy during the review period as evidenced by the performance of the stock market.

Figure 4.18 Private sector NPLs to total private sector loans & coverage ratio for the 12 largest securities dealers
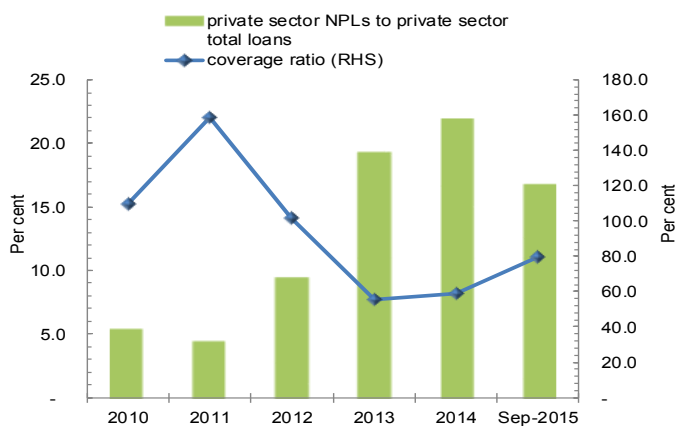

Figure 4.19 Public sector debt holdings to assets & capital for the 12 largest securities dealers
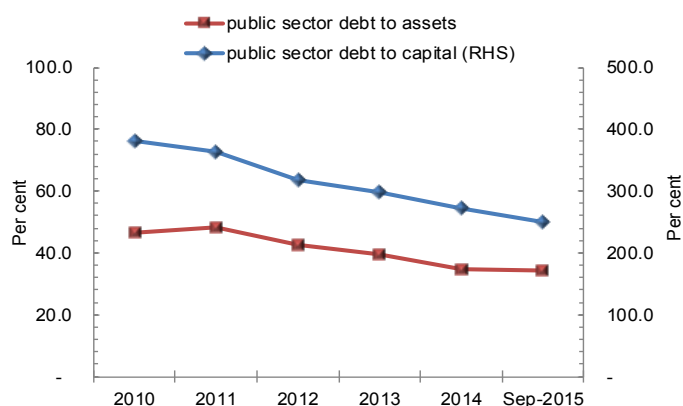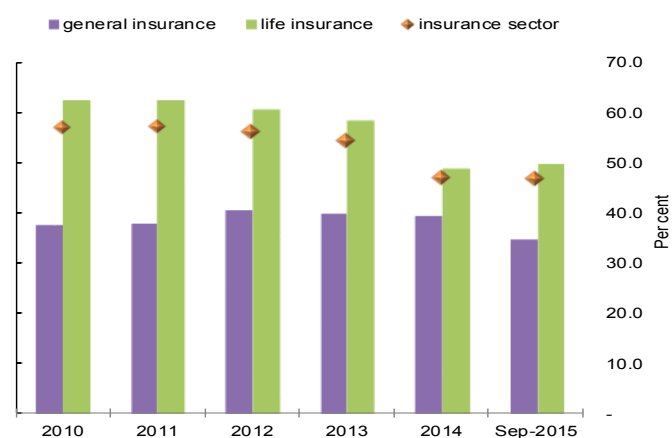

Figure 4.20 Public sector debt holdings to assets for insurance companies


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[15] The data for the industry represents data for the pension fund as at end-September 2015.

[16] Governments securities includes Government of Jamaica securities and other sovereign securities from the US, UK and Canada.

[17] Pension industry refers to private pension plans within the regulatory oversight of the Financial Services Commission.

[18] Exposure is computed as a per cent of total assets.

[19] Investment arrangement includes investments in deposit administration contracts and pooled funds.

Figure 4.21 Public sector debt holdings to capital for the insurance sector
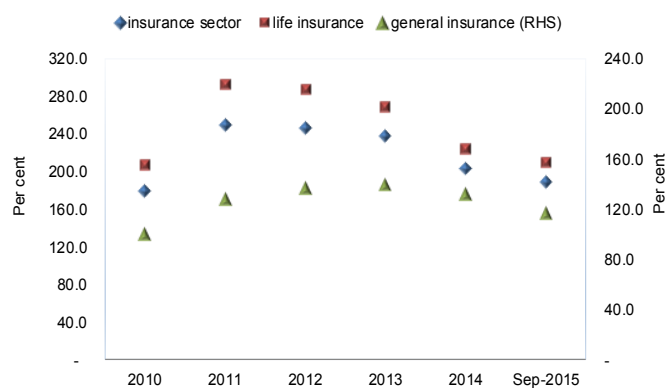
Figure 4.22 Investments in other assets for the DTIs, SDs & insurance sector
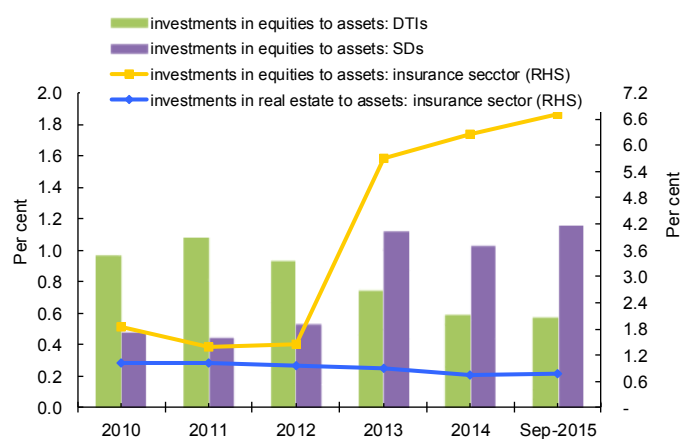
Table 4.2 Investment classes as a per cent of total assets pensions industry

	2011	2012	2013	2014	Sep-2015
Investments in Governments Securities to Assets (%)[1]	44.5	43.9	42.5	40.5	37.0
Investments in Equities to Assets (%)	11.7	10.3	9.8	9.3	11.1
Investments in Real Estate to Assets (%)	5.2	6.0	5.9	5.8	5.7
Investment Arrangements to Assets (%)[2]	25.9	26.9	29.0	29.5	31.2
Other Investments to Assets (%)	11.6	11.8	12.1	14.1	14.4
Total Asset values (J$BN)	283.0	294.1	307.1	341.4	367.0

Notes

[1] Governments securities includes Government of Jamaica securities and other sovereign securities from the US, UK and Canada.

[2] An investment arrangement describes investments in deposit adminitration contracts and pooled funds.

5. Risks Assessment of the Financial Sector

5.1 Overview

Results from stress tests conducted by the BOJ during 2015 showed that DTIs remained robust to hypothetical liquidity, market, foreign exchange and credit shocks against the background of continued strong capital positions. Furthermore, exposures to credit risk and foreign exchange risk decreased for 2015 in the context of continued improvement in loan quality and NOP to capital ratios for DTIs. Meanwhile, liquidity indicators reflected mixed results throughout the year, with stronger liquidity during the first half of the year, resulting in reduced levels of excess reserves at end-2015, relative to end-2014. In addition, the sector remained resilient to hypothetical interest rate increases throughout the year. The results of these stress tests were partly reflective of declines in domestic bond duration factors during the review period.

NDTFIs generally remained robust to a wide range of market and liquidity shocks during the first three quarters of 2015. In particular, SDs largely showed decreased exposure to interest rate, liquidity and foreign exchange shocks at end-September 2015 relative to the close of the previous year. Regarding insurance companies, there was decreased vulnerability to liquidity and market shocks due to increased levels of capitalization. Furthermore, stress test results based on counter-party exposures showed that at end-September 2015, commercial banks, SDs and building societies showed reduced susceptibility to these shocks relative to end-2014.

5.2 Risk exposure assessment for DTIs

DTIs' average exposure to financial risks were generally reduced during 2015 relative to 2014. In particular, the financial risk exposure "cobweb" diagram largely reflected declines in risk exposures in the areas of credit, foreign exchange and interest rates (see **Figure 5.1**).
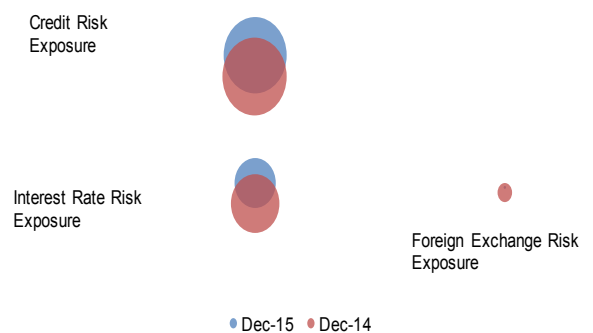
Concurrently, DTI's aggregate stress tests as at end-2015 showed improved results largely due to reduced exposure to an increase in interest rates, improvements in credit quality and foreign exchange rate depreciation (see **Figure 5.2**). This

Figure 5.1 Risk exposures of DTIs
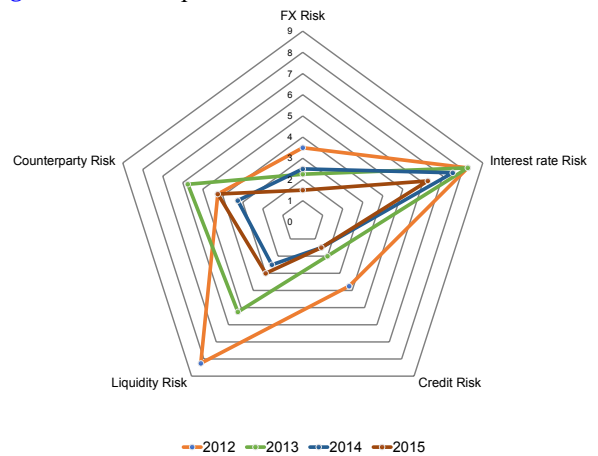
Note: Movements away from the centre of the diagram represent an increase in DTIs risk exposures. Movements towards the centre of the diagram represent a reduction in DTIs risk exposures. The credit, interest rate foreign exchange, liquidity and counterparty risk dimensions reflects the major classes of risks faced by DTIs.

Figure 5.2 Relative exposures of DTIs based on scenarios examined in aggregate stress test analysis

Note: The larger the bubble, the greater the exposure to risk factors. Aggregate stress tests assess the simultaneous impact of increases in interest rates, currency depreciation, changes in credit quality as well as deposit outflows on institutions' CARs. The size of each node is scaled in proportion to the total value of exposure arising from scenarios involving credit risk (100.0 per cent of past due performing loans (0-3 months) becoming non-performing), foreign exchange risk (10.0 per cent depreciation in the JMD/USD exchange rate) and interest rate risk (1100 bps/100 bps & 100 bps/10 bps increase in interest rates on domestic/foreign rate sensitive assets and liabilities, respectively).

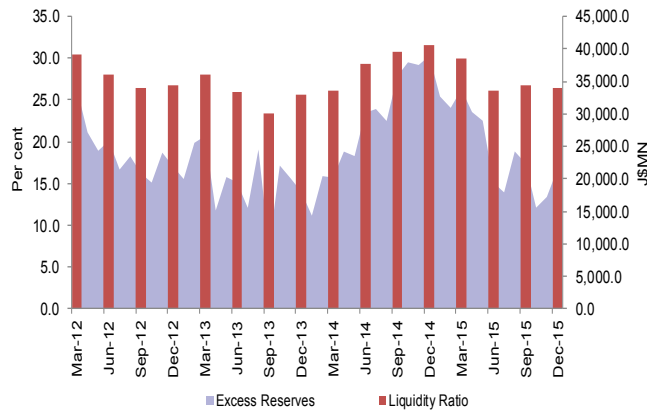**Figure 5.3** Trends in the liquidity ratio and excess reserves

Figure 5.4 The ratio of assets maturing within 3 –months to liabilities maturing within 3 - months for DTIs
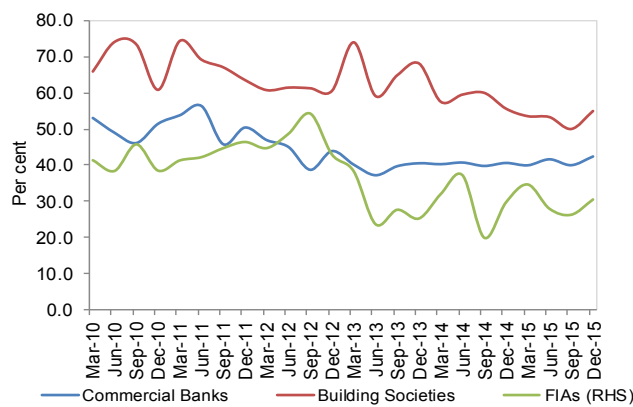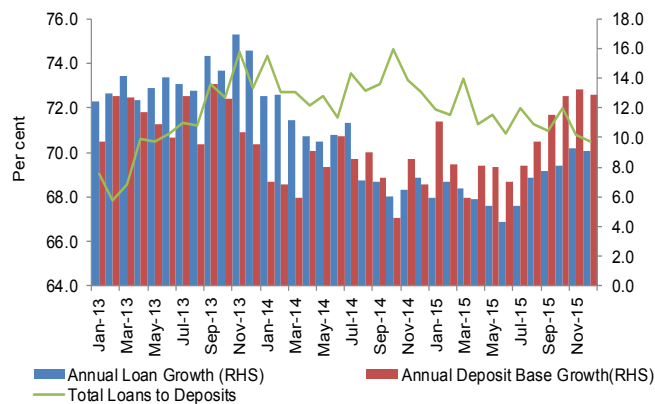

Figure 5.5 Loans to deposit ratio – DTI Sector

performance largely reflected improvements in key indicators, namely, NPL to total loans and NOP to capital. As a result, DTIs remained resilient to hypothetical liquidity, foreign exchange, interest rate and credit shocks during the year.

5.3 Liquidity funding risk assessment for DTIs

Against the background of tightening Jamaica Dollar liquidity conditions during most of 2015, the Jamaica Dollar liquidity risk exposure of DTIs increased during the year. This performance was evidenced by deterioration in some key measures of liquidity risk during the year. In particular, the statutory liquidity ratio of the sector declined steadily during the year to 26.4 per cent at end-2015 relative to 31.5 per cent at end-2014. Furthermore, DTIs' reserves of liquidity in excess of those prescribed by the Bank declined steadily during 2015 and were below levels recorded for the previous year (see **Figure 5.3**).[1]

Conversely, there was improvement in the ratio of short-term assets to short-term liabilities for the commercial banking and FIA licensees sub-sectors during 2015 relative to the previous year (see **Figure 5.4**). The ratio for the commercial banking sub-sector increased by 1.8 percentage points to 42.4 per cent while the ratio for the FIA licensees sub-sector increased by 0.8 percentage point to 30.5 per cent. However, the ratio for building societies declined by 0.7 percentage points to 55.0 per cent at end-2015, relative to the close of the previous year. In addition, the loans-to-deposit ratio for the DTI sector declined by 2.3 percentage points to 70.5 per cent at end-2015 relative to end-2014 (see **Figure 5.5**). At the same time, this ratio remained below 100.0 per cent, indicative of continued viability in meeting short-term liquidity needs.

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[1] During 2015, the BOJ introduced the Occasional Term Repo Operations which provided liquidity to DTIs for 90 days at a rate of 9.15 per cent. In addition, the Bank implemented the weekly fixed volume competitive bid auction repo facility in October 2015.

Regarding funding sources, deposits continued to account for the dominant share of DTIs' funding base. Deposits as a proportion of total funding increased to 81.4 per cent at end-2015 relative to 78.4 per cent at end-2014. In contrast, 'repos' as a source of total funding declined to 4.3 per cent relative to 10.1 per cent at the close of the previous year while 'other funding' liabilities as a share of total funding increased to 14.0 per cent relative to 11.6 per cent at end-2014.

As it relates to funding risk stress tests results, all DTIs were adequately capitalised to absorb losses associated with hypothetical declines in deposits during 2015. For example, following a hypothetical 10.0 per cent decline in average deposits, the post-shock CARs for all DTIs remained above the regulatory benchmark of 10.0 per cent.[2] However, there was a decline in the interquartile range of post-shock CARs for the system during 2015. It would take a 65.0 per cent reduction in deposits as at end-2015, for the CAR of the DTI sector breach the statutory benchmark of 10.0 per cent, relative to a reduction of 75.0 per cent at end-2014. These results are indicative of increased vulnerability of DTIs to liquidity funding risk during the review period, due to marginally weaker capital positions (see **Figures 5.6 & 5.7**).

5.4 Market risk assessment of DTIs

All DTI sub-sectors reflected an increase in the Jamaica Dollar value of foreign currency securities held during 2015. This increase mainly reflected increased holdings in foreign currency investments as DTIs adjusted portfolios within the context of continued depreciation of the domestic currency (see **Figure 5.8**). Against this background, foreign currency securities as a share of the total investment portfolio increased to 58.1 per cent and 59.1 per cent at end-2015 for the commercial banks and building societies, respectively, relative to 51.0 per cent and 56.7 per cent at end-2014. The

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[2] The 'hair cuts' (per cent loss in value) applied in the stress testing framework on liquidating each category of assets are items in course of collection (10.0 per cent), non-liquid investments (25.0 per cent), accounts receivables (25.0 per cent), loans & advances (25.0 per cent), fixed assets (50.0 per cent) and other assets (50.0 per cent). The resultant hypothetical losses are written off against the capital buffers first and then statutory capital.

Figure 5.6 Distribution of liquidity funding risk stress test results for DTIs (10.0 per cent decline in average deposits)
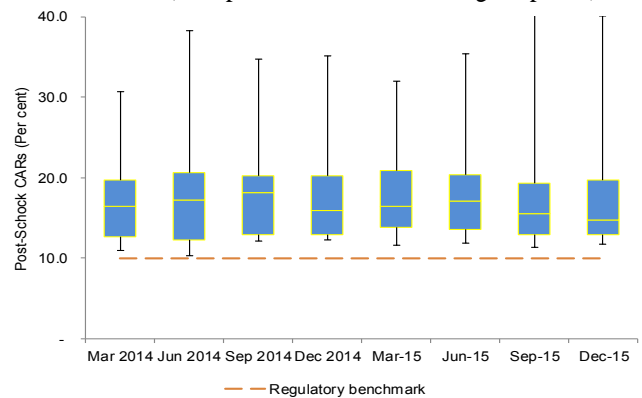

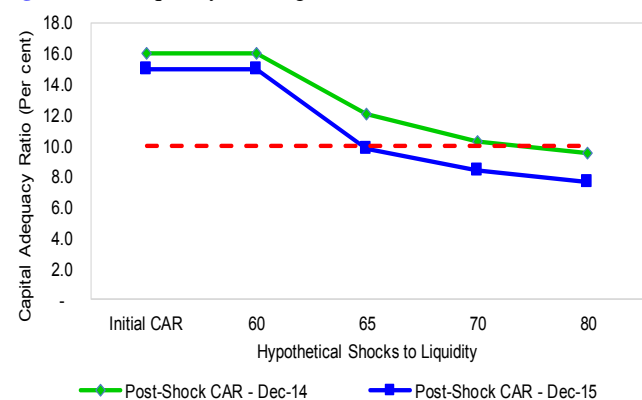**Figure 5.7** Liquidity funding risk stress test results for DTIs

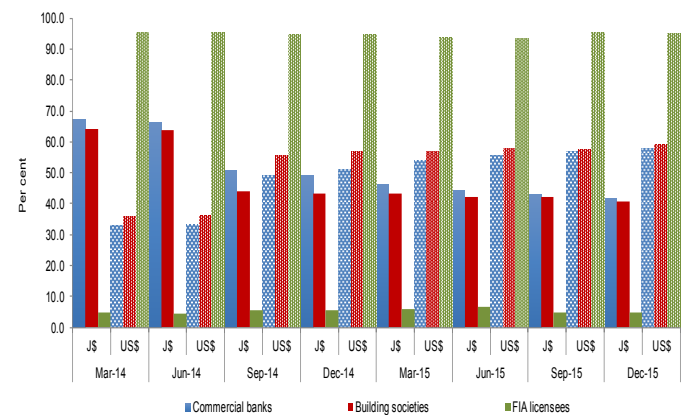**Figure 5.8** DTIs investment holdings as a ratio to total investments

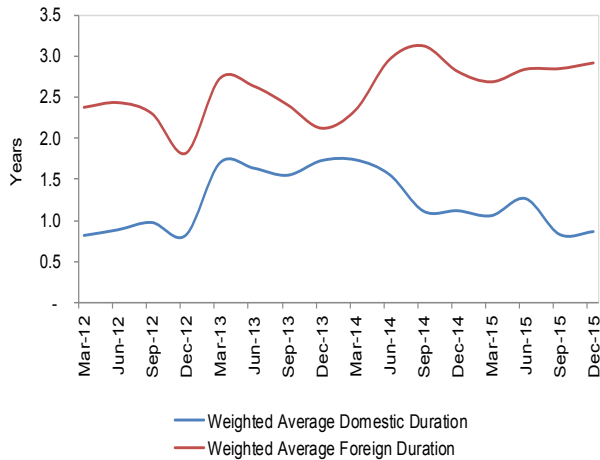**Figure 5.9** Evolution of duration measures for DTIs

Figure 5.10 The evolution of the annualized volatility in the Jamaica Dollar to US dollar exchange rate
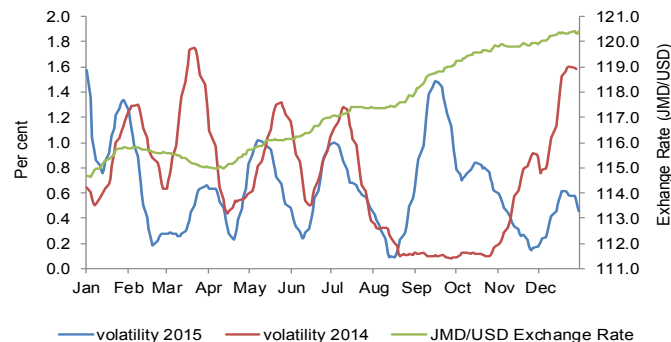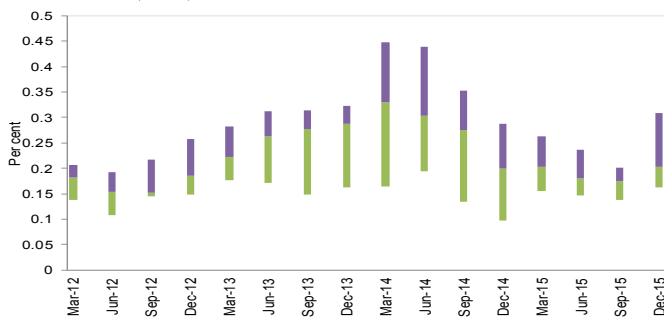

Figure 5.11 The evolution of inter-quartile ranges for the value at risk (VaR) for DTIs*

FIA licensees sub-sector continued to hold the largest proportion of their portfolio in foreign currency securities. At end-2015, foreign currency securities accounted for 95.1 per cent of the investment portfolio of the FIA licensees sub-sector.

Duration on domestic bonds declined during 2015, underscoring lower DTI exposure to interest rate risk on these securities relative to 2014. The duration of domestic bonds held by DTIs decreased to 0.86 at end-2015 relative to 1.12 at end-2014 reflecting the impact of increased holdings of shorter tenured domestic securities by commercial banks and FIA licensees. On the other hand, there was a trend increase in the duration on foreign bonds. The duration on foreign currency securities increased to 2.92 at end-2015 relative to 2.81 at end-2014 (see **Figure 5.9**). Additionally, there was reduced volatility in the foreign exchange market particularly during 2015 (see **Figure 5.10**). This reduced volatility along with the lower duration of domestic currency securities resulted in a lower inter-quartile range of DTIs' VaR estimates relative to 2014 (see **Figure 5.11**).

5.5 Interest rate risk assessment for DTIs

During 2015, interest rate risk stress tests showed increased vulnerability to interest rate shocks for DTIs. The median quarterly post-shock CAR of DTIs declined during 2015 relative to the previous year following a hypothetical increase in interest rates (see **Figure 5.12**). Nonetheless, all DTIs were adequately capitalised to absorb losses associated with large but plausible hypothetical increases in interest rates, with all DTIs remaining above the 10.0 per cent CAR prudential benchmark. Furthermore, DTIs were also robust to hypothetical interest rate declines during 2015.

5.6 Foreign exchange risk assessment for DTIs

DTIs' NOP declined by 80.6 per cent for 2015, to close the year at US$35.1 million (see **Figure 5.13**).[3] The NOP to capital ratio for the DTI sector decreased to 1.2 per cent at

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[3] Long position in foreign currency assets include all currencies converted to US dollars.

end-2015 relative to 18.8 per cent at end-2014, reflective of reduced foreign currency risks, particularly during the second half of the year. The decline in the NOP for 2015 was largely observed for commercial banks.

However, DTIs' foreign currency exposure to non-foreign currency earners increased during the review period relative to the previous year. In particular, loans to non-foreign exchange earners as a proportion of total foreign currency loans increased to a quarterly average of 15.1 per cent for 2015 compared to an average of 14.4 per cent for 2014 (see **Figure 5.14**).

DTIs remained generally resilient to hypothetical depreciation of the Jamaica Dollar vis-à-vis the U.S. dollar during 2015, as institutions were adequately capitalized to absorb losses associated with these shocks. However, subsequent to a hypothetical 30.0 per cent depreciation, the average median post-shock CARs across all DTIs was lower during 2015, relative to the average median post-shock CARs for 2014 (see **Figure 5.15**).[4] The increased susceptibility of the DTI sector to the hypothetical depreciation shock for 2015 largely reflected the impact of short positions for a number of these institutions during the year. Building societies remained most resilient to the shocks applied for 2015, despite a marginally lower quarterly average post-shock CAR for the sub-sector relative to 2014. Commercial banks also showed a marginal increase in exposure to the exchange rate depreciation shocks, with the average median post-shock CARs and average quarterly post-shock CARs of these institutions decreasing relative to 2014. However, FIA licensees exhibited decreased exposure to the exchange rate depreciation shocks relative to 2014. The post-shock CARs of these institutions remained above the 10.0 per cent prudential benchmark during for the review period. In addition, DTIs remained resilient to the range of hypothetical appreciation

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[4] Shocks are applied first to the exchange rate between the Jamaica Dollar and the US dollar. The corresponding exchange rates of the Jamaica Dollar vis-à-vis the Euro, the Canadian dollar, and the Pound Sterling are then incorporated based on historical correlations with the selling rate for the US dollar between the January and May 2003 foreign exchange crisis period.

Figure 5.12 Interquartile range for post-shock CARs due to interest rate risk stress tests of DTIs (impact on CAR of 1100 bps/ 100 bps & 275 bps/ 15 bps shock to interest rates)[5]
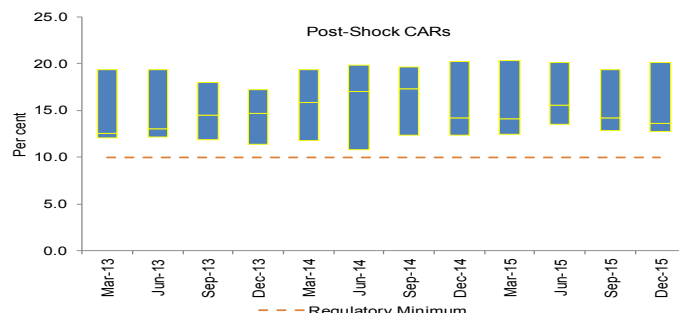
Figure 5.13 Quarterly ratio of DTI net open position to tiered capital
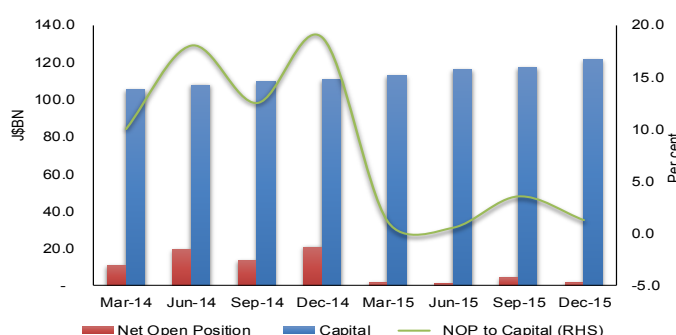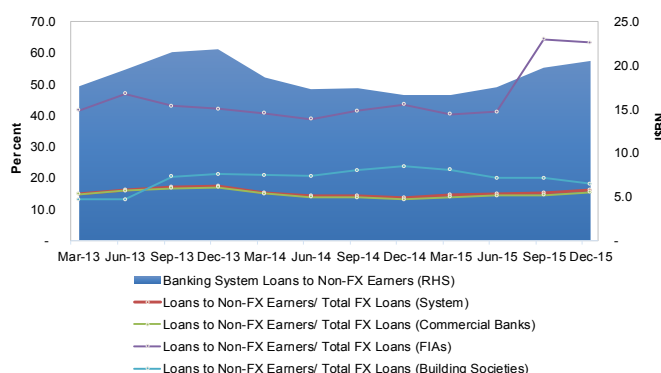

Figure 5.14 Analysis of foreign loans to non-foreign currency earners for DTIs

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[5] A shock of 1100 bps and 100 bps was applied to the domestic securities portfolio and the domestic deposits & loan portfolio, respectively. A shock of 275 bps and 15 bps was applied to the foreign securities portfolio and the foreign deposits & loan portfolio, respectively.

Figure 5.15 Distribution of foreign exchange risk stress test results for DTIs (impact on CAR of 30.0 per cent depreciation)
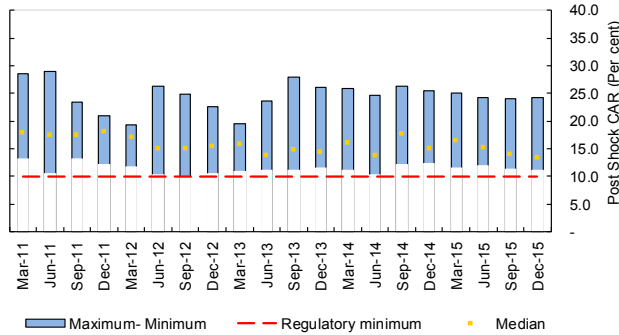

Figure 5.16 Credit risk exposure for DTIs at end-2015 (scenario: 100.0 per cent write-off of past due loans less than 3 months)
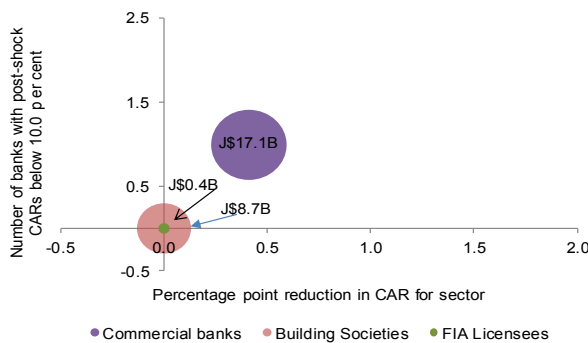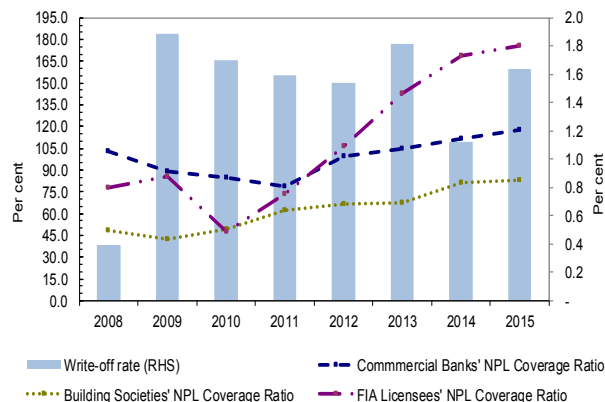

Figure 5.17 NPL coverage ratios for DTIs and write-off rates for NPLs for commercial banks

shocks considered over the review period.

5.7 Credit risk assessment of DTIs

DTIs' exposure to credit risk declined during 2015. The loan quality ratio, as measured by the ratio of NPLs to total loans for the sector, declined to 4.1 at end-2015 relative to 4.9 per cent at end-2014 and reflected improvement in the ratios for all DTI sub-sectors. The building societies sub-sector reflected the most pronounced improvement in loan quality, driven by a substantial decline in NPLs, with the NPLs to total loan ratio declining to 4.4 per cent at end-2015 relative to a ratio of 5.3 per cent at end-2014. For the commercial bank sub-sector, the ratio declined to 4.1 at end-2015 relative to 4.9 at end-2014. This occurred alongside an increase in the write-off ratio, measured as loan write-offs as a per cent of total loans, to 1.6 per cent at end-2015 relative to 1.1 per cent at end-2014 and was in-line with the five-year historical average. In addition, the loan quality ratio for the FIA licensees sub-sector declined marginally for the year, totalling 0.9 at end-2015 relative to 1.0 at end-2014 (see **Figure 5.16**).[6]

Against the background of strong declines in NPLs for the commercial banks and building societies for 2015, the NPL coverage ratios for both sub-sectors increased to respective values of 117.5 per cent and 82.7 per cent at end-2015 relative to 111.5 per cent and 81.0 per cent at end-2014. Also, the NPL coverage ratio for the FIA licensees increased to 175.5 per cent at end-2015 relative to 169.0 per cent at end-2014. In addition, the maximum ratio of NPLs to capital recorded across all DTIs also decreased to 27.5 per cent at end-2015 from 32.3 per cent at end-2014 (see **Figure 5.17**).

Furthermore, there was a narrowing of the inter-quartile range of NPLs to capital for DTIs, which underscored a lower exposure to credit risk. This ratio fell within an inter-quartile range of 12.0 per cent to 21.4 per cent at end-2015 relative to

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[6] Write-off rate is computed as the ratio of "charged off assets" for the year to "loans, advances & discounts (net of provisions)".

values of 11.6 per cent to 22.2 per cent at end-2014 (see **Figure 5.18**).

Stress test results at end-2015 showed that each sub-sector was adequately capitalized to absorb a hypothetical 30.0 per cent increase in NPLs (see **Figure 5.16 & 5.19**). In particular, there was strong improvement in FIA licensees' resilience to this hypothetical increase in NPLs during 2015. This was largely due to improvement in loan quality as well as stronger capital positions during the year. Further, the commercial bank and building societies sub-sectors also remained resilient to large but plausible hypothetical shocks to NPLs over the review year.

Reverse stress testing exercises showed that for the FIA licensees sub-sector it would take an increase in NPLs of 2985.0 per cent at end-2015 for the first FIA licensee to breach the CAR benchmark relative to an increase of 3 120.0 per cent at end-2014 (see **Figure 5.20**). In addition, building societies required an increase of 370.0 per cent at end-2015 relative to an increase of 300.0 per cent at end-2014.[7] The commercial bank sub-sector also showed reduced susceptibility to reverse stress testing assessments. It would take a larger increase in NPLs of 150.0 per cent to cause the most vulnerable institution to have its CAR fall below 10.0 per cent, relative to an increase of 120.0 per cent in NPLs at end-2014. In terms of the overall DTI sector, it would take a higher hypothetical 307.0 per cent increase in NPLs at end-2015 for the CAR of the DTI sector to breach the prudential minimum, relative to an increase of 269.0 per cent at end-2014 (see **Figure 5.21**).

5.8 Risk exposure assessment for SDs
During 2015, SDs' average risk exposure to foreign exchange risk, interest rate risk and credit risk decreased relative to the previous year, as reflected in the financial risk exposure cobweb diagram (see **Figure 5.22**). In addition, aggregate stress test results at end-September 2015, also showed

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[7] Reverse stress testing involves identifying the increase in NPLs required to bring the weakest institution's CAR below the 10.0 per cent minimum benchmark.

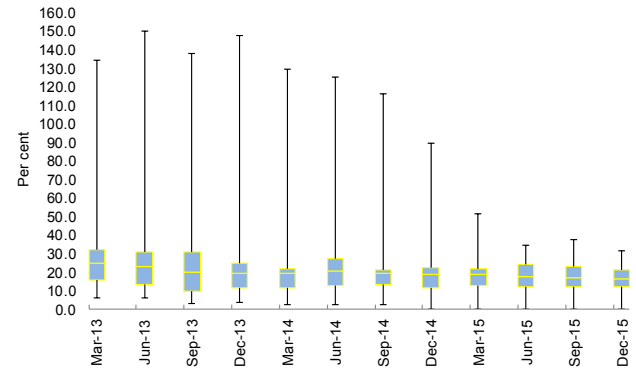**Figure 5.18** Distribution of NPLs to capital base for DTIs

Figure 5.19 Credit risk stress test results for DTIs (Scenario: Impact on CAR of a 30% increase in NPLs)
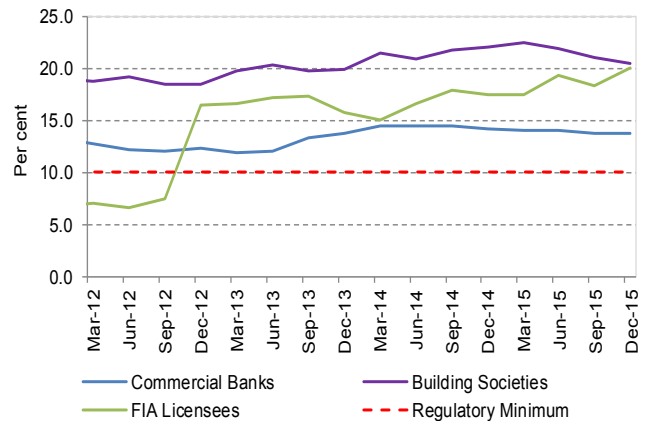

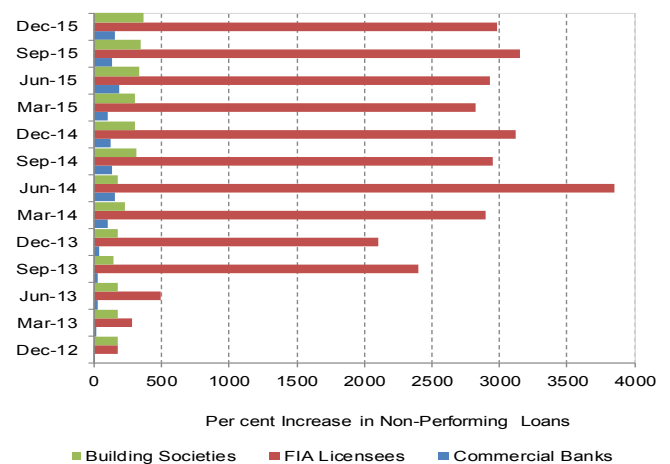**Figure 5.20** Reverse stress testing the credit risk exposure of DTIs

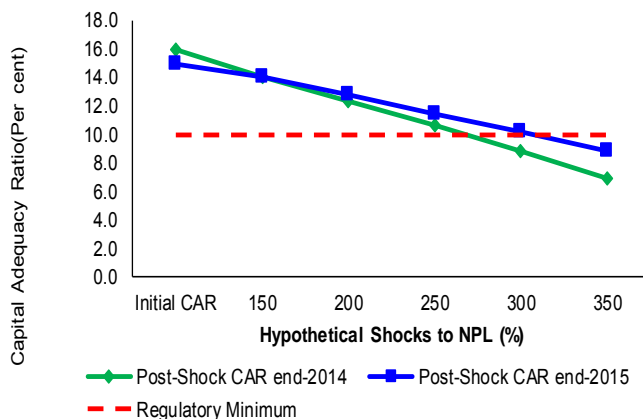**Figure 5.21** Impact on DTIs' CAR from an increase in NPLs
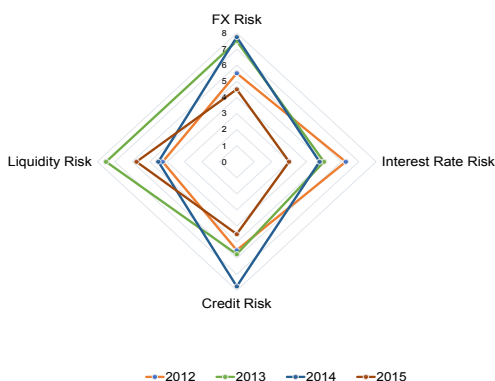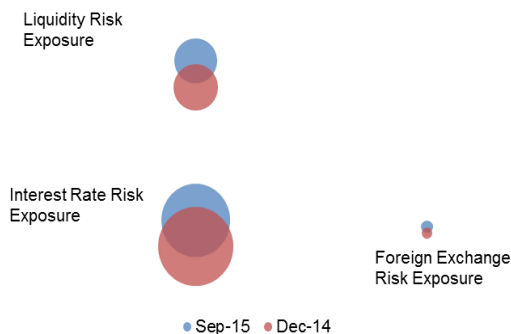

Figure 5.22 Risk Exposures of SDs

Figure 5.23 Relative exposures of SDs based on scenarios examined in aggregate stress test analysis

improved results due to reduced exposure these risks as well as reduced exposure to liquidity risks (see **Figure 5.23**).[8] Against this background, the SDs remained generally robust to the hypothetical, foreign exchange, interest rate, liquidity and credit shocks during the year.

5.9 Liquidity funding risk assessment of SDs

Stress test results at end-September 2015 for the twelve largest SDs, showed continued robustness to hypothetical reductions in these institutions' retail repo liabilities. Furthermore, it would take a more than 50.0 per cent reduction in retail repo liabilities for the CAR of the SD sector to fall below the 10.0 per cent benchmark. This performance represents an improvement relative to end-2014 when a lower shock of below 50.0 per cent would bring the sector CAR below 10.0 per cent. The increased resilience of the sector to liquidity shocks was largely influenced by the continued decline in securities dealers' holdings of repo liabilities during 2015, which occurred in the context of the continued phasing down of the retail repo business model as well as the incremental increase in the minimum size for retail repo transactions (see **Figure 5.24**).[9] The reduced vulnerability of the sector to reductions in repo liabilities was also supported by improvement in a number of key liquidity indicators. In particular, the ratio of liquid assets to total assets increased to an average of 12.0 per cent for the first three quarters of 2015 from an average of 11.65 per cent for 2014.

In addition, the ratio of short-term assets (less than three months) to short-term liabilities increased marginally to a quarterly average of 28.3 per cent from 27.1 per cent for the previous year (see **Figure 5.25**). There was also a narrowing of the cumulative 30 day and cumulative 90 day maturity gap between interest-sensitive assets

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[8] Nonetheless, the 'cobweb' diagram showed an increase in the average exposure to liquidity risk. The indicators used for this dimension are the liquid assets to total assets ratio and the liquid assets to short-term liability ratio.

[9] The minimum transaction size for repos has been increased on a phased basis up to December 2015.

Figure 5.24 Liquidity funding risk stress test results for the 12 largest SDs (10.0 per cent to 50.0 per cent decline in Retail Repo-liabilities)
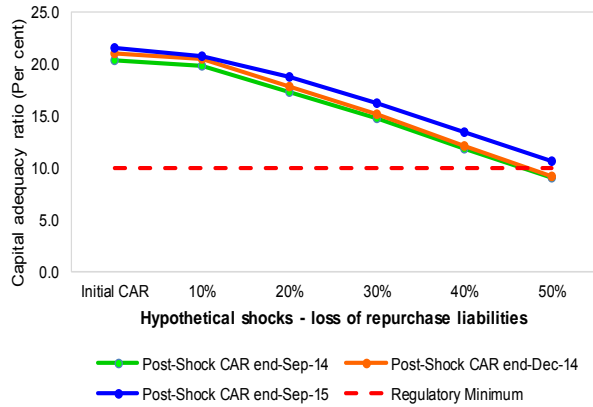

Figure 5.25 The ratio of assets maturing within 3–months to liabilities maturing within 3-months for securities dealers
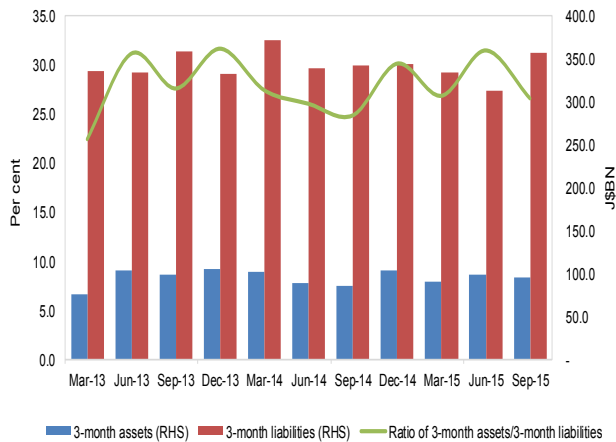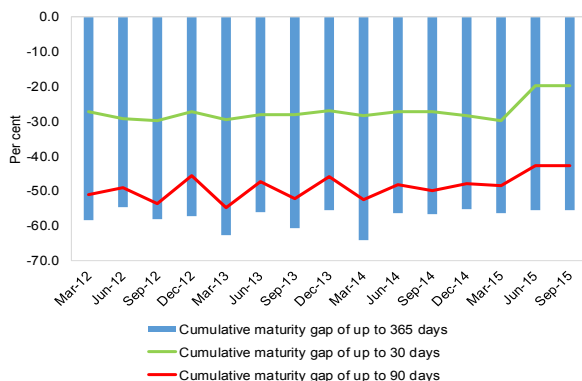

Figure 5.26 Cumulative gap positions as a per cent of total assets - SDs

and liabilities during the review period (see **Figure 5.26**).

5.10 Market risk assessment of SDs

VaR results for the twelve largest SDs were generally higher during the first three quarters of 2015 relative to end-2014 (see **Figure 5.27**). This deterioration was also reflected in a higher inter-quartile range of VaR estimates for these institutions.

The higher VaR outturn for the SDs was influenced by a continued shift in the composition of the investment portfolio towards foreign currency denominated securities as well as an increase in the average duration on securities dealers' foreign currency bond portfolios to 5.4 relative to 5.0 for 2014 (see **Figures 5.28 & 5.29**).

The stronger investment in foreign currency securities was partly influenced by the continued lifting of the cap on foreign currency investments, greater portfolio diversification given the phasing down of retail repos as well as revaluations due to the depreciation in the domestic currency. Foreign currency securities as a share of total investments averaged 52.3 per cent for the first three quarters of 2015 relative to an average ratio of 51.5 per cent for 2014.

5.11 Interest rate risk assessment of SDs

The securities dealers sector remained resilient to hypothetical shocks involving a 1100 bps/100 bps & 275 bps/15 bps and 1200 bps/200 bps & 300 bps/30 bps increase in interest rates on domestic/foreign rate sensitive assets and liabilities using data at end-September 2015 (see **Figure 5.30**). However, the sector's CAR fell below the 10.0 per cent CAR benchmark when more severe hypothetical shocks were examined. More specifically, following a hypothetical increase of 1300 bps/300 bps & 325 bps/50 bps in interest rates on domestic/foreign rate sensitive assets and liabilities, respectively, at end-September 2015, the sector's CAR declined to 9.0 per cent. Nonetheless, the sector showed increased resilience to positive interest rate shocks relative to end-2014. The stronger performance during 2015 was largely

due to a lower positive repricing gap and reduced fair value losses for these institutions.

The impact of simulated upward shifts in the domestic GOJ yield curve on securities dealers' capital adequacy was also evaluated on a quarterly basis using data up to end-September 2015 (see **Figure 5.31**).[10,11] These stress tests were utilized in evaluating the potential of these institutions to absorb hypothetical mark-to-market losses in the context of limited trading of domestic GOJ debt.[12] The scenarios considered involved parallel upward shifts in the GOJ domestic yield curve of 20.0 per cent, 50.0 per cent and 100.0 per cent.

Following these simulated shocks, the post-shock CAR of the securities dealer sector remained well above the 10.0 per cent benchmark following a 20.0 per cent, 50.0 per cent and 100 per cent upward shift in the GOJ yield curve (see **Figure 5.31**). Nonetheless, the post-shock CAR of a few SDs fell below the CAR benchmark following a 100.0 per cent upward shift in the yield curve. The largest impact of this shock for the sector was evidenced in the March 2015 quarter, with fair value loss as a share of capital of 22.8 per cent, relative to ratios of 13.4 per cent and 20.5 per cent for the June and September quarters, respectively. In addition, the post-shock CARs for the sector declined to 16.0 per cent at end-March 2015 relative to respective values of 18.5 per cent and 16.9 per cent at end-June 2015 and end-September 2015.

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[10] GOJ domestic yield curve is derived from reported market yields by DTIs and SDs and where no market yields were reported by an institution, the average weighted yields across all reporting DTIs and SDs were used.

[11] See Box 5.2 (Stress testing the impact of parallel and non-parallel shifts of the domestic GOJ bond yield curve) for additional shifts using an estimated yield curve.

[12] Fair value losses are simulated by applying the difference in the market values of domestic GOJ securities held by institutions as at end-March 2015, end-June 2015 and end-September using the institution's internally applied GOJ bond yields and the market values assuming a 20.0 per cent, 50.0 per cent & 100.0 per cent increase in GOJ bond yield, respectively.

Figure 5.27 Evolution of box and whisker plots for the value at risk for the 12 largest securities dealers
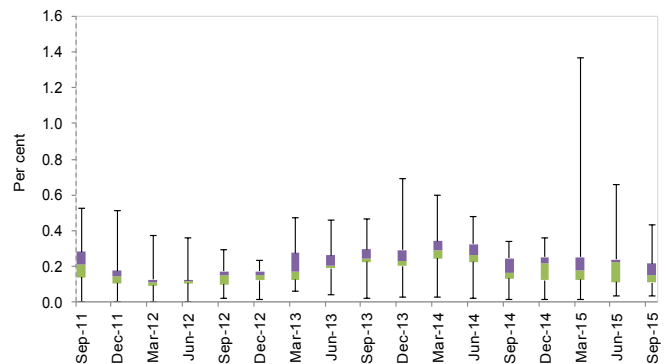
*The VaR was adjusted relative to previous publications to reflect amendments to the methodology.

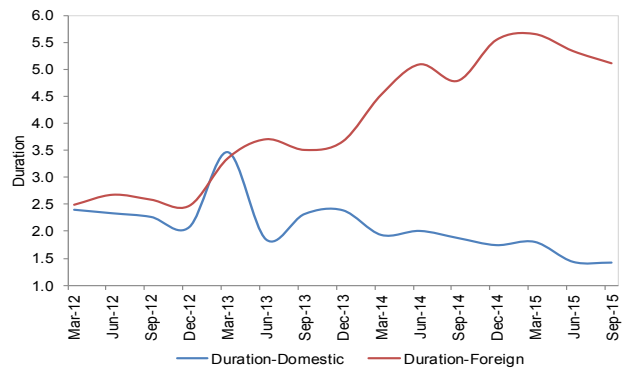**Figure 5.28** Evolution of duration for domestic and foreign securities for top 12 securities dealers

Figure 5.29 Investment holdings as a ratio to total investments for top 12 securities dealers
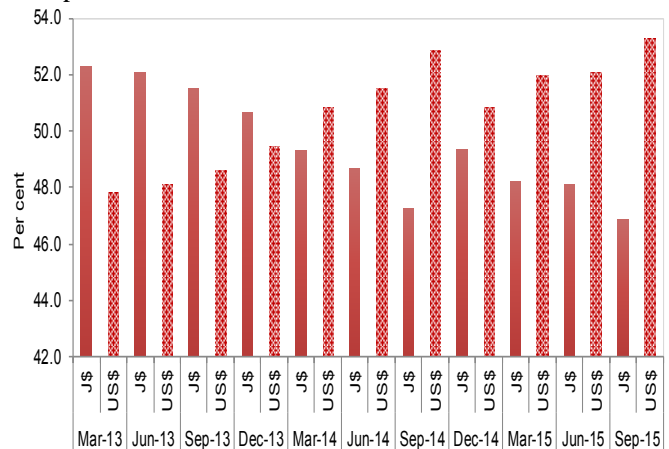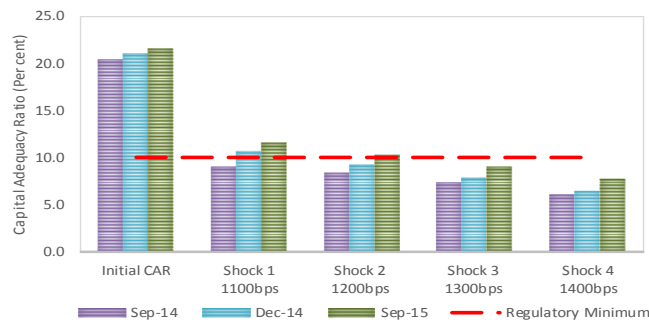
Figure 5.30 Interest rate stress test results for the top 12 securities dealers

Note: The scenarios examined include: Increases of 1100 bps/100 bps & 275 bps/15 bps, 1200 bps/200 bps & 300 bps/30 bps, 1300 bps/300 bps & 325 bps/50 and 1400 bps/400 bps & 350 bps/70 bps in interest rates on domestic/foreign rate sensitive assets and liabilities

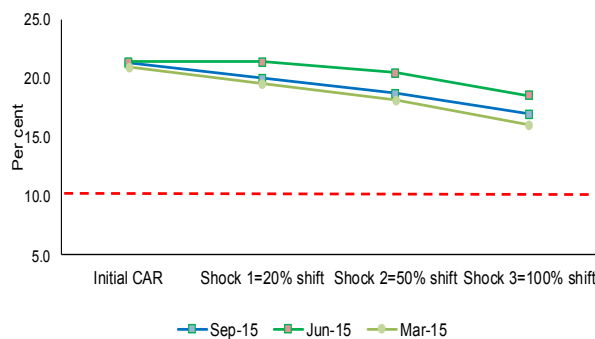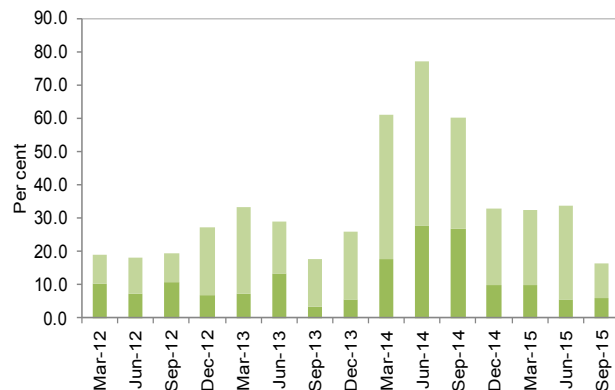**Figure 5.31** Impact on CAR of SDs due to upward parallel shifts in the yield curve

Figure 5.32 Quarterly inter-quartile ranges for the ratio of net open positions to tiered capital for securities dealers

5.12 Foreign exchange risk assessment of SDs

SDs showed reduced susceptibility to FX risks during the first three quarters of 2015. In particular, the NOP to capital ratios for the SDs declined, with the median NOP to capital ratio decreasing to 8.0 per cent at end-September 2015 from 9.4 per cent at end-2014; while the inter-quartile range for the SDs also narrowed during the year (see **Figure 5.32**). Moreover, SDs remained resilient to a 10.0 per cent to 50.0 per cent range of shocks involving hypothetical depreciations and appreciations in the exchange rate. In particular, the post-shock CARs of the SDs remained unchanged following these shocks (see **Figure 5.33**). The continued resilience of SDs was primarily due to strong levels of capital. Furthermore, SDs also showed reduced susceptibility to depreciation shocks due to the general declines in the net open position of these institutions during 2015.

5.13 Liquidity funding risk assessment of ICs

During 2015, life insurance and general insurance showed increased resilience to shocks involving a sudden decline in liquid liabilities. The stronger performance was attributable to general improvements in the capital and liquid position of these institutions during the review period. In particular, subsequent to a shock involving a 10.0 per cent loss of liquid liabilities, post-shock minimum continuing capital surplus requirements (MCCSRs) of the life insurance companies increased to a quarterly average of 251.5 for 2015 relative to an average of 238.3 for 2014 (see **Figure 5.34**). At the same time, the average post-shock MCT for general insurance companies rose to 291.4 per cent for 2015 relative to 288.8 per cent for the previous year. In addition, the post-shock CARs of all insurance companies remained above the statutory benchmark following the hypothetical liquidity shock.

5.14 Market and interest rate risk assessment of ICs

Life insurance companies also showed increased resilience to large but plausible hypothetical interest rate shocks during 2015, due to strong levels of capitalization. Following the

most severe shock which was applied, involving a 1400 bps/400 bps & 350 bps/70 bps increase in interest rates, the MCCSR for the sector remained unchanged at 264.2 per cent at end-September 2015 (see **Figure 5.35**).

Furthermore, the life insurance sector also reflected lower positive re-pricing gap positions as well as a decline in the average duration on the domestic bond portfolio which resulted in a decrease in fair value losses relative to 2014. In addition, the average quarterly VaR estimate for the sector decreased marginally during 2015. The VaR outturn decreased to an average of 0.14 per cent of total investments for the first three quarters of 2015 relative to 0.21 per cent for 2014 (see **Figure 5.36**).

5.15 Contagion risk assessment of the domestic financial system

Against the background of enhanced liquidity conditions in the domestic money market, inter-bank rates declined to a daily average of 3.8 per cent during 2015 relative to a daily average of 6.4 per cent for 2014. Furthermore, building societies, securities dealers and insurance companies were generally net lenders in the interbank market while commercial banks were net borrowers. In addition, the net counterparty exposure of the general insurance companies and FIAs to the commercial banks increased during 2015.

Moreover, stress testing of counter-party risk exposures for the financial system revealed that at end-September 2015, commercial banks, securities dealers and building societies showed reduced susceptibility to these shocks relative to end-2014 (see **Figures 5.37 & 5.38**).[13]

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[13] Stress testing of counter-party risk exposures for the financial system involved the assessment of the hypothetical failure of a financial entity which exposed the financial system to the largest counter-party credit risk.

Figure 5.33 Foreign exchange risk stress test results for the 12 largest securities dealers (impact on CAR of 10.0 per cent to 50.0 per cent depreciation)
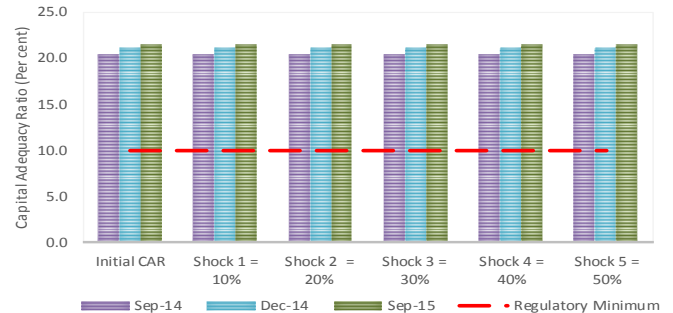
Figure 5.34 Liquidity funding rate risk stress test results for the insurance sector (impact on CAR of 10.0 per cent decline in liquid liabilities)
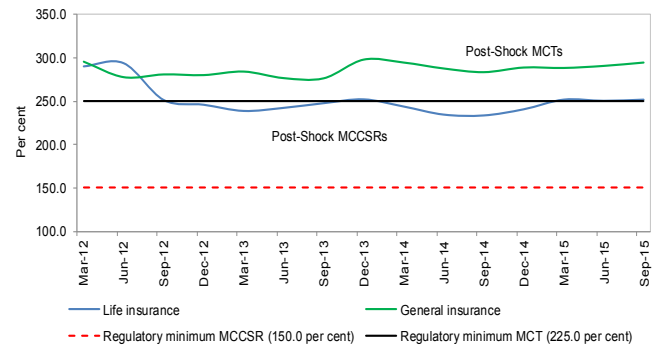
Figure 5.35 Interest rate risk stress tests for the life insurance sector
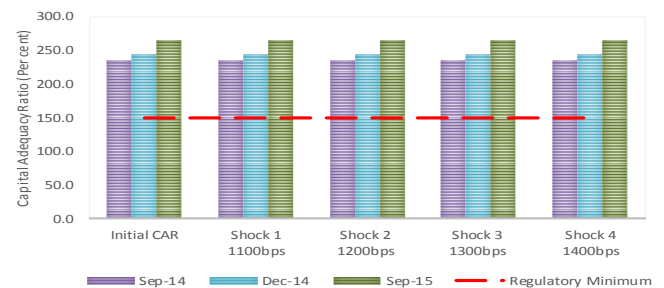
Note: The scenarios examined include: Increases of 1100 bps/100 bps & 275 bps/15 bps, 1200 bps/200 bps & 300 bps/30 bps, 1300 bps/300 bps & 325 bps/50 bps and 1400 bps/400 bps & 350 bps/70 bps in interest rates on domestic/foreign rate sensitive assets and liabilities

Figure 5.36 Value at risk and durations for the life insurance sector
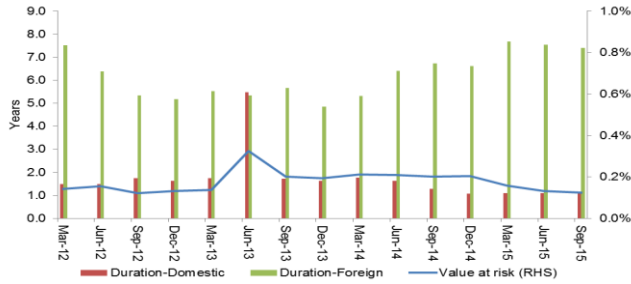
Figure 5.37 Distribution of counterparty risk exposures for the financial system at end-September 2015 (impact on CAR due to large net credit exposures)
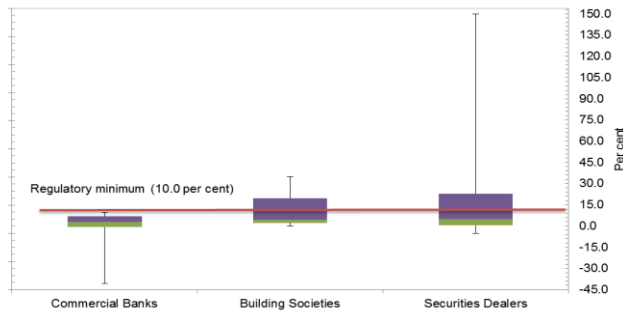
Figure 5.38 Distribution of counterparty risk exposures for the financial system at end-2014 (impact on CAR due to large net credit exposures)
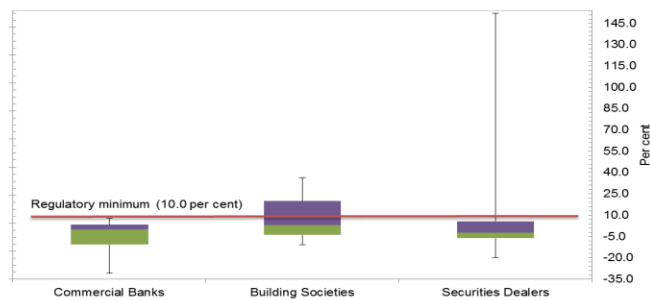
BOX 5.1: Collective Investment Schemes in Jamaica, their Growth and Risks

What are collective investment schemes (CIS)?

A CIS, is a type of investment vehicle used by investment managers to pool investors' funds to enable them to access investments which they might not otherwise be able to access in their individual capacities. Securities dealers that manage CIS may invest pooled funds into similar or different asset classes including equities, bonds, real estate and money market instruments. One of the main characteristics of a CIS is that investors share the risks as well as benefits of their investment in a scheme in accordance with their ownership interests in the scheme.[1]

Reform of the securities dealers' sector and growth in CIS

Since 2013, the securities dealers' (SDs') sector has embarked on a process of reform which entails the phase-down of the "retail repo" business model. Specifically, legislation was enacted to allow for the establishment of CIS which would facilitate the transfer of market, interest rate and liquidity risk to individual investors and off the balance sheet of broker dealers. Additionally, the Minister of Finance issued orders to allow for incremental increases in the limit on investments in foreign securities for SDs and CIS from 5.0 per cent at end-2013.[2,3] The essential purpose of these measures was to facilitate the emergence and growth of CIS as a safe and diversified investment alternative.

Currently there are two types of collective investment scheme structures in Jamaica, namely unit trusts and

mutual funds. Relative to end-2013, FUM for unit trusts grew sharply by 135.3 per cent to $136.4 billion at end-September 2015 (see **Figure 1.0**).[4] This upward trend was primarily driven by investments in fixed income securities which accounted for 74.7 per cent of the unit trust portfolios at end-September 2015. Notably, investments in all other classes of investments during the review period declined marginally relative to end-2013 (see **Table 1.0**). Growth in unit trusts was also supported by an increase in the number of unit trusts to 12 at end-September 2015 from 10 at end-2013.

Figure 1.0: Trends in FUM & value of units held by Jamaicans for units trust and mutual funds.
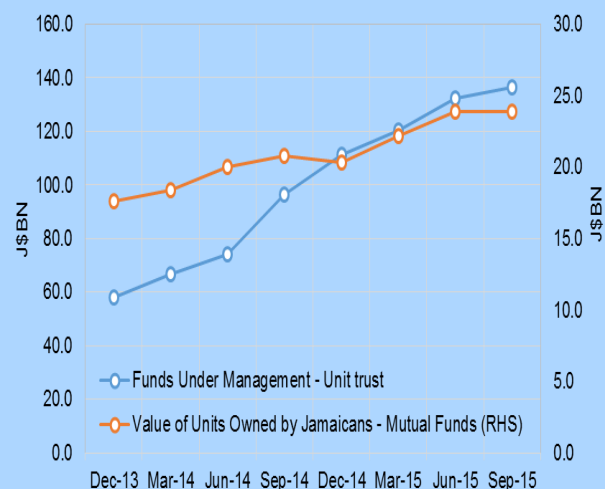
Source: Financial Services Commission

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[1] Source: Financial Services Board.

[2] Subsequent to the issued orders, the limit on investments in foreign securities has increased on four occasions to 7.5 per cent as at 1 July 2014, 10.0 per cent as at 2 January 2015, 15.0 per cent as at 31 August 2015 and 25.0 per cent as at end-2015.

[3] With the raising of the foreign currency investment cap, securities dealers and CIS will be permitted to acquire in all currencies investment grade sovereign obligations, investment grade corporate obligations of entities incorporated outside of Jamaica and shares of such corporations.

[4] Of note, the unit trust sector is dominated by two entities accounting for approximately 73.0 per cent of market share at end-September 2015.

Regarding mutual funds, the value of units managed by foreign mutual funds that are licensed to operate in Jamaica and held by Jamaicans increased to $23.9 billion at end-September 2015 relative to $17.6 billion at end-2013 (see **Figure 1.0**). However, there was a slight decline in the value of units held at end-2014 relative to end-September 2014, reflecting a decline in the value of global equities held in the mutual fund investment portfolio.[5] During 2015, investments in mutual funds improved steadily, consistent with an increase in the number of investors (see **Table 2.0**). To date one domestic mutual fund has been registered, however, it has not yet been operationalized.

Notwithstanding the various benefits associated with investing in CIS, there are certain risks which investors must bear in mind. These include sovereign and corporate default risk as well as loss in value of investments due to market downturns. As a consequence of these risks and depending on changes in investor behaviour, securities dealers who are the primary fund managers, will be susceptible to loss/volatility in income from fees.

Table 1.0: CIS statistics – Unit trusts

	Dec-13	Dec-14	Mar-15	Jun-15	Sep-15
Unit Trust Statistics					
Portfolio Composition					
Investments in Fixed Income Securities	65.8%	72.1%	73.3%	73.7%	74.7%
Investments in Real Estate	22.2%	18.7%	18.0%	18.0%	18.5%
Investments in Equities	8.1%	7.1%	6.9%	7.7%	6.7%
Cash and other Investments	3.9%	2.1%	1.8%	0.7%	0.2%
Market Share by Company					
Sagicor Investments	49.4%	55.5%	54.2%	54.2%	51.6%
Scotia Asset Management	39.7%	24.3%	23.1%	21.8%	21.4%
NCB Capital Market	0.2%	11.5%	14.1%	14.9%	16.8%
Barita Unit Trust Management	4.9%	4.9%	4.9%	5.1%	5.7%
JMMB Fund Managers	5.8%	3.8%	3.7%	4.1%	4.5%
# of Unit Trusts	10	11	11	12	12

Source: Financial Services Commission

Table 2.0: CIS statistics – Foreign mutual funds licensed to operate in Jamaica

	Dec-13	Dec-14	Mar-15	Jun-15	Sep-15
Mutual Fund Statistics					
Market Share by Company					
Scotia Caribbean Income Fund	45.6%	43.5%	46.9%	48.2%	51.3%
Scotia Mutual Funds	25.8%	29.7%	28.6%	28.3%	27.4%
CI Investments	28.6%	26.9%	24.5%	23.5%	21.3%
Total Investors	7,889	9,155	9,530	9,902	10,234
# of Overseas Mutual Funds	10	10	10	10	10

Source: Financial Services Commission

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[5] Mutual funds investment portfolios comprise mainly of equities and fixed income securities.

Box 5.2 Stress Testing the Impact of Parallel and Non-Parallel Shifts of the Domestic GOJ Bond Yield Curve

Background

DTIs and SDs in Jamaica are significant holders of domestic debt instruments issued by the GOJ. On two occasions, uncertainty related to fiscal and debt sustainability on the part of the GOJ influenced debt restructuring exercises, the 2010 JDX and the 2013 NDX, as pre-conditions for new arrangements with the International Monetary Fund. These exchanges involved the extension of maturities on domestic GOJ instruments as well as a reduction in the associated interest rates.

Since the NDX, the market for domestic GOJ instruments has been illiquid as institutions have become reluctant to trade these securities. Within this context, restarting of trading could potentially create significant volatility in yields and therefore volatility in mark-to-market asset valuations. This box assesses the impact of potential valuation risks on institutions in two steps. Firstly, a parsimonious fitting of the term structure of GOJ domestic instruments was developed using market yields reported to BOJ and the Financial Services Commission (FSC) by DTIs and SDs, respectively, for the first three quarters of 2015. Secondly, the impact of changes in yields on the domestic GOJ holdings of DTIs and SDs was conducted using scenarios to shift the estimated yield curve.

A yield curve depicts the relationship between market interest rates and residual maturity for bonds from the same issuer. Yield curves are important as they can be used to identify the value placed today by investors on nominal payments in the future. In addition, yield curves are also a useful indicator for central banks as they are able to capture changes in market expectations of macroeconomic conditions, monetary policy and investors' risk preferences. For financial stability purposes, hypothetical changes to the yield curve may be applied to portfolio holdings of securities by financial institutions in order to determine the potential impact on net earnings and capital adequacy.

Methodology

The methodology for constructing the domestic GOJ yield curve is similar to that utilised in Kladivko *et al.* (2010).[1] This model relies on the Svensson functional form to estimate a zero coupon curve given information on the current market yields of existing bond issues (Svensson 1994).[2] The zero coupon curve represents the yield to maturity of hypothetical zero coupon bonds, which are not directly observable in the market for a wide range of maturities. The model representing the zero coupon curve is specified as follows:

$$zero\ coupon\ yield(\tau) = \beta_0 + \beta_1 \left[\frac{1 - e^{-\lambda\tau}}{\lambda\tau}\right] + \beta_2 \left[\frac{1 - e^{-\lambda\tau}}{\lambda\tau} - e^{-\lambda\tau}\right] + \beta_3 \left[\frac{1 - e^{-\lambda\gamma}}{\gamma\tau} - e^{-\gamma\tau}\right]$$

Where: β_0 is the level component, β_1 is the coefficient of the slope component, β_2 is the coefficient of the first hump component and β_3 is the coefficient of the second hump component. The parameters λ and γ control the location of the first and second hump, respectively while τ is the term to maturity. A negative β_1 indicates an upward sloping curve while a negative β_2 indicates a U-shaped hump.[3] Although the estimated yield curve can be presented in various forms, namely spot rates, forward rates and par yields, this analysis focuses on spot rates. Given the inherent nature of markets, zero rates which are extracted from some known assets are used as a proxy for the spot rates.

The development of the yield curve utilized 10 fixed rate GOJ Benchmark Investment Notes, which were perceived to be the most liquid. The data used for estimation of the yield curve comprised average end-period prices reported to the BOJ and the FSC by DTIs and SDs, respectively. Additionally, the GOJ bond yield curve was estimated with residual maturities above six months. To address the issues that arise in estimating the short-end of the curve,

[1] Kladivko, K. et al, 2010, "The Czech Treasury Yield Curve from 1999 to Present", Journal of Economics and Finance, 60, no. 4.
[2] Svensson, L. E., 1994, "Estimating and Interpreting Forward Interest Rates: Sweden 1992-1994", Centre for Economic Policy Research, Discussion Paper No 1051.

[3] Similarly a negative β_3 indicates a U-shaped hump closer to the long end of the curve.

equivalent GOJ Treasury bill rates were computed using the end-period bills with maturities of 30 days and 90 days. No adjustments for tax or coupon effects are made.

Yield curve estimation results

The average mean absolute error across all three quarters under assessment was 9.8 bps which indicates that on average the absolute difference between the observed market yields and the yields estimated by the model was significantly less than 1.0 per cent. Notably, the September 2015 quarter provided the best fit for the model with a minimum MAE of 6.0 bps. This suggests that the estimated model is a reasonable fit.

An assessment of the estimated curves for Jamaica over the first three quarters of 2015 indicated a generally upward slope (see **Figure 1.0**). However, the steepness of the slope declined with each subsequent quarter. This outturn indicated a lowering of the risk-premia required to hold longer tenor bonds, reflecting increased investor's appetite for holding longer dated assets.

Figure 1.0: Estimated yield curve for 2015
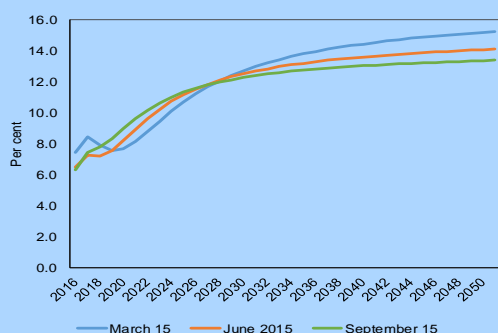
Yield curve shift scenarios

To assess the impact of parallel and non-parallel yield curve shifts, three broad scenarios were developed. Scenario 1 assumed that investors would require higher risk premiums across all tenors to hold domestic GOJs. As

such, all yields were increased by 20.0 per cent, 50.0 per cent and 100.0 per cent, respectively. Scenario 2 assumed that investors perceive greater risk at longer maturities relative to shorter tenors. This slope shift or yield curve twist involved an increase in yields on tenors over 10 years by 20 per cent, 50 per cent and 100 per cent, respectively.[4] Finally, scenario 3 assumed that investors would require higher premiums to hold medium tenors relative to shorter tenors and longer tenors. These curvature or butterfly shifts involved the application of 20.0 per cent, 50.0 per cent and 100.0 per cent increases, respectively, on tenors between 5 and 10 years.[5]

The results suggest that the SDs would record the largest fair value losses to capital for all three sets of scenarios (see **Figure 2.0**). In Scenario 1, at the application of the 100.0 per cent upward parallel shift in the yield curve, fair value losses to capital were 18.7 per cent for the sector at end-September 2015. However, based on the holdings of securities across individual SDs, non-parallel shifts had a smaller impact on fair value losses. Under Scenarios 2 and 3, at the application of 100.0 per cent slope and curvature non-parallel shifts, the SDs would record fair value losses to capital of 15.5 per cent and 18.1 per cent, respectively. Additionally, one institution recorded significant exposures in excess of 60.0 per cent of capital in response to the maximum shock of 100.0 per cent increases under all three scenarios.

Concurrently, DTIs would also experience fair value losses, albeit lower than that of the SDs. DTI fair value exposure to capital, as a result of a 100.0 per cent upward parallel shift under Scenario 1, was 9.1 per cent at end-September 2015. Under both Scenarios 2 and 3, DTIs would record fair value losses to capital of 6.8 per cent and 6.7 per cent, respectively, at the application of 100.0 per cent slope and curvature non-parallel shifts.

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[4] Increase in the yield curve slope: The respective 20 per cent, 50 per cent and 100 per cent shifts were assumed for maturities over 10 years, the curve was left unchanged for maturities up to1 year and linear interpolation was used for the shift for maturities over 1 year and up to 10 years.

[5] A widening of spread at medium term tenors (5 to 10 years) relative to other tenors: The respective 20 per cent, 50 per cent and 100 per cent shifts were

assumed for maturities over 5 years and up to 10 years, the curve was left unchanged for maturities up to 1 year and at maximum maturity. Linear interpolation was used for the shift in maturities over 1 year and up to 5 years as well as over 10 years and up to maturity prior to maximum maturity time.

Figure 2.0: Fair value losses to capital for DTIs and SDs from yield curve shifts as a per cent of regulatory capital at end-September 2015
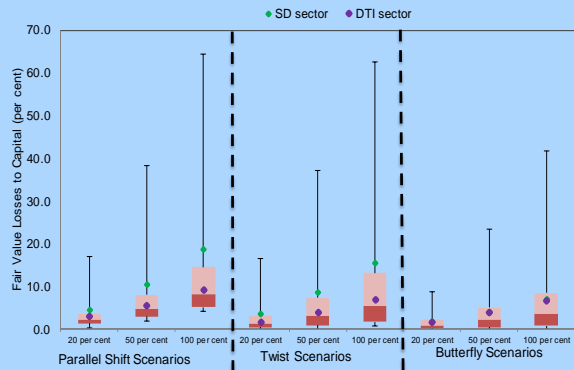
the sectors, individual SDs would require capital injections given that the CARs for these institutions would fall below the prudential minimum.

Regarding capital adequacy, the SD and DTI sectors would both remain robust to shocks under the three broad scenarios. Specifically, the sector capital adequacy ratios (CARs) remained well above the prudential benchmarks of 10.0 per cent (see **Figure 3.0**). However, under Scenario 1, a 100.0 per cent increase in yields across all tenors would result in three SDs falling below the prudential minimum. For Scenario 2, only one institution would fall below the prudential minimum.

Figure 3.0: CARs for DTIs and SDs at end-September 2015
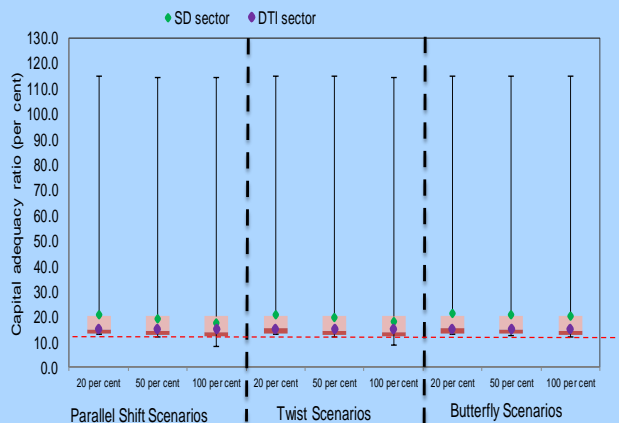
The abovementioned analysis suggests robustness of the SD and DTI sectors to hypothetical increases in yields that may be required for the restarting of the domestic GOJ bond market. Notwithstanding the overall performance of

Box 5.3 Macro Stress Testing of the Jamaican Commercial Banking Sector

Introduction
In light of the recent global financial crisis, the development of specialized financial sector surveillance tools are of high importance. Given that financial sector stability is a major objective of the Bank, an accounting framework was developed in order to assess the consistency between Jamaica's macroeconomic programme, which includes medium term projections of the real, fiscal, external and monetary sectors, and the solvency of the banking sector. The framework evaluates the tradeoffs among the several macro-economic objectives such as exchange rate, price stability, government debt sustainability and financial sector stability. The commercial banking sector's profit and loss (P&L) accounts are integrated into the standard macroeconomic projections which are derived within the context of IMF surveillance.[1]

The P&L account projections over the medium term generate a path for profits which, net of dividends, translates into a path for capital buildup. Capital adequacy is then measured using the projected paths of capital and risk-weighted assets. If the generated paths of profitability and capital adequacy show a declining trend or fall below specified thresholds, this would suggest that the assumptions of the macroeconomic framework are likely unsuitable for the solvency of the commercial banking sector and should be re-examined.[2]

Data and Assumptions
The framework combines historical data from the financial sector with historical stocks, flows and projections from the fiscal, monetary and banking sectors to formulate assumptions and derive P&L projections (see **Figure 1.0**).

Figure 1.0 The derivation of commercial banks' P&L projections
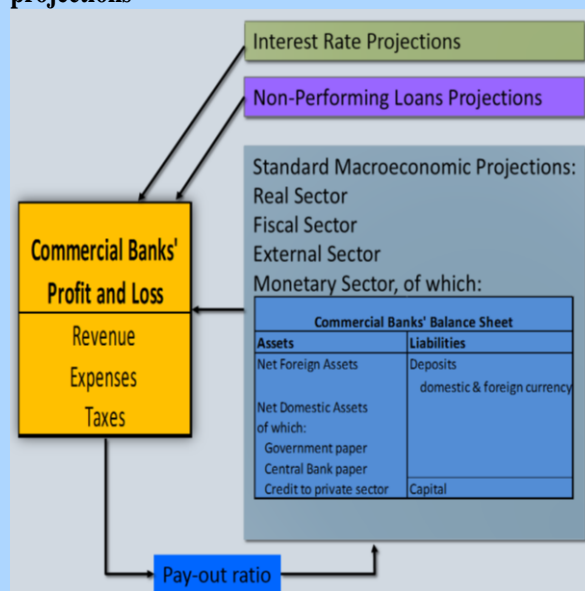
Fiscal sector
Net financing needs of the government is an important source of interest income for commercial banks. Projections regarding GOJ bond interest payments were based on assumptions outlined in the GOJ's medium term debt management strategy which suggests that external borrowing is currently the government's preferred source of funding.

Monetary sector
Projections of monetary stocks are based on the aggregation of the Bank's and commercial banks' balance sheet projections and were obtained from the Financial Programme and Policies framework.[3]

Interest rates
Projected monetary stocks are multiplied by projected interest rates to determine projected interest related elements of the P&L. As it relates to interest rate projections, this entails specifying the benchmark rates for

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[1] Basu, R., Choueri, N., & Pascaul, A. G. (2006). Financial sector projections and stress testing in financial programming: A new framework. *IMF Working Paper 06/33*.

[2] The assumptions of the macroeconomic framework also rely on projections of private sector credit from the commercial banking sector.

[3] The Financial Programme and Policies framework is used to analyze the current state of the economy, forecast where the economy is headed, and identify economic policies that can change the course of the economy.

each interest rate involved, as well as the margins associated with each benchmark rate. The following assumptions are made with respect to the projection of interest rates:

- There is a transmission mechanism of international reference rates to domestic rates.
- A link also exists between international rates and rates on Central Bank instruments.
- Commercial banks link interest rates offered on private sector deposits and loans to the rates of return on government paper.

Loan-loss provisions

Provisions against credit risk are also a key element in the projections of commercial banks' P&L accounts. The path of these provisions relies heavily on the projected path of NPLs. The use of an empirical model suggested that the logit-transformed NPLs of each bank *i* follows an AR (1) process and is influenced by past GDP growth, with up to *S* lags (see **Equation 1.0**):[4]

$$ln\left(\frac{NPL_{i,t}}{1-NPL_{i,t}}\right) = \mu_i + \alpha \ln\left(\frac{NPL_{i,t-1}}{1-NPL_{i,t-1}}\right) +$$
$$\sum_{s=0}^{S} \beta_{t-s} \Delta ln(GDP)_{t-s} + \varepsilon_{i,t} \qquad (1)$$

Projections of non-interest related components of the P&L

The non-interest income and expenditure related components of the P&L include net commissions earned, other income and general & administrative expenses. These components were projected using parameters based on historical averages as well as projected inflation.

Scenarios and Results

The FY 2015/16 results of the commercial banking sector projections framework was used to measure the resilience of the Jamaican commercial banking sector using six scenarios: a baseline scenario and five stress scenarios. The five stress scenarios applied included: an 'Inflation shock' scenario, a 'Recession' scenario, a 'Foreign exchange shock' scenario, an 'Interest rate shock' scenario as well as an 'Aggregate shock' scenario.

The 'Inflation shock' applied was an inflation rate of 15.0 per cent for FY 2015/16. The 'Inflation shock' directly translated to increases in non-interest related elements of the P&L accounts. The 'Recession shock' scenario assumed a 10.0 per cent decline in both *Loans & Advances* and *Deposits* as well as a quarterly decline of 2.0 per cent in GDP for FY 2015/16. This hypothetical contraction in GDP would resulted in a non-performing loan (NPL) ratio of 23.0 per cent.

The 'Foreign exchange shock' scenario assumed an additional 20.0 per cent depreciation in the value of the Jamaica Dollar against the United States dollar relative to the baseline scenario, while the 'Interest rate shock' scenario assumed 1100 bps/100bps and 100 bps/10bps increases in interest rates on domestic/foreign rate sensitive assets and liabilities, respectively. In addition, all four stress scenarios were combined to derive the 'Aggregate Shock' scenario.

The commercial banking sector remained resilient to these adverse shocks to the real economy and financial markets (see **Table 1.0**). The sector continued to meet the local capital adequacy benchmark of 10.0 per cent. The resilience of the banking sector was largely supported by strong capital adequacy as well as the ability of the sector to generate interest income under all the stress scenarios examined.

Table 1.0 Macro stress test results for commercial banking sector

	Commercial banking sector CAR (%)
Initial position (March 2015)	14.2
Baseline (March 2016)	12.9
Stress Scenario	**Post Shock CAR**
'Inflation shock'	12.9
'Recession shock'	12.7
'Foreign exchange rate shock'	12.8
'Interest rate shock'	12.9
'Aggregate shock'	10.6

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[4] Vazquez, F., Tabak, B., & Souto, M. (2012). A macro stress test model of credit risk for the Brazilian banking sector. *Journal of Financial Stability*, 69-83.

6. Payment System Developments

6.1 Overview

Jamaica's payment and settlement systems remained vibrant during 2015 in spite of tightened liquidity conditions experienced over a large portion of the year. Activities in the BOJ's JamClear-Real-Time Gross Settlement System (RTGS) increased with the overall value of transactions amounting to 9.4 times GDP. Liquidity remained concentrated among a few participants and transactional activity highlighted continued payment concentration. There was, however, mixed performance in the BOJ's JamClear-Central Securities Depository (CSD) with a slight increase in transactional value amounting to 11.4 times GDP but a reduction in the number of transactions. The reduction in volume was primarily due to the continued inactivity of trading in the secondary Government domestic bond market.

Despite increases in electronic payments, there remained a strong preference for cash payments. Although card penetration increased over the period, however, the migration from cash to electronic payments continued to lag, as signaled by a reduction in the point-of-sale (POS) transactions to automated banking machines (ABM) withdrawal ratio, which showed approximately two ABM withdrawals for each POS transaction.

6.2 Large value transfer system
6.2.1 JamClear-RTGS System[1]

During 2015, there was an increase in activity in the JamClear-RTGS system. In particular, the total value of RTGS transactions increased to J$15.3 trillion for 2015 from J$14.4 trillion for 2014, indicating a system turnover of 9.4 times. This reflected an increase in average aggregate monthly transaction value by 6.5 per cent to J$1.2 trillion for 2015. This transactional value represented an average monthly turnover for the RTGS of 2.4 times GDP (see **Figure 6.1**).[2]

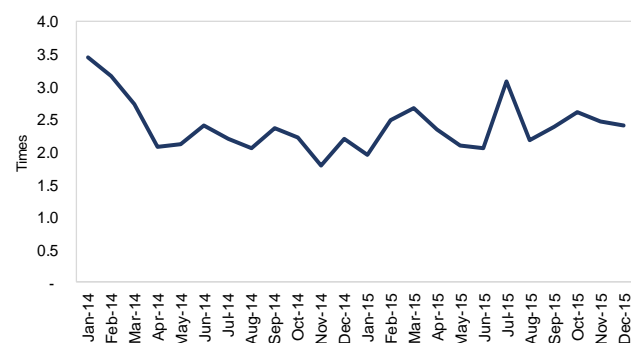**Figure 6.1** JamClear-RTGS monthly system turnover

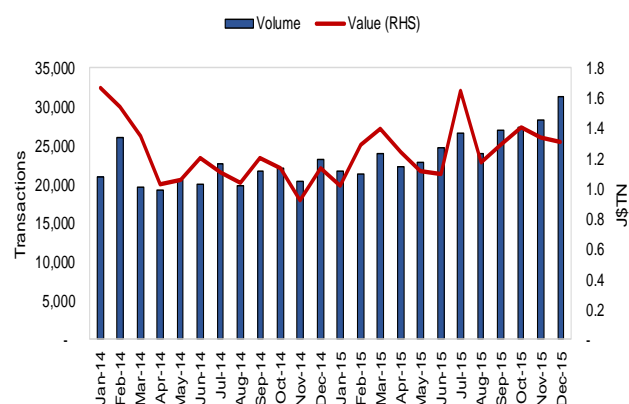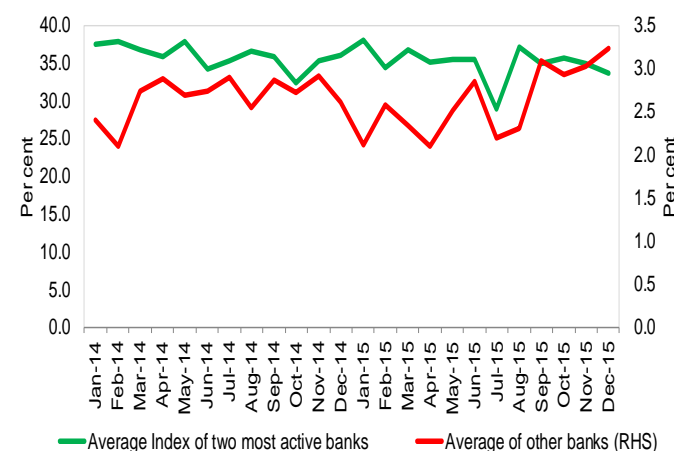**Figure 6.2** JamClear-RTGS monthly transaction values and volumes

Figure 6.3 Large-value system concentration risk index

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[1] JamClear-RTGS statistics include both JMD and USD denominated payments.
[2] Turnover is a ratio of the total transaction value as percentage of GDP.

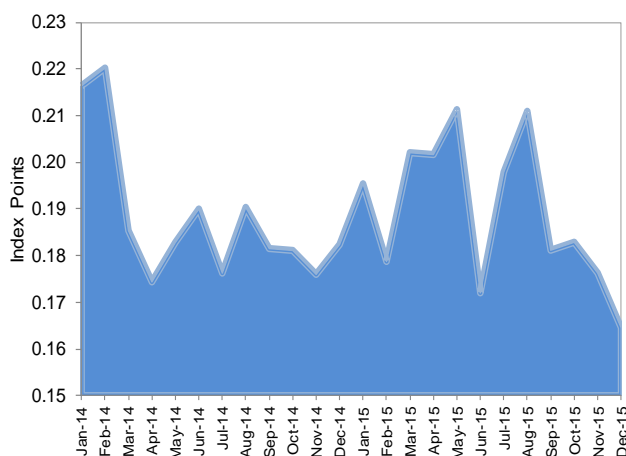**Figure 6.4** Herfindahl index of JamClear-RTGS payment activity

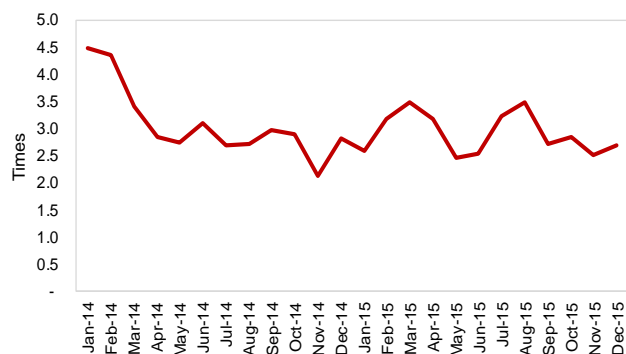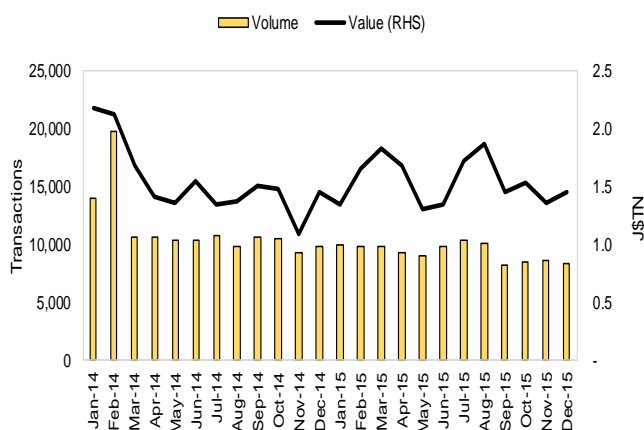**Figure 6.5** JamClear-CSD monthly system turnover

Figure 6.6 CSD monthly transaction values and volumes

Payments related to securities transactions from the JamClear-CSD accounted for the largest portion of the total transaction value, approximately 56.6 per cent.

Additionally, overall JamClear-RTGS volumes for the period increased from 255 839 transactions for 2014 to 301 371 transactions for 2015. The average monthly transaction volume also increased by 17.8 per cent to 25 114 (see **Figure 6.2**). Customer credit transfers (single and multiple) accounted for approximately 71.3 per cent of transaction volumes. These payments are considered time critical and as such have been given a required time within the system rules of a maximum of two hours to be settled. Over the review period all customer credit transfers were settled within the two hour rule with a maximum settlement time of 0.3 seconds.

6.2.1.1 Concentration risk

The Large-Value System Concentration Risk Index (LSCRI) records the share of payment activity between the two most active participants in relation to all other participants. [3,4] An examination of the LSCRI showed that liquidity concentration remained high for the review period. There was, however, marginal risk reduction as indicated by a decrease in the average share of payment activity for the two most active institutions to 33.7 per cent for 2015 coupled with an increase in the share of activity for all other institutions to 3.2 per cent (see **Figure 6.3**).

The level of concentration risk within the system was also reflected in the Herfindahl Index of JamClear-RTGS Liquidity Concentration.[5] This Index averaged 0.2, in line with the annual average over the last five years, thereby signalling persistence in the level of liquidity concentration within the large value transfer system in Jamaica (see **Figure 6.4**).

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[3] This measure is computed based on the sum of payments made and received by each bank as a share of overall payments for the system.

[4] The calculation excludes the activities of the Accountant's General Department, BOJ and Clearing Houses who are also participants in the RTGS system.

[5] The Herfindahl index is a measure of the extent of a financial institutions' payment activity in relation to the other participants in the system. It is also an indicator of the level of concentration of liquidity with the system.

High levels of concentration within the JamClear-RTGS as indicated by both concentration measures is an indication of potential systemic risk within the system. This underscores the importance of identifying and monitoring systemically important financial institutions (SIFIs) within the system as well as measuring the level of systemic risk emanating from the persistence of concentration (see **Box 6.1**).

6.2.2 JamClear-CSD[6]
The JamClear-CSD system showed mixed performance for 2015 with increases in transactional value but decreases in transaction volume. The overall value increased slightly in 2015 by 0.1 per cent to J$18.5 trillion which represented a system turnover of 11.4 times. The average monthly value of CSD transactions for 2015 decreased marginally to J$1.5 trillion, an average monthly turnover of 2.9 times GDP (see **Figure 6.5**).

The overall volume of transactions however, declined to 111 180 transactions for 2015 from 135 902 for 2014. The average monthly volume of transactions also decreased by 18.2 per cent to 11 325 for 2015 (see **Figure 6.6**).

6.2.3 Liquidity risk: usage of BOJ's intra-day liquidity facility[7]
Amid tight market liquidity conditions at the start of 2015, the BOJ introduced a three-month lending facility as well as a weekly fixed volume competitive bid auction repo facility[8]. The Bank continued provision of the standing liquidity facility, the bi-monthly repurchase operations and the excess funds rate throughout the year. Liquidity was complemented by maturities on the Bank's Fixed Rate and Variable Rate CDs as well as injections through net foreign currency purchases via the foreign currency surrender facility, net issues of repurchase agreements and to a lesser extent,

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[6] The Jamaica Dollar portion of the JamClear-CSD is assessed.

[7] The BOJ's intraday liquidity facility provides funds to system participants to minimize their exposure to liquidity risks. Such risk could be brought about by timing mismatches between incoming and outgoing payment activities.

[8] The Bank implemented the weekly fixed volume competitive bid auction repo facility in October 2015. Key benefits of the facility are: increased access to liquidity, market determined interest rates through true price discovery as well as increased market confidence.

Figure 6.7 Share of BOJ intraday repos (values) demanded by the top four subscribers during 2014 & 2015
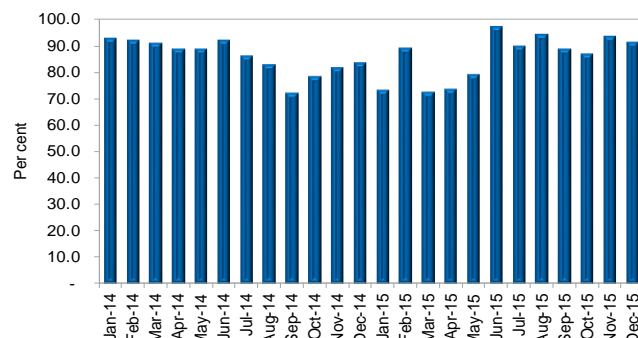

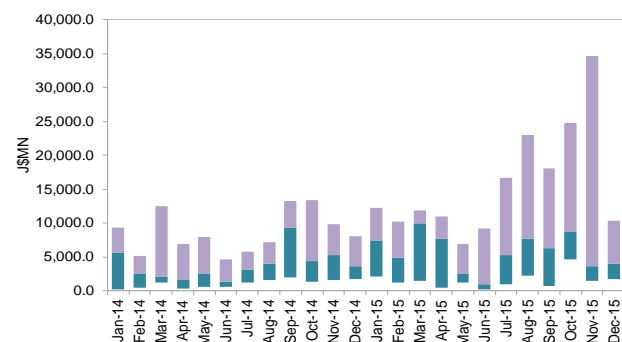**Figure 6.8** BOJ intraday repo facility monthly transaction value

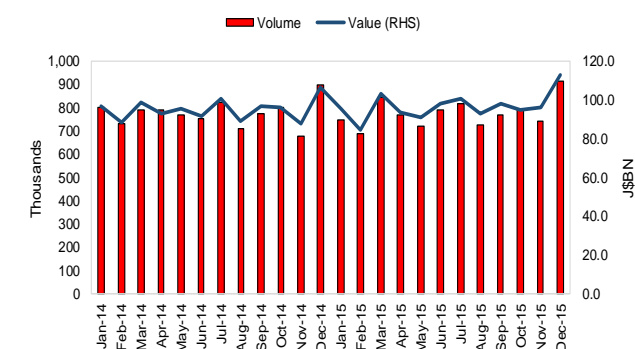**Figure 6.9** Automated Clearing House monthly transaction values and volumes

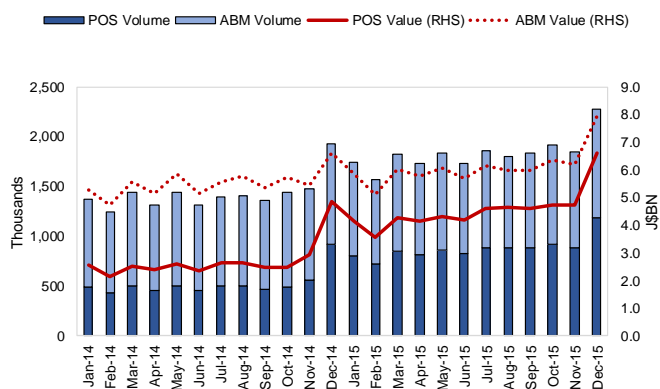**Figure 6.10** MultiLink monthly transaction values and volumes

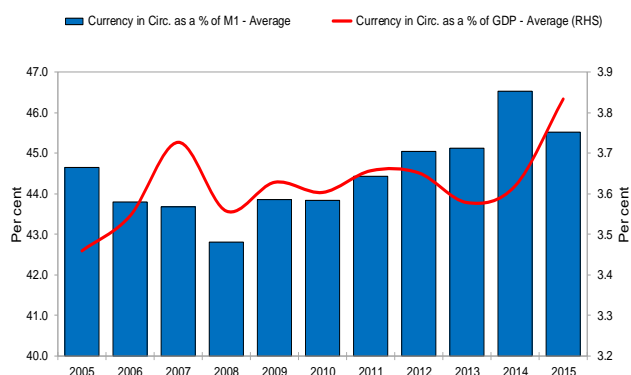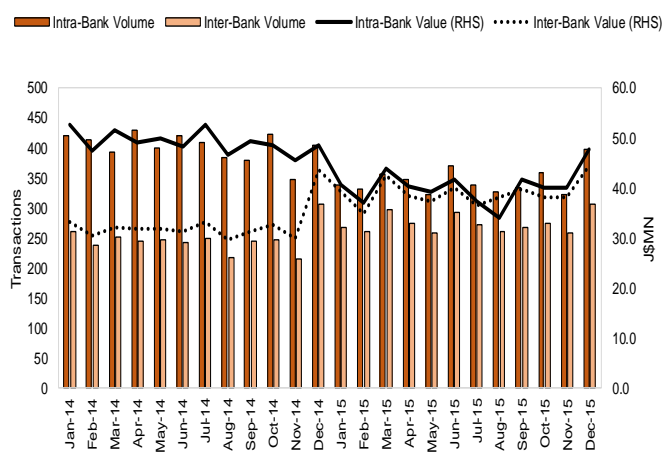**Figure 6.11** Currency in circulation

Figure 6.12 Inter-bank and intra-bank cheque monthly volumes and values per 1 000 persons

maturing open market operations instruments.

The use of the Bank's intra-day lending facility increased for 2015 by 23.4 per cent relative to growth of 4.5 per cent for 2014. The number of the intra-day liquidity transactions, however, decreased slightly by 0.7 per cent in 2015 relative to 2014. Of the participating institutions utilizing the BOJ intra-day repo facility, the percentage of funds demanded by four institutions remained consistently over 70.0 per cent for most of the review period, an indication of concentration of liquidity demand in the payment system (see **Figure 6.7**). The Bank's provision of intra-day repos totalled $1.9 trillion at end-2015 relative to $1.5 trillion at end-2014. The amount of funds demanded during the second half of the year totalled J$1.2 trillion relative to a total of J$648.2 billion up to end-June 2015 (see **Figure 6.8**).

6.3 Retail payment systems
6.3.1 Automated clearing house (ACH)
Activity in the ACH remained relatively unchanged in 2015 in comparison to 2014. The level of activity was in keeping with BOJ's continued objective of minimizing liquidity risk associated with differed net settlement in the ACH. Of note, the total volume of ACH transactions stood at 9.3 million for the review period. Average monthly transaction volumes, however, increased to 774 678. Transaction values increased by 1.9 per cent to J$1.2 trillion with average monthly transaction value increasing to J$96.7 billion (see **Figure 6.9**).

6.3.2 MultiLink
There was an increase in activity for the MultiLink card network in 2015. The total value of MultiLink transactions increased to J$127.4 billion, for 2015 from J$ 98.6 billion for 2014. The average monthly transactional value also increased by 29.2 per cent to J$530.7 billion. Additionally, transactional volumes increased from 17.1 million for 2014 to 22.0 million for 2015. The average monthly volume also increased by 28.4 per cent to 91 480 transactions (see **Figure 6.10**).

Increases in the average monthly transactional activity was influenced by growth in both POS and ABM transactions. The average monthly volume of POS transactions increased to 873 102, an increase of 68.0 per cent, amounting to J$4.5 billion while the number of ABM transactions increased to 956 504, an increase of 5.6 per cent, amounting to J$6.1 billion (see **Figure 6.19**).

6.4 Trends in retail payments

Total retail payment transaction increased in 2015 by approximately 4.1 per cent to J$1.5 billion per 1 000 persons at end-2015.[9] The average monthly transactional value also increased to J$122.1 million per 1 000 persons for the period. The total number of retail transactions increased by 3.6 per cent to 52 673 per 1 000 persons with average monthly transaction volumes increasing to 4 389 transactions per 1 000 persons (see **Table 6.1**).

6.4.1 Paper-based instruments

There was stronger growth in currency in circulation during 2015 relative to 2014. For the year, currency in circulation increased by 15.3 per cent to J$73.3 billion relative to growth of 8.4 per cent for 2014. The average monthly level of currency in circulation as a share of GDP, increased from 3.6 per cent at end-2014 to 3.8 per cent at end-2015. Average currency in circulation as a share of M1, however, decreased to 45.5 percent at end-2015 relative to 46.5 per cent at end-2014 (see **Figure 6.11**). [10]

Cheque payments declined for 2015 with the average monthly cheque transaction volume declining by 4.6 per cent to 618 transactions per 1 000 persons.

A further disaggregation of cheque transactions revealed that intra-bank cheque volumes declined by 14.1 per cent to 345 transactions per 1 000 persons while inter-bank transactions increased by 11.1 per cent to 273 transactions per 1 000 persons.

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[9] Retail payments include cheque payments, debit and credit card payments and other electronic forms of payment.

[10] M1 is composed of currency in circulation plus demand deposits in local currency.

Figure 6.13 E-payment monthly volumes and values per 1 000 persons
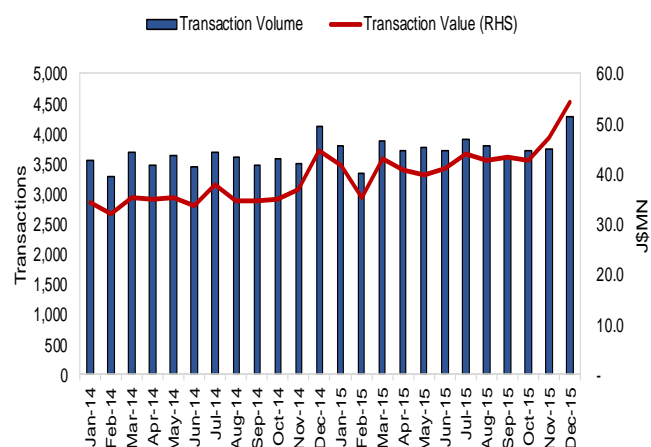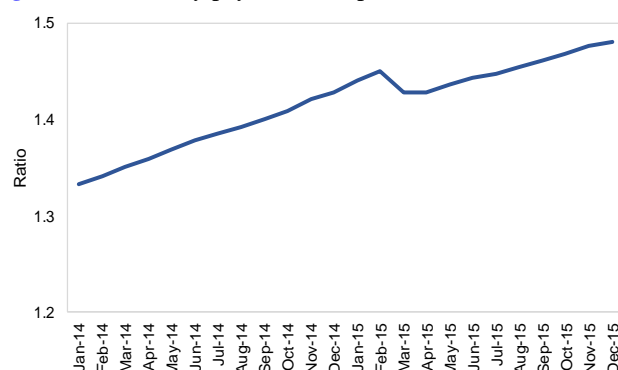

Figure 6.14 Monthly payment card penetration

Table 6.1 Composition of monthly retail payment transactions per 1 000 persons

	Proportion of Retail Payment in Per cent	
	Value	Volume
Cheques	64.8	14.1
Card Payments		
Debit	22.3	65.4
Credit	9.6	15.9
Other Electronic Payments	3.3	4.5

Figure 6.15 Composition of cards in circulation per 1 000 persons
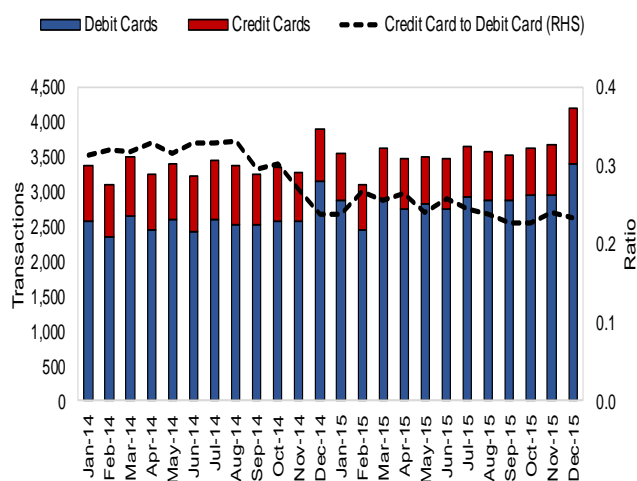

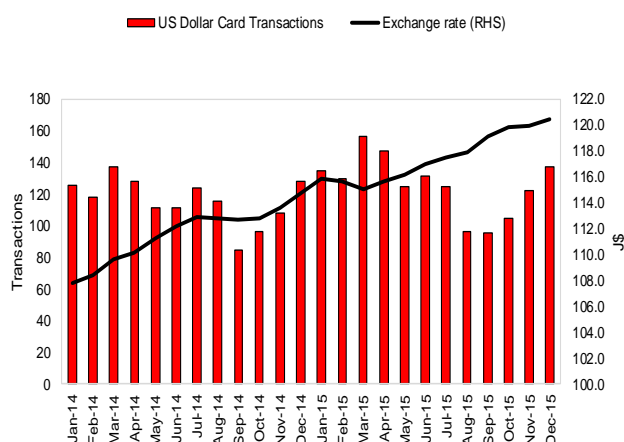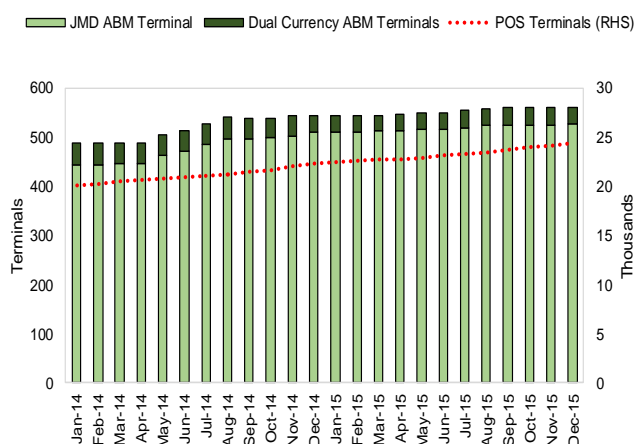**Figure 6.16** US dollar card transaction per 1 000 persons and exchange rate

Figure 6.17 POS and ABM Terminals in circulation

Total average monthly cheque transactions decreased by 3.1 per cent to J$79.1 million per 1 000 persons. Consistent with the change in transactional volumes, the value of intra-bank cheques decreased by 18.1 per cent to J$40.2 million per 1 000 persons while the value of inter-bank transactions increased by 19.7 per cent to J$38.9 million per 1 000 persons (see **Figure 6.12**).

6.4.2 Commercial bank electronic payment instruments

There was growth in the use of electronic payment instruments during 2015. The total number of electronic transactions for 2015 increased by 5.0 per cent to 45 260 transactions per 1 000 persons. Average monthly electronic payments also increased to 3 772 transactions per 1 000 persons for 2015 from 3 592 per 1 000 persons for the previous period. The value of electronic payments increased by 30.7 per cent to J$560.7 billion per 1 000 persons with the average monthly value increasing to J$43.0 million per 1 000 persons (see **Figure 6.13**).

Payment cards in circulation increased by 5.4 per cent to 2.9 million at end-2015 relative to end-2014. Consequently, card penetration increased to 1.5 cards per capita (see **Figure 6.14**)[11]. As it relates to card transactions per 1 000 persons, the ratio of credit cards to debit card transactional volume decreased in 2015 to 0.24. [12] This was largely due to a decrease in the average monthly number of credit card transactions by 11.1 per cent to 700 transactions per 1 000 persons. The average monthly debit card transactions, however, increased by 11.4 per cent to 2 873 transactions per 1 000 persons (see **Figure 6.15**).

There was a slight increase in the average monthly volume of US dollar card transactions despite the continued depreciation in the Jamaican Dollar vis-à-vis the US dollar. For 2015, average monthly volume of US dollar card transactions increased by 8.5 per cent to 137 transactions per 1 000 persons (see **Figure 6.16**). There was also an increase in the average monthly value of US dollar card payments by

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[11] Cards penetration is measured as the number of cards per capita.

[12] Card statistics include both JMD and USD denominated card payments.

16.2 per cent to J$3.6 million per 1 000 persons for 2015. The volume of Jamaica Dollar-denominated card transactions also increased relative to 2014.

6.5 Electronic payment channels

There was an increase in the number of active ABM and POS terminals operated by commercial banks. Specifically, the number of ABM terminals increased by 4.0 per cent at end-2015 to 561 terminals. The number of active POS terminals also increased by 10.0 per cent at end-2015 to 24 425 terminals (see **Figure 6.17**).

Although electronic payments continued to increase in usage, the ratio of POS transactions to ABM withdrawals declined in 2015 (see **Figure 6.18**). While POS transactions increased for same period to 1 269 per 1 000 persons, the ratio declined to 0.6 POS transactions for every ABM withdrawal (more than one ABM withdrawal to POS transaction). Similarly, the average monthly value of POS increase by 18.4 per cent to J$9 927 per 1 000 persons while average monthly ABM values increased by 15.9 per cent to J$11 601 per 1 000 persons. The ratio of the two however indicated that the value of ABM transactions remained higher than the value of POS transactions. This outturn illustrates the continued prevalence of cash as a medium of payment even in the presence of increasing electronic payments.

Figure 6.18 POS transactions to ABM withdrawals per 1 000 persons
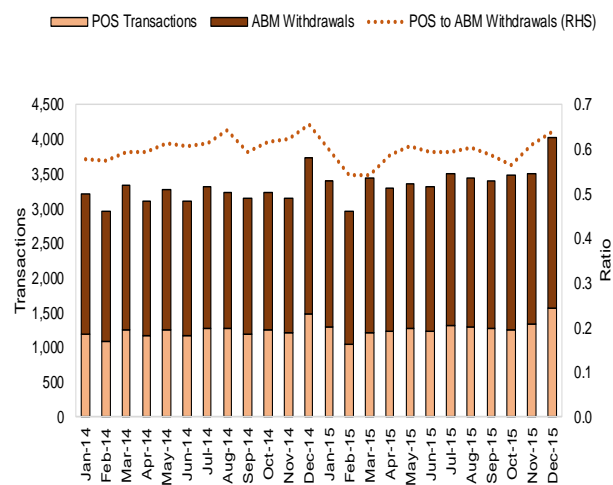
BOX 6.1: Structure & Stability of the JamClear-RTGS

The operational resilience of payment infrastructures are important to maintain financial stability as disruptions in routine payment flows can result in severe contagion across the financial network. To mitigate the effects from the materialization of systemic risk within the system, it is important to examine the network topology of the BOJ operated JamClear-RTGS system. In particular, the systemic risk surveillance of the financial network can assist policymakers in identifying SIFIs as well as monitoring indicators which quantify the systemic impact of the inability of a participant to make payments when due. Network analysis also allows for the monitoring of system participants with the aim of identifying emerging institutional liquidity and operational risks.

The JamClear-RTGS is central to the functioning of the financial system. It is specifically designed to process large value and time critical payments by financial market participants, with value passing to beneficiaries in a timely manner. The JamClear-RTGS facilitates fast, secure, final and irrevocable clearing and settlement of payments. In doing so, it enhances transparency of banking activities, reduces settlement risk and improves the speed for the settlement of payment obligations.

At end-2015, the RTGS had 22 participants and operated between the hours of 8:00 a.m. and 5:00 p.m. each business day. The participants are categorized into commercial banks (6), merchant banks (2), building societies (2) and primary dealers (9). The Jamaica Central Securities Depository and Accountant General are also participants alongside BOJ.

Financial network analysis
In the context of the JamClear-RTGS, the network is a structure of financial institutions (nodes) connected by payment flows (links) over a given period. The size of nodes in this analysis, are weighted by financial institutions' level of connectivity. Links are directed and assigned weights according to the value of payments that occurred between the sender and recipient.[1]

This analysis describes the network structure by utilizing actual participant-to-participant payment transactions between 2 January 2014 and 31 December 2015. This data includes records on the sender, receiver and the value for each transaction.

Network structure of the JamClear-RTGS[2]
An annual comparison of the network statistics revealed that all network statistics except the distance measures decreased for 2015 relative to 2014 (see **Table 1.0** and **Figure 1.0**).[3] Total and average payment flows decreased at end-2015 to 144 and 6.9 transactions relative to 293 and 11.7 transactions for end-2014. This outturn was largely attributable to the reduction in the number of participants within the network to 21 (not including the BOJ) at end-2015 relative to end-2014. This was primarily due to mergers and acquisitions and the relinquishing of primary dealer licenses during the review year. There was also the inclusion of a new arrangement in 2015, which involved the establishment of the JCSD Trustee account for retail repo transactions to handle the cash related aspects of retail repo transactions.

Table 1.0: Annual network statistics for JamClear-RTGS

	2014	2015
Nodes (Number of Institutions)	25	21
Links (Payment Flows)	293	144
Average Payment Flow	11.7	6.9
Connectivity[4]	0.5	0.3
Radius[5]	1	2
Diameter[6]	5	5
Average Path Length[7]	1.5	1.7

Note: Statistics exclude Bank of Jamaica as a participant.

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[1] Directed refers to links originating from source participant to a target participant.
[2] In order to analyze the performance of the market participants, BOJ was removed from the network structure.
[3] Distance in network relates to the speed of contagion within the network. The indicators include: radius, average path length and diameter.

[4] Connectivity calculates the measure of network completeness.
[5] The radius is the minimum distance between the nodes in the network.
[6] The diameter indicates the maximum distance between any two financial institutions in the network.
[7] Average path length is the average distance for any combination of two nodes in the network.

Connectivity within the network, as measured by the ratio of the actual payments made to potential payments, declined to 34.3 per cent from 48.8 per cent in 2014. Intuitively, this suggested that only 34.3 per cent of all potential links between participants had been created relative to 48.8 per cent in 2014. This outturn was in keeping with the reduction in the number of participants, which impacted the number of actual payments as well as the potential payments. Monthly connectivity, however, increased to 37.0 per cent relative to 33.0 per cent for 2014.

As it relates to contagion, both the radius and average path length of the JamClear-RTGS network increased for 2015 indicating a relatively lower speed of contagion risk when compared to 2014. An average path length greater than one, however, indicates that activities are concentrated among fewer pairs of participants.[8] The diameter, however, remained unchanged. Intuitively, the greater the distance, the slower the speed of contagion as intermediary institutions would be able to absorb some of the shock brought about by liquidity issues.

Commercial banks consistently dominated the network in terms of connectivity as indicated by the larger nodes. This, is an indication of the thriving interbank market. As it relates to the distribution of payment links, there was skewness in participant-to-payment links. Notably, most participants had only a few payment links (node degree). There exists, however, some nodes that account for a majority of the payments. This was more pronounced for 2015 relative to 2014 as the majority of participants had 20 links or less while 4 participants had more than 20 links (see **Figure 2.0**).

SIFIs within the JamClear-RTGS

The systemic importance of financial institutions in terms of their size, complexity and/or systemic interconnectedness within the entire market was assessed and whether their distress or failure would cause significant disruption to the wider financial system and economic activity. SIFIs were captured in the giant, strongly connected component (GSCC).[9] Within this sub group, all participants are connected to each other. The number of participants within the network's GSCC decreased to 7 in 2015 relative to 11 in 2014

(see **Figure 3.0**). This is an indication of more concentration in payment activity. Furthermore, commercial banks continued to report the highest number of participants within the GSCC. It was also observed that in 2015, both building societies were a part of the GSCC. Consistent with these observations, the commercial banks were reported to be the most influential (central) and systemically important participants based on their payment activity within the network.

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[8] An average path of one indicates that all participants have sent a payment to all others.

[9] The giant strongly connected component is the set of nodes attached to each other with a directed path.

Figure 1.0: Network structure of the JamClear-RTGS (excluding BOJ)
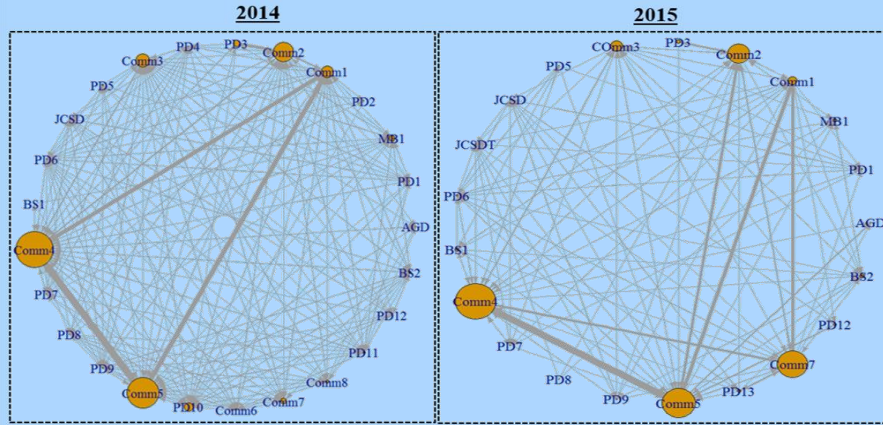
Note: Nodes represent the financial institutions and the flow of funds from sender to receiver represent links. Arrows directed towards a node indicates that the node is a receiver while arrows directed outwards indicates that the node is a sender. Nodes are weighted based on how connected a sector is relative to many other sectors within the network. Links are weighted by the value of payments. Larger nodes represent most important nodes in the network and thicker links indicate larger payment flows. Participants are assigned codes based on the bank identification code (BIC) registered in the system in the given period.
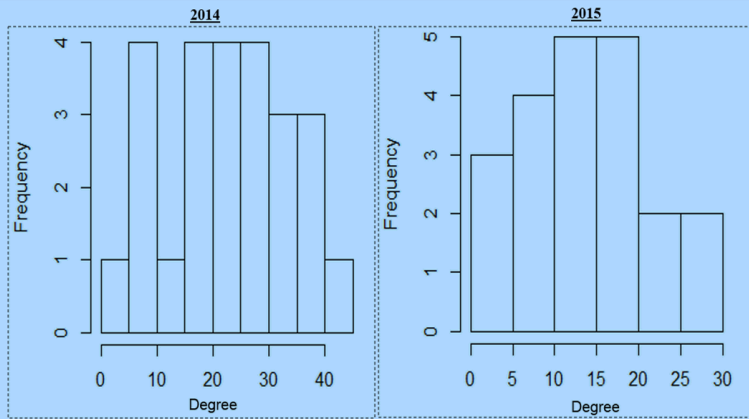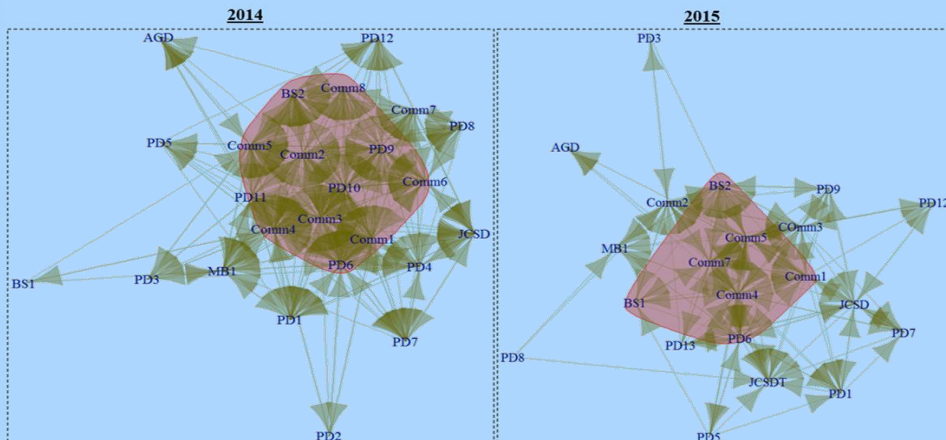
Figure 2.0: Distribution of payment links

Figure 3.0: Systemically important block of participants (excluding BOJ)

Glossary

Asset Utilization

This is a ratio which reflects the overall yield on earning assets.

Automated Clearing House

A facility that computes the payment obligations of participants, vis-à-vis each other based on payment messages transferred over an electronic system.

Central Securities Depository

An institution which provides the service of holding securities and facilitating the processing of securities transactions in a book entry (electronic) form.

Certificate of Participation

A financial instrument in which an investor has a *pro rata* share of lease revenue made by a municipal or government entity over a specified period.

Concentration Risk

The risk associated with the possibility that any single exposure produces losses large enough to adversely affect an institution's ability to carry out their core operations.

Consumer Confidence Index

An indicator of consumers' sentiments regarding their current situation and expectations of the future.

Credit Rating

A rating assigned to a borrower, which may be alphabetic or numerical, which indicates the probability associated with the party paying back a loan.

Credit Risk	The risk that a counterparty will be unable to settle payment of all obligations when due or in the future.
Deferred Net Settlement	The settlement of transfer orders netted at designated times between or among counterparties in order to economize on the number and value of transactions.
Delivery versus Payment	A mechanism which ensures that the transfer of payment from a payment system occurs if and only if the delivery of securities from a securities system occurs.
Disposable Income	The remaining income after taxes has been paid which is available for spending and saving.
Financial Conglomerates	Financial institutions under common ownership which undertake a wide range of activities such as banking, stocking broking, insurance and fund management.
Financial Intermediation	The process of channelling funds between lenders and borrowers. Financial institutions, by transforming short-term deposits or savings into long-term lending or investments engage in the process of financial intermediation.
Fiscal Deficit	The excess of government expenditure over revenue for a given period of time.
Foreign Exchange Risk	The risk of potential losses which arise from adverse movements in the exchange rate incurred by an institution holding foreign currency-denominated instruments.

Funds Under Management/ Managed Funds	The management of various forms of client investments by a financial institution.
Gap Ratio	The ratio of cumulative differences between interest bearing assets and liabilities over various time horizons (e.g. less than 1 year, 1-2 years) to total assets.
Hedging	Strategy designed to reduce investment risk or financial risk. For example, taking positions that offset each other in case of market price movements.
Interest Margin	The dollar amount of interest earned on assets (interest income) minus the dollar amount of interest paid on liabilities (interest expense), expressed as a percent of total assets.
Interest Rate Risk	The risk associated with potential losses incurred on various financial instruments due to interest rate movements.
Intraday Credit	Credit extended to a payment system participant that is to be repaid within the same day.
Large Value Transfer System	A payment system designated for the transfer of large value and time-critical funds.
Liquid Ratio	The ratio of average prescribed assets to average prescribed liabilities.
Liquidity Risk	The risk that a counterparty will be unable to settle payment of all obligations when due.
Net Open Position	The difference between long positions and short positions in various financial instruments.
Non-Performing Loans	Loans whose payments of interest and principal are past due by 90 days or more.
Off-Balance Sheet Items	Contingent assets and debts that are not recorded on the balance sheet of a company. They are usually note worthy as these items could significantly affect profitability if realized.

Payment System	A payment system consist of the mechanisms - including payment instruments, institutions, procedures, and technologies - used to communicate information from payer to payee to settle payment obligations.
Payment Versus Payment	A mechanism which ensures that the transfer of payment occurs if and only if the final transfer of a counterparty payment is simultaneously received.
Preferences shares	Capital stock which provides a specific dividend that is paid before any dividends are paid to common stock holders and which takes precedence over common stock in the event of liquidation.
Prescribed Liabilities	These refer to a) deposit liabilities, b) reservable borrowings and c) interest accrued and payable on a) and b).
Real-Time Gross Settlement System	A gross settlement system in which payment transfers are settled continuously on a transaction-by-transaction basis at the time they are received (that is, in real-time).
Repurchase Agreement (Repo)	A contract between a seller and a buyer whereby the seller aggress to repurchase securities sold at an agreed price and at a stated time. Repos are used as a vehicle for money market investments as well as a monetary policy instrument of BOJ.
Retail Payment System	An interbank payment system designated for small value payments including cheques, direct debits, credit transfers, ABM and POS transactions.
Stress Test	A quantitative test to determine the loss exposure of an institution using assumptions of abnormal but plausible shocks to market conditions.

Systemic Risk

The risk of insolvency of a participant or a group of participants in a system due to spillover effects from the failure of another participant to honour its payment obligations in a timely fashion.

Value at Risk (VAR)

A metric or statistical technique that seeks to estimate the loss that an institution will not exceed over a specified time period with a given probability.