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1. Preface

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. 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 banks, 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 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 2012 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.
Macroeconomic Environment

During 2012, risks to financial stability remained largely contained despite a challenging environment resulting from uncertainties in both the domestic and international economies. Challenges within the domestic economy, in particular the financial markets, stemmed from heightened uncertainty surrounding the signing of an agreement with the International Monetary Fund (IMF) on a new medium-term economic programme. Global financial markets continued to be impacted by the on-going debt and financial crisis in the Eurozone, as well as debt and fiscal sustainability challenges in the U.S, particularly during the second half of the year.

Within the domestic financial sector, risks to deposit-taking institutions (DTIs) emanating from the corporate and household sectors remained contained, particularly in the context of improvements in loan quality as well as strong levels of provision coverage for NPLs. Regarding the government sector, sovereign risk increased and was reflected in deterioration in a number of key fiscal performance indicators, in particular debt to GDP ratios. As it relates to GOJ investments, financial institutions increasingly switched to foreign currency denominated instruments, particularly in the context the substantial depreciation in the value of the domestic currency during the December 2012 quarter.

Financial sector performance was also negatively affected by weak economic activity during 2012. The weakness in the domestic economy constrained financial system profits, with the sector reflecting lower revenue and tighter margins. Despite the relatively low profitability, financial institutions maintained adequate capital positions with some institutions reflecting capital adequacy (CAR) ratios well above the regulatory minimum during the review year.

The maintenance of low interest rates also created a positive atmosphere for credit growth, which was the main driver of asset growth for the DTI sector during 2012. However, the weak performance in economic activity coupled with income effects from further fiscal consolidation by the GOJ constrained improvements in loan quality during the year.

Global Environment

The ongoing Euro area crisis remained the biggest threat to global financial stability during 2012, particularly during the first half of the year. Continued deleveraging, lowered credit availability and persistently volatile and wide credit spreads in the Euro area resulted in heightened global contagion risks from the Eurozone. This led to a continuation of safe haven flows to other jurisdictions, notably the United States and Japan, pushing funding costs to historic lows in these economies. Nonetheless, both countries continued to face significant fiscal challenges. In the U.S., concerns related to the debt ceiling deadline and the associated uncertainties while Japan continued to face high deficits and record debt levels.

Global financial conditions improved during the second half of 2012 in the context of the continuing implementation of fiscal austerity measures and monetary policy easing in the Euro area and other advanced economies. The Emerging Markets Bond Index (EMBI+) declined during this period and was partly reflective of a shift in investor preference to emerging market assets yielding positive real returns. However, the spread between the Jamaica Global Bond Index
and the EMBI+ widened during 2012 due to the uncertainty regarding the signing with the IMF on an economic programme for Jamaica.

**Domestic Financial System Developments**

There was a gradual increase in the depth of financial intermediation in Jamaica during 2012, as measured by total financial institution assets as a share of GDP, largely reflecting the performance of the DTI sector and to a lesser extent the securities dealer (SD) and insurance sectors. The ratio increased to 129.4 per cent at end-2012 relative to 126.7 per cent at end-2011. Nonetheless, insurance sector penetration remained low totaling 4.6 per cent of GDP at end-2012 despite the increase in the asset base for the sector during the review period.

Financial soundness indicators signaled a slight deterioration in conditions within the financial sector. DTIs, SDs and insurance companies reflected reduced profit margins during 2012, in a context where revenue performance in some sectors was constrained by the weakness in the domestic economy during the year. Liquidity indicators for the DTIs also signaled deterioration in the liquidity risk exposure for the sector. Additionally, in the context of the continued phasing of the risk weights on foreign currency GOJ bonds, there were further declines in the CARs for the DTI and SD sectors. On the other hand, there were also marked improvements in loan quality, particularly for the DTI sector, partly reflecting charge offs by a number of commercial banks.

**Financial System Exposures**

During 2012, the balance sheets of DTIs reflected increased exposure to household sector debt amid weak conditions in the domestic economy, including a decline in real GDP growth, increased unemployment levels and lower remittance inflows. The increased exposure to household debt was largely driven by growth in consumer loans, particularly installment credit and to a lesser extent mortgage loans, particularly in the context of aggressive market strategies. Regarding corporate sector debt, DTIs exposure increased reflecting a growth in lending to the tourism and manufacturing sectors which was consistent with improvements in the economic growth rates of these sectors.

In terms of public sector debt, the uncertainty in the domestic economy led to elevated sovereign risk and reduced exposure to GOJ investments by many financial institutions during 2012. The strongest reduction in these investments was evidenced in the commercial banking and securities dealers sectors.

**Risk Assessment of the Financial System**

Financial institutions were generally robust to hypothetical shocks examined for the review period. In relation to stress test scenarios involving credit, liquidity and foreign exchange shocks, financial institutions’ post-shock CAR outturns generally remained above the regulatory minimum. Nonetheless, DTIs reflected increased vulnerability to liquidity shocks. The exposure of DTIs and SDs to interest rate risk stress tests also increased, with these institutions showing strong susceptibility to large but plausible increases in domestic interest rates. Furthermore, the heightened volatility in the domestic financial markets also contributed to deterioration in the Value-at-Risk estimates for these institutions during 2012.

With regard to composite indicators of systemic risk, there were mixed performances for 2012. In
particular, the BOJ’s Aggregate Financial Stability Index for DTIs improved fueled mainly by the performance in the loan quality, world economic climate and world inflation indicators. However, financial markets continued to reflect the deteriorating conditions in the economy and this was evidenced by an increase in the Bank’s Composite Indicator of Systemic Stress. The Banking Stability Index, measured by the BOJ, also showed continued deterioration in the stability of the DTIs reflecting tight liquidity conditions and deterioration in profit performance.

**Payment System Developments**

During 2012, risks to financial stability relating to the operation of the major domestic payments and settlement systems remained at low levels. There were also continued declines in the use of cheques during the review period as the impact of a reduction in the maximum ACH value threshold was reflected in the increased settlement of large value and time critical payments in the JamClear-RTGS. Against this background, transactions via the RTGS as a proportion of the total value of transactions in the RTGS and ACH increased to 93.0 per cent at end-2012 relative to 91.0 per cent at end-2011, indicative of lower payment system credit risks.

Growth in the use of electronic payments instruments remained strong during 2012. Measures of payment of safety via these instruments also improved, in particular ABM and POS intra-bank value and volumes as a share of overall values and volumes increased moderately to respective values of 69.0 per cent and 66.0 per cent at end-2012.

**Outlook**

With the signing of an agreement with the IMF, Jamaica’s economic environment is expected to improve in 2013 due to reduced uncertainties. However, the financial system remains susceptible to weaker than anticipated domestic economic recovery which could give rise to further deterioration in loan quality. In addition, sovereign risk from the Euro area remains a concern and further deterioration in conditions in the Eurozone could pose a threat to domestic economic recovery.

Capital adequacy levels have been above statutory requirements and institutions are expected to continue to maintain adequate capital positions during 2013. However, arising from the implementation of 100.0 per cent risk weighting on foreign currency GOJ securities, increased provisioning for loan losses as well as the generally weak economic conditions for 2012, the prospects for reinforcing capital buffers through profit retention is anticipated to contract for 2013. Furthermore, the downward adjustment in interest income from the National Debt Exchange (NDX), which was completed in March 2013, could lead to added reduction in profitability for all institutions. Projections for 2013 indicate that lower profitability, negative real interest rates and declining asset prices could further dampen capital adequacy and funding ratios, especially for securities dealers and pension funds. In addition, fiscal consolidation efforts while being necessary to reduce the debt burden will be a drag on growth for some time. Moreover, external imbalances and foreign exchange market pressures could rise as a result of the inadequate NIR levels.

Notwithstanding, the Bank expects further recovery in household and corporate sector debt in 2013 toward pre-2008 levels. This recovery should
continue to improve loan quality ratios for the year. Anticipated strengthening in domestic economic recovery and aggregate demand should also buttress financial institutions’ profitability performance for the year.
2. Macro-Financial Risks

2.1 Overview

During 2012, the conditions in the global financial markets were influenced by debt and fiscal sustainability challenges as well as uncertainty regarding elections in the Euro area and the USA. These conditions as well as lower growth prospects contributed to the generally weak global demand. However, these concerns were partially offset by the implementation of fiscal austerity measures and monetary policy easing by some Euro area countries and other advanced economies and led to an improvement in global financial market conditions, particularly during the second half of the year. Regarding domestic conditions, there was uncertainty surrounding the delay in the signing of a new agreement between the International Monetary Fund (IMF) and the Government of Jamaica (GOJ) as well as the continued weak economic environment. This was reflected in the significant depreciation in the Jamaica Dollar vis-à-vis the United States dollar as well as a decline in economic activity.

The Bank’s measures of financial stability reflected mixed performance during 2012. Of note, there was an overall improvement in the macro-financial index as well as the micro-prudential indices for all three banking sub-sectors for the review period. Similarly, the Z-score index of DTI insolvency improved for 2012 reflecting a decline in the volatility of profits. However, there was an increase in the exposure of DTIs to GOJ sovereign debt default, as measured by credit risk exposure to capital base, for the review period. Concurrently, the risk of debt default for the publicly-listed DTIs increased over 2012 as the distance to default narrowed significantly over the previous year.

2.2 Macroeconomic Risks in the Domestic and Global Environment

During 2012, the Jamaican economy was generally characterized by deterioration in key macroeconomic variables such as GDP growth, the exchange rate, the net international reserves (NIR) and the unemployment rate (see Figure 2.1). In particular, the economy is estimated to have contracted by 0.3 per cent for 2012 relative to growth of 1.3 per cent for 2011. Additionally, there was a 7.4 per cent depreciation in the value of the Jamaica Dollar vis-à-vis the United States dollar for 2012 when compared to 0.9 per cent depreciation recorded for the previous year. The pace of depreciation accelerated during the last quarter of the calendar year and mainly reflected uncertainty relating to the delay in the signing of an agreement between the GOJ and the IMF. Influenced by the tight foreign exchange market conditions the NIR declined by US$0.84 billion to US $1.1 billion dollars at end-2012 or 17.7 weeks of goods imports. This decline reflected interventions by the BOJ in the foreign exchange market in an effort to stem the pace of depreciation in the exchange rate. Concurrently, given the generally weak domestic conditions, the unemployment rate increased to 14.3 per cent for 2012 relative to 13.2 per cent for 2011.

The BOJ’s broad measure of the financial environment, as captured by the “cobweb” diagram, indicated that risks to the financial system increased for 2012 relative to 2011 (see Figure 2.2). Notably, there was deterioration in the ‘domestic environment’ and ‘funding and liquidity’ dimensions of the cobweb for the review year relative to 2011. Risks to the global economic environment, financial markets and capital and profitability were unchanged at the elevated levels.
The global economy grew by an estimated 2.3 per cent for 2012 relative to a growth rate of 3.0 per cent for 2011 (see Figure 2.3). This occurred in the context of the on-going debt and fiscal sustainability challenges in the Euro area and the USA. Offsetting these concerns, particularly during the second half of the year, were some improvements in global financial conditions mainly influenced by the implementation of fiscal austerity measures and monetary policy easing in the Euro area and other advanced economies.

In light of these developments, global financial markets were characterized by a general decline in the level of uncertainty particularly during the second half of the year as reflected in the decline in the Bank of America-Merrill Lynch Global Financial Stress Index (BOAML-GFSI) (see Figure 2.4). This was following a spike in the BOAML-GFSI in May 2012 which reflected uncertainty surrounding elections in some European countries. Additionally, with the exception of Spain and Portugal, there was a general decline in the Credit Default Swap (CDS) prices for selected countries relative to end-2011, consistent with investors demand for relatively lower yields on these sovereign debt (see Figure 2.5). However, the increases in CDS prices and CDS spreads for Spain and Portugal indicated increases in default and liquidity risk relative to the previous year (see Figure 2.6). This reflected the continued concerns about uncertainty in the Euro area regarding measures to correct the fiscal and debt issues.
2.3 Indicators of Domestic Financial Market Conditions

During 2012, the BOJ’s Aggregate Financial Stability Index (AFSI) for DTIs improved in spite of the heightened uncertainty regarding the delay in the signing of an agreement between the GOJ and the IMF as well as the continued weak domestic economic environment (see Figure 2.7). The higher index value was influenced mainly by improvements in specific indicators, namely the loan quality, world economic climate and world inflation indicators, which offset the impact of deterioration in the other indicators.

Notwithstanding the improvement in the AFSI, financial markets continued to reflect the deteriorating conditions in the economy. This was evidenced by an increase in the Bank’s Composite Indicator of Systemic Stress (CISS). The CISS increased on average to 0.3 for 2012 relative to 0.2 for 2011 (see Figure 2.8). Regarding the domestic GOJ bond market, the volatility which was evident during 2011 continued throughout 2012 (see Figure 2.9). The longer tenors experienced greater volatility particularly during the last quarter of 2012 given heightened macroeconomic uncertainties. Additionally, investors continued to demand more GOJ Variable Rate (VR) bonds relative to Fixed Rate (FR) instruments. For the review period there were 17 VR bonds and 7 FR bonds offered to the market.

The spread between the Jamaica Global Bond Index and the Emerging Markets Bond Index (EMBI+) widened in 2012 (see Figure 2.10). This occurred in spite of an overall shift in investors’ preference for emerging market and frontier market assets yielding positive real interest rates. Investor concerns regarding the ability of the GOJ to finance the Euro-denominated bond which matured in July 2012 as well as the impact of uncertainty regarding the signing of an IMF programme before end-2012 resulted in relatively higher yields on the GOJ global bonds.

In the context of the continued uncertainty in the domestic economy, the Bank maintained interest rates on the 30-day certificate of deposit (CD) at 6.25 per cent during the review period. Given this uncertainty, the Risk Appetite Index...
The Jamaica Stock Exchange (JSE) Main Index declined by 3.4 per cent for 2012 relative to an increase of 11.8 per cent recorded for 2011. This poor performance was influenced by a weak domestic economy as well as the substantial depreciation in the value of domestic currency and relatively favourable money market rates which provided attractive alternative investments. The overall decline in the index occurred in spite of favourable business plan announcements by listed entities during the last two quarters of 2012 which resulted in an increase in the value for the Amihud Index of stock market depth. Of note, the Amihud Index increased to 0.2 at end-2012 when compared to 0.1 at end-2011 (see Figure 2.15). Notwithstanding, the overall reduction in the Main JSE index and fell to negative 0.08 in 2012 from 0.23 in 2011 indicating the loss of investor interest in the stock market supported outturn for the JSE Risk Appetite Index (see Figure 2.16).
Note: The Amihud index of market depth is measured by the daily change in asset prices divided by daily level of trading (turnover). Reductions in the index suggest daily volumes traded have a minimal impact on asset prices.

2.4 Indicators of Financial Sector Conditions

2.4.1 Banking Stability Index

The Banking Stability Index (BSI) measured by the BOJ suggests a continued deterioration in the stability of the banking system since March 2008 consistent with the generally weak economic conditions (see Figure 2.17). Risks to the DTI sector increased over the review period relative to 2011. An analysis of the components contributing to banking stability shows that tighter liquidity and weaker profitability were the major contributors to the decline in stability of the DTIs (see Figure 2.18). However, there was a marginal improvement in the index in the last quarter which resulted primarily from recovery in liquidity and asset quality conditions.

The stock of bank lending to the real economy increased during the review period following on a trend decline in 2011. Additionally, the ratio of credit-to-GDP exceeded its long-term trend as measured by the HP filter (see Figure 2.19). Lending by banks was particularly exuberant during the last two quarters of 2012, with the stock of credit-to-GDP at its highest in the third quarter of the year. These developments coincided with a sharp increase in the leverage of DTIs. Burgeoning capital buffers and adequate provision of credit meant that bank solvency was kept in check.

1 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. Source BOJ’s staff calculations.
2.4.2 Macro-financial and Micro-prudential Indices

The Bank’s macro-financial index (MaFI) for DTIs improved at end-2012 relative to end-2011. In particular, the index recorded a value of 9.0 points at end-2012, 4.0 points below the value of the index recorded at end-2011 (see Figure 2.20). This favourable performance was attributed to improvements in fiscal measures, volatility indicators and growth in private sector credit. Of note, the signals from the ratios of national debt and external debt to GDP declined to 2.0 points and 0.0 point, respectively, when compared to 4.0 points each at end-2011, reflecting declines in both ratios. Similarly, the signal from private sector credit fell to 0.0 point relative to 2.0 points at end-2011 reflecting an increase of 7.6 percentage points in 12-month private sector credit to 17.3 per cent. However, partially offsetting the improvement in the index was deterioration in the performance of M2 to net international reserves which increased to 5.0 points at end-2012 relative to 3.0 points at end-2011. This mainly reflected the significant reduction in the level of net international reserves during the review period.

The micro-prudential indices (MiPIs) for the commercial banks, FIA licensees and building societies improved at end-2012 compared to end-2011. The MiPI for the commercial banks declined marginally to 29.0 points at end-2012 relative to 30.0 points at end-2011. The improvement in the MiPI for commercial banks reflected the favourable changes in the ratios of loans to capital, non-performing loans to assets, non-performing loans to total loans and provision for loan losses to total assets (see Figure 2.21). However, the impact of these improvements was partially offset by deterioration in some profitability indicators which reflected

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2 The BOJ macro-financial and micro-prudential indices of the banking sector are monitored via a non-parametric approach to signal banking sector vulnerability. The signal is based on scores for each indicator, which is computed 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 of relative stability 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).
the continued weakness in the domestic economy. There was also deterioration in the signals from the net income to total assets indicator and the interest income to assets indicator reflecting continued low interest income.

For the building society sector, the MiPI declined to 32.0 points at end-2012 relative to the 44.0 points recorded at end-2011 reflecting an improvement of asset quality indicators. Specifically, there was improvement in the ratios of non-performing loans to total loans, non-performing loans to assets and provision for loan losses to total assets. The impact of these improvements was partly offset by deterioration in loans to capital, investment to assets, foreign currency liabilities to foreign currency assets and foreign currency deposits to foreign currency assets (see Figure 2.22).

For the FIA licensees, the MiPI declined to 44.0 points at end-2012 relative to 59.0 points at end-2011. This improvement mainly reflected improved signals related to the performance in asset quality and balance sheet indicators. In particular, there was a reduction in signals from the ratio of deposits to total assets, deposits to total loans, loans to capital, reserve for loan losses to total assets, 12-month growth in deposits as well as foreign currency liabilities to foreign currency assets (see Figure 2.23).
2.4.3 Insolvency Risk and Distance to Default

Insolvency risk for DTIs, as measured by the Z-score index, declined over the review period. In particular, the index reflected an increase of 83.3 points to total 161.0 points at end-2012 relative to end-2011 (see Figure 2.24).\(^3\)\(^4\) The improvement in the index for the review period was mainly influenced by a decline in the volatility of profits for DTIs.

However, with respect to market perception during 2012, the vulnerability of DTIs to the risk of default increased. The median distance-to-default for DTIs decreased to 2.9 per cent at end-2012 from 6.9 per cent at end-2011 (see Figure 2.25).\(^5\) This deterioration for DTIs reflected increases in the default barriers and the implied volatility of assets as well as a decline in the market weighted share price for listed DTIs.

Similar to the DTIs, the vulnerability of the non-bank financial institutions (NBFIs) sector to the risk of default increased over 2012. Of note, the median distance to default for the NBFIs declined to 3.7 at end-2012 from 8.3 at end-2011. The decline was mainly reflected in an increase in the implied volatility of assets as well as a decline in the weighted share price for listed (see Figure 2.26).

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3. The Z-score (insolvency risk) index is used as a measure of a bank’s financial soundness. The ratio is calculated as:\[^5\]

\[
z = \frac{\text{RORAC} + \text{C/}}{\text{A Std} \text{dev(RORAC)}}
\]

where RORAC is the bank’s return on risk adjusted capital, C/A is its regulatory capital to asset ratio and \(\text{std dev(RORAC)}\) is its standard deviation of return on assets computed over the sampling period. 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.

4. The Z-Scores are weighted based on the relative total assets of the sectors.

5. Default barrier = \(\frac{1}{2}*(\text{short-term + long-term liabilities})\)
2.4.4 Exposure to Sovereign Debt Default Risk

During 2012 there was an increase in the exposure of the banking system to sovereign debt default, as measured by the ratio of holdings of GOJ total debt to capital. In particular, this ratio was approximately 145.4 per cent, 190.3 per cent and 108.7 per cent for commercial banks, FIA licensees and building societies, respectively. These exposures represent increases of 26.9 percentage points, 41.5 percentage points and 2.0 percentage points for the commercial banks, FIA licensees and building societies, respectively, relative to end-2011 (see Figure 2.27).

Concurrently, BOJ’s estimate of the probability of default increased over the review period to 52.3 per cent at end-2012 relative to 35.9 per cent end-2011. In light of this, the exposure of the banking system to sovereign credit risk, as measured by credit risk exposure (CRE), also increased at end-2012. The commercial banks, FIA licensees and building societies recorded increases as a per cent of capital to 53.2 per cent, 69.7 per cent and 39.8 per cent, respectively, for the review period. This compares to 29.8 per cent, 37.5 per cent and 26.9 per cent for building societies, FIA licensees and commercial banks, respectively, at end-2011 (see Figure 2.28).

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6 The credit risk exposure (CRE) is a product of the holding of GOJ total debt by banks, the probability of default (PD) and the loss given default (LGD).
2.4.5 Capital Adequacy Ratio Rating Transitions

The CARs for most of the DTIs remained relatively unchanged during the review period. According to BOJ’s estimate of the ratings transition probability matrix at end-2012, 76.9 per cent of the institutions remained within their previous rating. Notwithstanding, 15.4 per cent of DTIs migrated to a lower capital adequacy rating while 7.7 per cent were upgraded in rating when compared with their rating at the beginning of the review year (see Table 2.1 and Table 2.2). The lowest DTI CAR for the review period was 11.1 per cent while the highest DTI CAR was 32.9 per cent. This was in comparison to end-2011, 61.5 per cent of institutions CARs remained unchanged, 30.8 per cent of the institutions were downgraded and 7.7 per cent were upgraded.

For the top 12 securities dealers (SDs) there were more institutions migrating to different capital adequacy ratings. Of note, 54.5 per cent remained within their previous rating while 36.4 per cent of SDs migrated to a lower capital adequacy rating and 9.1 per cent were upgraded in rating at end-2012 (see Table 2.3 and Table 2.4). The lowest SD CAR for the review period was 15.1 per cent while the highest SD CAR was 179.4 per cent. This compares to end-2011, where 81.8 per cent remained unchanged, 18.2 per cent of the institutions were downgraded, and no institutions were upgraded.

There are nine possible ratings that can be attributed to any bank at a given point in time as a function of its capital adequacy ratio (CAR). Banks with CARs which are greater than 20.0 per cent are rated SCAP, between 15.0 and 20.0 per cent are rated WCAP, between 10.0 and 15.0 per cent are rated CAP, between 9.0 to 10.0 per cent are rated UNDER, between 8.0 and 9.0 per cent are rated SUNDER, between 7.0 and 8.0 per cent are rated CUNDER, and CARs between 0.0 and 7.0 per cent are rated NFAIL. The transition probability matrix (TPM) for the banking sector is then calculated by evaluating the proportion of banks which have migrated from one rating to another over the period of a year. As is typical with TPMs the largest probabilities lie along the main diagonal indicating no change of rating for the period. Generalized maximum entropy is then used to condition these unconditional probabilities on bank-specific and macro-economic variables.
3. Financial System Developments

3.1 Overview

Despite continued weak domestic economic conditions, persistently low global demand and uncertainty surrounding negotiations with the IMF during 2012, institutions within the financial sector remained broadly profitable and adequately capitalized. Financial soundness indicators signaled a slight deterioration in conditions within the financial sector in particular as it relates to profitability for 2012. This reduction in profitability of the financial system was led by the deposit-taking institutions (DTIs) sector which realized a reduction in its profit margins despite an accelerated growth in asset base. However, even within a post-Jamaica Debt Exchange (JDX) business environment, the sector observed robust profits. The financial sector capital adequacy decreased but remained at acceptable levels during 2012 despite scheduled increases in risk weights on GOJ foreign currency securities.

3.2 The Financial System

There was a marginal improvement in the depth of financial intermediation in Jamaica during 2012, as measured by total financial institutions assets as a share of GDP (see Figure 3.1). The ratio increased to 129.4 per cent at end-2012 relative to 126.7 per cent at end-2011 but remained below the high of 145.7 per cent at end-2006. This improvement in the ratio during 2012 was primarily due to a faster pace of growth in the system’s asset base relative to the change in nominal GDP. Regionally, the depth of financial intermediation in Trinidad and Tobago continued to strengthen to 142.0 per cent at end-2012 relative to 132.2 per cent at end-2011. Similarly, this indicator increased sharply for Barbados to 1 188.2 per cent at end-2012 relative to 1 045.9 per cent the previous year (see Figure 3.1). This outturn was largely due to significant growth in the asset base of their respective financial systems.

1 Deposit taking institutions include commercial banks, building societies and FIA licensees.

Note: Financial corporations in Jamaica includes DTIs, securities dealers and insurance companies. Financial corporations in Trinidad & Tobago and Barbados include commercial banks, finance companies and merchant banks.

Figure 3.1 Depth of financial intermediation (assets of financial corporations as % of GDP)

Figure 3.2 Growth in market shares in DTI and credit union assets (growth between end-2011 and end-2012)

Figure 3.3 Market share in financial system assets at end-2012
3.3 Deposit Taking Institutions (DTIs) and Credit Unions

In 2012, building societies increased its share of the market at the expense of commercial banks and FIA licensees (see Figure 3.2). However, commercial banks remained the dominant sub-sector despite their share of sector assets decreasing marginally to 69.0 per cent at end-2012 from 69.2 per cent at end-2011 (see Figure 3.3). FIA licensees’ asset base expanded by 0.3 per cent for 2012 following a contraction of 12.5 per cent the previous year.

3.3.1 DTIs balance sheet position

All DTI sub-sectors recorded growth in asset base during 2012. DTI’s total assets grew by 8.1 per cent to $938.2 billion during 2012 relative to 4.3 per cent growth during the previous year. This outturn compared to an average of 10.4 per cent for the five years prior to the Jamaica Debt Exchange (JDX). This acceleration in asset growth for the review year mainly reflected an improvement in institutions’ holdings of Loans, Advances and Discounts (5.3 per cent) (see Figure 3.4). Loans, Advances and Discounts comprised the majority of DTIs’ asset base, totaling 48.6 per cent at-end 2012 relative to 46.1 per cent at end-2011 (Figure 3.5). The impact of this increase on the asset base was partially offset by a notable decline in Investments (4.8 per cent). The maximum value for domestic investments as a share of total assets across all DTIs at end-2012 declined to 10.9 per cent relative to 13.3 per cent at end-2011. This decrease was consistent with a reduction in the holdings of domestic investments by DTIs which reflected a partial substitution towards foreign currency holdings. Lending to the domestic household sector represented the DTI’s largest exposure to the private sector during 2012 albeit declining by 6.8 percentage points to 41.4

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2 Credit unions increased their market share of the sector’s total assets. Total assets increased by 13.0 per cent for the review period following a contraction of 0.1 per cent for 2011.

3 Assets are defined as total balance sheet assets.
per cent of total loans at end-2012 (see Table 3.1). Moreover, the Herfindahl-Hirschman Index (HHI), which measures concentration in private sector lending decreased by 20.3 per cent to 2 086.7 points from 2 618.8 points at end-2012 (see Figure 3.6). In addition, the DTIs’ other significant exposures in the lending market were to Distribution (13.0 per cent), Tourism (8.6 per cent), Public Sector (8.2 per cent) and Construction (6.9 per cent) at end-2012 (see Table 3.1).

NPLs declined by 13.1 per cent for 2012 relative to an increase of 9.7 per cent the previous year (see Figure 3.7). Subsequently, loan loss provisions decreased to 6.5 per cent for 2012 from growth of 6.8 per cent for 2011 (see Figure 3.8). Consequently, the NPL coverage ratio improved to 92.7 per cent at end-2012 from 69.7 per cent at end-2011 and remained well above the requirement under the international accounting standards. This increase was characteristic of the performance of all sub-sectors and the distribution of the ratio for the DTIs revealed an increase in the median aggregate ratio relative to end-2011 (see Figure 3.8 and Figure 3.9).

DTIs also maintained adequate levels of liquidity for 2012 in regards to the minimum statutory requirements. However, the ratio of liquid assets to total assets declined to 22.6 per cent at end-2012 from 23.1 per cent at the close of the previous year. This decrease in the ratio was due mainly to faster pace of growth in DTI asset base relative to the increase in liquid assets for 2012 (see Figure 3.10). In addition, total liabilities increased during 2012. Funding from deposits continued to represent the main source of asset financing for DTIs. Deposits increased by 3.1 per cent to $633.2 billion representing 69.5 per cent of total liabilities at end-2012 relative to 67.4 per cent at

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4 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 IFRS plus prudential provisions for expected losses based on regulatory criteria as a ratio to NPLs.
end-2011 (see Figure 3.11). However, deposits as a share of loans decreased to 138.9 per cent at end-2012 from 144.1 per cent at end-2011. This suggests increased funding risk over the review period as deposits represent a relatively cheap and stable source of financing compared to other categories of liabilities (see Figures 3.11 and 3.12).

The capital adequacy ratio (CAR) for DTIs declined during 2012. Of note, the median CAR fell to 15.5 per cent at end-2012 from 21.2 per cent at end-2011 (see Figure 3.20). The scheduled increases in risk weights on holdings of GOJ foreign currency denominated securities contributed to the decline in CAR (see Figures 3.21 and 3.22). The quality of regulatory capital, as measured by the ratio of Tier 1 capital to total regulatory capital, was 103.4 per cent at end-2012 relative to 103.9 per cent at end-2011. Retained earnings remained the largest component of Tier 1 capital at end-2012 accounting for 47.5 per cent relative to 48.4 per cent in 2011. Statutory reserves accounted for 24.1 per cent relative to 28.5 per cent at end-2011.

3.3.2 DTIs earnings and profitability
Similar to the performance in DTIs’ capital adequacy, profits also fell in 2012. Of note, DTIs recorded a reduction in profits for 2012 reflecting the impact of the continued low interest rate environment which was partially driven by a reduction in the sector’s profit margins. The sector posted profits despite low aggregate demand resulting from the recessionary environment and poor performance of interest bearing assets (see Figure 3.13). At end-2012, the DTIs recorded net profits of $20.9 billion reflecting a decline

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5 The schedule of increases in risk weights on GOJ foreign currency denominated securities initiated in the June 2010 quarter was set at 12.5 per cent and increased by 12.5 per cent each quarter to 100 per cent in the June 2012 quarter. However, the risk weight was kept at 50.0 per cent in the March and June 2011 quarters.

6 Capital quality as defined by the Basel Committee examines the classes of capital instruments that are able to fully absorb losses at the point of non-viability before taxpayers are exposed to loss.

7 Tier 1 can be greater than regulatory capital due to prescribed deductions applied directly to regulatory capital.
of 43.1 per cent over that which obtained at end-2011. This corresponded with a 3.9 percentage points decline in the sector’s return on equity (ROE) to 11.8 per cent at end-2012 (see Figure 3.14 and Table 3.2). The reduction in the ROE was mainly due to declines in the net profit margin, however, the impact of which was partially offset by improved leverage during the review period (see Figure 3.14). Similarly, DTIs’ return on assets (ROA) decreased to 2.2 per cent at end-2012 from 3.7 per cent at end-2011 (see Figure 3.15).

Despite the decline in profitability for DTIs’ net interest margin increased reflecting higher interest income for 2012. Nevertheless, the outturn in net interest margin for DTIs revealed that interest income increased throughout 2012 primarily as a result of a higher interest margin in the retail segment of deposits, reduced NPLs and loans which grew faster than the net interest income from the administration of securities and other financial operations (see Figures 3.17 to 3.19). In general, net interest income for DTIs increased to $52.3 billion at end-2012 relative to $50.0 billion at end-2011. As such, DTIs’ profits for 2012 were primarily driven by gains on foreign exchange holdings of 19.4 per cent to $4.9 billion and increases in fees and commissions by 14.9 per cent to $17.3 billion (see Figure 3.17).

3.3.3 Interbank Market
DTIs’ engagement of the interbank market in managing short-term liquidity demands decreased during 2012 relative to 2011. Furthermore, the standard measure of connectivity in the interbank market shown by the interrelationship matrix continued to reflect relatively sparse interconnection.

The end-quarter average number of relationships between DTIs in Jamaica increased to 5 at end-2012 relative to 4 the prior year (minimum 0, maximum 4).
Similarly, the end-quarter average connectivity within the DTIs and securities dealers (SDs) increased its average connectivity to 2.2 per cent during 2012 from 1.8 per cent the previous period for the 25 financial institutions assessed (see Figure 3.23). Of note, the majority of relationships also yielded a decrease in the average end-quarter exposures among DTIs and SDs (see Figure 3.24). During 2012, the average net exposure was $790.3 million relative to $1 456.4 million in 2011. Despite the low connectivity within the interbank market, some institutions exhibited extreme vulnerabilities to foreign institutions and to their subsidiaries which recorded an end-quarter average of $423.2 million in 2012 or 53.5 per cent of average net exposure.

3.4 Non-bank Financial Institutions (NBFIs)

NBFIs experienced increased asset growth despite challenging economic conditions during 2012. Of note, the sector’s asset base increased by 4.0 per cent for 2012 relative to an expansion of 2.8 per cent for 2011. The expansion in the sector’s total assets reflected increases in total assets of life insurance companies, general insurance companies and securities dealers, respectively (see Figure 3.3 & Figure 3.25). Of note, securities dealers accounted for 66.6 per cent of NBFIs market share. The growth of life insurance companies’ asset base was virtually unchanged at 8.1 per cent, which accounted for 26.4 per cent of NBFI market share at end-2012.

3.4.1 Securities Dealers

Securities dealers’ asset base recorded growth of 2.1 per cent to $511.7 billion at end-2012 relative to growth of 0.8 per cent the prior year. The acceleration in the growth in the asset base was largely reflected expansion in Investments in particular foreign currency denoted

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8 The number of relationships refers to the number of financial institutions with which a particular DTI or 12 largest securities dealer conducts interbank transactions.
9 Data on interbank connectivity are not generally available from other jurisdictions for comparison.
investments (12.0 per cent). However, the increase in the asset base was partially offset by a notable decline in Loans, Advances, and Discounts (85.2 per cent). Of note, Investments and Loans, Advances and Discounts constituted 88.2 and 2.1 per cent, respectively, at end-2012.

The funds under management (FUM) of the major securities dealers increased to $685.8 billion at end-2012 relative to $657.6 billion at end-2011 (see Figure 3.26). The sector’s growth in FUM during 2012 was driven by increases in their holdings of assets categorized as Other Assets but was marked by reductions in GOJ, BOJ and Public sector holdings.

In an environment of scheduled increases in the risk weights on GOJ foreign currency denoted securities and a depreciating Jamaica Dollar, risk weighted assets of the securities dealers grew significantly by 33.4 per cent to $276.4 billion at end-2012 relative to $207.2 billion at end-2011 (see Figure 3.22). Consequently, the sector’s capital adequacy ratio declined to 23.4 per cent at end-2012 relative to 29.3 per cent at end-2011 and 81.5 per cent at end-March 2010 when risk weightings were first implemented on GOJ foreign currency denoted securities (see Figure 3.27). In contrast, the sector’s primary ratio, measured as a ratio of regulatory capital to total assets, increased to 12.6 per cent at end-2012 relative to 12.1 per cent at end-2011. This was largely due to an increase in regulatory capital by 6.5 per cent to $64.7 billion. The sector’s asset base grew by a slower pace of 2.1 percent to $511.7 billion at end-2012.

Securities dealers’ sensitivity to foreign exchange risk declined throughout most of 2012 as the sector’s foreign currency net open position to capital ratio declined to 0.2 per cent at end-September 2012.
However, for the last quarter of 2012 the NOP to capital ratio increased sharply to 5.9 per cent. This outturn at end-2012 was 2.4 percentage points lower relative to 8.3 per cent recorded at end-2011. This year-to-end-September 2012 trend decline largely reflected the relatively faster pace of growth in foreign currency denoted liabilities relative to foreign currency denoted assets. However, this trend decline reversed in the December 2012 quarter as institutions repositioned their foreign currency-denoted portfolios in a context of the rapid depreciation of 7.4 per cent in the exchange rate of the Jamaica Dollar vis-à-vis the US dollar for the quarter (see Figure 3.28 and Table 3.3A).

Securities dealers’ profitability was fairly robust relative to the previous year despite respective declines in the sector’s ROA and ROE of 0.2 percentage point and 3.2 percentage points to 2.5 per cent and 16.6 per cent, respectively, for the year 2012 (see Figure 3.29 and Table 3.3A).

The decline in the profitability occurred despite an increase in the leverage ratio to 16.6 per cent relative to 15.0 per cent the prior year. This increase was largely due to increases in Tier 1 capital during the review period.

However, the ratio of the sector’s holdings of liquid assets to current liabilities significantly increased to 35.1 per cent at end-2012 from 7.7 per cent for the previous year.

### 3.4.2 Insurance Companies

Similar to SDs and DTIs, there was growth in the insurance sector’s asset base despite weak economic conditions. In particular, life and general insurance companies experienced increases of 8.1 per cent and 7.9 per cent, respectively, in their asset base. For life insurance companies, this growth was driven predominantly by increases in fixed term investments and investments in subsidiaries. In particular, there was
expansion in the holdings of GOJ securities by 2.1 per cent to $118.4 billion during 2012. Moreover, GOJ Jamaica Dollar denoted investments constituted 73.7 per cent of total fixed term investments holdings. Similarly, short-term GOJ fixed term investments were largely responsible for growth in general insurance companies’ asset base during the review year. Specifically, short-term investments in GOJ Jamaica Dollar denoted investments increased by 102.4 per cent to $9.2 billion during 2012.

Despite the sector’s increased asset base for 2012, insurance penetration remained low but increased relative to the previous year (see Figure 3.30 and Tables 5.0 & 6.0). Insurance penetration for life insurance companies marginally increased by 0.05 percentage point to 2.4 per cent of GDP at end-2012 while penetration for general insurance companies increased to 2.3 per cent at end-2012 from 2.2 per cent of GDP at end-2011. These developments suggest that the market continued to be relatively underdeveloped as indicated by an insurance density which was unchanged at 0.001 per cent at end-2012 (see Table 3.4).

The sector’s profitability indicators during 2012 deteriorated relative to the prior year. The life insurance sector’s ROA decreased to 12.3 per cent at end-2012 relative to 13.1 per cent at end-2011. Similarly, the sector’s ROE decreased to 58.4 per cent relative to 61.4 per cent at end-2011. However, this was in the context of an increase in the leverage ratio to 73.2 per cent at end-2012 from 72.6 per cent the previous year. The general insurance sector recorded similar results realizing a decrease in both ROA and ROE to 10.6 per cent and 30.4 per cent, respectively, at end-2012 relative to 15.2 per cent and 41.0 per cent respectively, at end-2011.

10 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.
Additionally, the sector’s leverage increased to 58.2 per cent at end-2012 relative to 56.2 per cent at end-2011. The insurance sector’s profitability was largely impacted by a decline in investment operating income of general insurance companies while life and general insurance companies realized slower growth in revenues from premiums. For life insurance companies premiums increased to 20.0 per cent at end-2012 from 15.2 per cent at end-2011. Similarly, general insurance companies’ net premium grew by 8.8 per cent for 2012 relative to growth of 9.4 per cent for 2011.

The capital adequacy and solvency of the insurance companies remained at adequate levels at end-2012. However, the sector’s median solvency ratio declined to 147.8 per cent at end-2012 relative to 165.1 per cent the prior year (see Figure 3.31). The sector was also adequately capitalized despite the ratio of capital to total assets declined sharply to 21.4 per cent at end-2011 from 31.1 per cent at end-2010 (see Figure 3.32).

The reinsurance retention ratio measures the amount of risk being absorbed by an insurer rather than passing it on to a reinsurer. At end-2012, the retention ratio for life insurance companies declined to 97.8 per cent relative to 99.2 per cent the prior year (see Figure 3.32).

The reinsurance retention ratio measures the amount of risk being absorbed by an insurer rather than passing it on to a reinsurer. At end-2012, the retention ratio for life insurance companies declined to 97.8 per cent relative to 99.2 per cent the prior year (see Figure 3.32).

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11 As defined in the EU’s Solvency I & II regulation of insurance companies, the solvency ratio is disposable (actual) solvency to required solvency.

12 Measured as the ratio of net premiums to gross premiums, this ratio captures the net amount of risk which the reinsurer keeps for its own account. The lower the ratio, the more the company is able to avoid financial distress following a large claim.
Figure 3.30  Insurance penetration (% of GDP)

Figure 3.31  Solvency of life and general insurance companies (available capital to total liabilities ratio)

Figure 3.32  Capitalization of the life and general insurance sector

Figure 3.33  Life insurance retention ratio

Figure 3.34  General insurance retention ratio
### Table 3.2 The core and encouraged set of financial soundness indicators for DTIs<sup>1/</sup>

<table>
<thead>
<tr>
<th>Indicator (%)</th>
<th>Categories</th>
<th>Dec-11</th>
<th>Mar-12</th>
<th>Jun-12</th>
<th>Sep-12</th>
<th>Dec-12</th>
</tr>
</thead>
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<tr>
<td><strong>Core Indicators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>Regulatory capital to risk-weighted assets</td>
<td>Capital adequacy</td>
<td>15.9</td>
<td>15.4</td>
<td>14.7</td>
<td>14.5</td>
<td>14.1</td>
</tr>
<tr>
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<td>16.1</td>
<td>15.3</td>
<td>15.1</td>
<td>14.6</td>
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<tr>
<td>Non-performing loans (net) to capital</td>
<td>Capital adequacy</td>
<td>28.4</td>
<td>26.5</td>
<td>22.7</td>
<td>22.8</td>
<td>20.0</td>
</tr>
<tr>
<td>Non-performing loans to total loans</td>
<td>Assets quality</td>
<td>8.9</td>
<td>8.6</td>
<td>7.4</td>
<td>7.1</td>
<td>6.8</td>
</tr>
<tr>
<td>Return on assets</td>
<td>Earnings &amp; Profitability</td>
<td>2.0</td>
<td>0.5</td>
<td>0.9</td>
<td>0.5</td>
<td>0.4</td>
</tr>
<tr>
<td>Return on equity</td>
<td>Earnings &amp; Profitability</td>
<td>12.5</td>
<td>3.2</td>
<td>5.8</td>
<td>3.3</td>
<td>2.6</td>
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<tr>
<td>Interest margin to income</td>
<td>Earnings &amp; Profitability</td>
<td>37.4</td>
<td>53.7</td>
<td>50.3</td>
<td>57.3</td>
<td>54.8</td>
</tr>
<tr>
<td>Non-interest expenses to income</td>
<td>Earnings &amp; Profitability</td>
<td>19.4</td>
<td>28.9</td>
<td>25.9</td>
<td>28.6</td>
<td>29.7</td>
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<tr>
<td>Liquid assets to total assets</td>
<td>Liquidity</td>
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<td>22.8</td>
<td>22.2</td>
<td>19.7</td>
<td>22.6</td>
</tr>
<tr>
<td>Duration on assets - Domestic Bonds</td>
<td>Sensitivity to Market Risk</td>
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<td>0.7</td>
<td>0.9</td>
<td>1.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Duration on assets - Global Bonds</td>
<td>Sensitivity to Market Risk</td>
<td>2.6</td>
<td>1.5</td>
<td>3.2</td>
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<td>2.4</td>
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<td>NOP to capital</td>
<td>Sensitivity to Market Risk</td>
<td>30.6</td>
<td>20.5</td>
<td>15.2</td>
<td>22.2</td>
<td>24.1</td>
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<td><strong>Encouraged Indicators</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Capital to assets</td>
<td>Capital adequacy</td>
<td>16.9</td>
<td>16.8</td>
<td>15.6</td>
<td>15.6</td>
<td>15.1</td>
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<td>Trading income to total income</td>
<td>Earnings &amp; Profitability</td>
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<td>67.1</td>
<td>71.2</td>
<td>47.3</td>
<td>61.4</td>
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<td>Personnel expenses to non-interest expenses</td>
<td>Earnings &amp; Profitability</td>
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<td>38.0</td>
<td>41.2</td>
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<td>37.7</td>
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<tr>
<td>Spread between lending &amp; deposits rates&lt;sup&gt;2/&lt;/sup&gt;</td>
<td>Earnings &amp; Profitability</td>
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<td>13.7</td>
<td>13.4</td>
<td>13.5</td>
<td>14.2</td>
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<td>Customer deposits to total (non-interbank) loans</td>
<td>Liquidity</td>
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<td>145.8</td>
<td>145.2</td>
<td>140.0</td>
<td>144.4</td>
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<td>Foreign-currency-denominated loans to total loans</td>
<td>Foreign Exchange risk</td>
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<td>29.9</td>
<td>28.5</td>
<td>27.6</td>
<td>26.2</td>
</tr>
<tr>
<td>Foreign-currency-denominated liabilities to total liabilities</td>
<td>Foreign Exchange risk</td>
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<td>36.9</td>
<td>37.3</td>
<td>34.7</td>
<td>35.7</td>
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<tr>
<td>Net open position in equities to capital</td>
<td>Foreign Exchange risk</td>
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<td>15.8</td>
<td>17.0</td>
<td>17.0</td>
<td>17.9</td>
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<td>Household debt to GDP</td>
<td>Household sector leverage</td>
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<td>61.9</td>
<td>65.5</td>
<td>68.7</td>
<td>64.8</td>
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<td>Residential real estate loans to total loans</td>
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<td>24.0</td>
<td>23.5</td>
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<tr>
<td>Commercial real estate loans to total loans&lt;sup&gt;3/&lt;/sup&gt;</td>
<td>Exposure to real estate</td>
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<td>0.3</td>
<td>0.3</td>
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<td>0.3</td>
</tr>
</tbody>
</table>

**Notes:**

1/<sup>1/</sup> Deposit-taking Institutions (DTIs) include commercial banks FIA licensees and building societies.

2/<sup>2/</sup> Weighted by assets size.

3/<sup>3/</sup> Represents data for building societies only.
### Table 3.3 Core set of financial soundness indicators: SDs

<table>
<thead>
<tr>
<th>Indicator (%)</th>
<th>Categories</th>
<th>Dec-11</th>
<th>Mar-12</th>
<th>Jun-12</th>
<th>Sep-12</th>
<th>Dec-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Securities Dealers 1/</td>
<td>Regulatory capital to risk-weighted assets</td>
<td>Capital adequacy</td>
<td>29.3</td>
<td>25.1</td>
<td>24.0</td>
<td>23.3</td>
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<td></td>
<td>Tier 1 capital to risk-weighted assets</td>
<td>Capital adequacy</td>
<td>21.8</td>
<td>19.1</td>
<td>17.6</td>
<td>17.5</td>
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<td>0.3</td>
<td>0.2</td>
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<td>Non-performing loans to total loans</td>
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<td>Return on assets</td>
<td>Earnings &amp; Profitability</td>
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<td>0.6</td>
<td>1.0</td>
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<td>Return on equity</td>
<td>Earnings &amp; Profitability</td>
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<td>4.5</td>
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<td></td>
<td>Interest margin to income</td>
<td>Earnings &amp; Profitability</td>
<td>37.9</td>
<td>37.2</td>
<td>31.0</td>
<td>38.0</td>
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<td>Non-performing loans to total loans</td>
<td>Earnings &amp; Profitability</td>
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<td>26.1</td>
<td>20.3</td>
<td>25.7</td>
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<tr>
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<td>Liquid assets to total assets</td>
<td>Liquidity</td>
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<td>13.8</td>
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<td>Sensitivity to market risk</td>
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<td>2.9</td>
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<td>NOP to capital</td>
<td>Sensitivity to market risk</td>
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<td>8.4</td>
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<td>B. General Insurance</td>
<td>Net premium to Capital</td>
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<td>24.1</td>
<td>23.2</td>
<td>24.6</td>
<td>22.5</td>
</tr>
<tr>
<td></td>
<td>Capital to Assets</td>
<td>Capital adequacy</td>
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<td>29.7</td>
<td>27.6</td>
<td>29.3</td>
</tr>
<tr>
<td></td>
<td>(Real estate + unquoted equities + debtors) to total assets</td>
<td>Assets quality</td>
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<td>64.6</td>
<td>60.5</td>
<td>64.6</td>
</tr>
<tr>
<td></td>
<td>Receivables to gross premiums</td>
<td>Assets quality</td>
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<td>Net technical reserves to net claims paid in last year</td>
<td>Reinsurance &amp; actuarial issues</td>
<td>409.4</td>
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<td>386.3</td>
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<td>Risk retention ratio (net premium to gross premium)</td>
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<td>Management Soundness</td>
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<td>Earnings &amp; Profitability</td>
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<td>Return on Equity</td>
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<td>C. Life Insurance</td>
<td>Capital to technical reserves</td>
<td>Capital adequacy</td>
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<td>106.3</td>
<td>95.3</td>
<td>95.2</td>
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<td>(Real estate + unquoted equities + debtors) to total assets</td>
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<td>78.0</td>
<td>78.6</td>
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<td>4.8</td>
<td>5.3</td>
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<td>Assets per employee (J$000)</td>
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<td>137.7</td>
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<td>Expenses to net premium (expense ratio)</td>
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<td>Earnings &amp; Profitability</td>
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<td>Return on Equity</td>
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<td>Liquid assets to total liabilities</td>
<td>Liquidity</td>
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<td>Duration on assets - Domestic Bonds</td>
<td>Sensitivity to market risk</td>
<td>2.01</td>
<td>2.33</td>
<td>2.07</td>
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<td>Duration on assets - Global Bonds</td>
<td>Sensitivity to market risk</td>
<td>5.3</td>
<td>6.4</td>
<td>6.2</td>
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Notes:

1/ Includes the top-12 securities dealers.
## Sectoral Indicators of Financial Development

<table>
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<th>Sub-sector</th>
<th>Indicator</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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<td><strong>Banking</strong></td>
<td>Total number of DTIs</td>
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<td>Number of branches and outlets</td>
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<td>Number of branches/thousands population</td>
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<td>Bank deposits/GDP (%)</td>
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<td>44.5</td>
<td>42.9</td>
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<td>Bank assets/total financial assets (%)1/</td>
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<td>43.2</td>
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<td>Bank assets/GDP (%)</td>
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<td>63.8</td>
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<td>Gross premiums/GDP (%)</td>
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<td>4.5</td>
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<td>Gross life premiums/GDP (%)</td>
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<td>Gross non-life premiums/GDP (%)</td>
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<td><strong>Pensions</strong></td>
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<td># Defined Benefit plan</td>
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<td>129</td>
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<td># Defined Contribution plan</td>
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<td>363</td>
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<td>347</td>
<td>347</td>
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<td>Pension fund assets/GDP (%)</td>
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<td>22.1</td>
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<td>21.5</td>
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<td>Pension fund assets/total financial assets (%)</td>
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<td>15.0</td>
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<td><strong>Mortgage</strong></td>
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<td>5.5</td>
<td>5.7</td>
<td>5.8</td>
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<td>Mortgage assets/GDP (%)</td>
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<td>9.0</td>
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<td>8.8</td>
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<td><strong>Securities Dealers</strong></td>
<td>Securities dealer's assets/GDP (%)</td>
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<td>47.4</td>
<td>42.4</td>
<td>39.6</td>
<td>38.0</td>
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<td>Securities dealer's/total financial assets (%)</td>
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<td>29.2</td>
<td>27.5</td>
<td>26.5</td>
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<td>Total number of securities dealers</td>
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<td>29.0</td>
<td>29.0</td>
<td>31.0</td>
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<td>5.2</td>
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<td>Credit union's assets/total financial assets (%)</td>
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<td>46.0</td>
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<td>3.6</td>
<td>5.7</td>
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<td>Foreign exchange reserves as ratio to short-term external debt (%)</td>
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<td>188.5</td>
<td>217.2</td>
<td>196.8</td>
<td>159.2</td>
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<td>Number of listed securities (equities) 3/</td>
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<td>51</td>
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<td>Number of new issues (equities) 4/</td>
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<td>1</td>
<td>7</td>
<td>6</td>
<td>4</td>
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<td>Number of new issues (bonds) 5/</td>
<td>30</td>
<td>55</td>
<td>22</td>
<td>19</td>
<td>24</td>
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<td>Value of new issues (equities) J$Bn</td>
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<td>0.1</td>
<td>1.3</td>
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<td>0.4</td>
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<td>Value of new issues (bonds) J$Bn</td>
<td>96.1</td>
<td>222.8</td>
<td>151.6</td>
<td>105.1</td>
<td>77.8</td>
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<td>Market capitalization/GDP (%)</td>
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<td>50.4</td>
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<td>Value traded/market capitalization (%)</td>
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<td>Unit trust funds under management (J$Bn) 6/</td>
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<td>Mutual funds (value of units held by Jamaicans) US$MN</td>
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<td>-</td>
<td>151.1</td>
<td>164.5</td>
<td>122.0</td>
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</table>

**Notes:**
- Financial system assets includes assets for banks, insurance companies, credit unions, securities dealers and pension funds.
- Includes data for building societies, commercial banks & National Housing Trust
- Includes Junior market listings
- Includes preference shares
- Government of Jamaica bonds
- Unit trust portfolios are composed mainly of fixed income securities, equities and real estate investments
- Data availability

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"Bank of Jamaica Financial Stability Report 2012"
Policymakers and stakeholders across the world have grappled with the impact on the macroeconomic wellbeing of citizens as a result of major mergers and acquisitions. Studies have shown that the impact of mergers and acquisitions (M&A) within the financial system have long-term consequences on corporate governance, the regulatory environment and the wider macroeconomy.

M&As are aimed at improving profits and productivity of a firm while simultaneously reducing the expense ratios of the firm thus promoting greater efficiency in the financial system and economy.

Since 1999, in the aftermath of the Jamaican financial crisis, the growth in M&A has resulted in a material increase in risk to financial stability due to the possible reduction in competition within the system, the increased contagion risk and the impact on monetary policy due to increased cross-border activity. In addition, these M&A may influence national labour policies, as well as supervision within the system due to the increase in size of the combined entity.

During 2012, there were three notable mergers in Jamaica’s financial system. These were:

- the acquisition of Capital and Credit Financial Group (CCFG) by Jamaica Money Market Brokers (JMMB).
- the merger of Churches Co-operative Credit Union and GSB Co-operative Credit Union merged to form First Heritage Co-operative Credit Union.

This box highlights potential risks to financial stability resulting from M&As.

One such risk is the creation of large conglomerates and their resulting impact on:
- efficiency within the financial system;
- contagion risk within the system;
- supervision and regulation.

Financial consolidation could reduce competition in the sector and, hence, have unintended consequences on the efficiency of financial intermediation. In this regard, despite high levels of investment in the Jamaican banking system since 1999, Jamaica’s economy continued to underperform yielding low growth. Many economists have posited that Jamaica’s weak growth performance is largely due to high interest rate spreads arising from wide-spread inefficiencies in the sector.

These financial consolidations as a result of M&A may significantly influence financial variables, in particular, the volatility in short-term interest rates. Without sufficient depth in the bond and money markets, this concentration of investments within fewer large market players could increase liquidity risk and thus interest rate instability. To the extent in which liquidity risks are economically important to financial stability, financial consolidation could

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1 Merger is considered to be a process when two or more companies come together to expand their business operations and finalize the agreement on friendly terms. On the other hand when one company takes over the other and controls all its business operations, it is known as acquisitions.

2 Theoretically, consolidations increase the profitability of the financial system but data from advanced economies have yielded mixed results.
create asymmetry of information within the banking system and thus encourage predatory lending within the interbank market.

Moreover, in a context where interest income from investments significantly contribute to overall profits in Jamaica’s financial sector, significant volatility of investment yields could have a large impact on financial stability. Specifically with regards to securities dealers (SDs), interest income composes the largest share of profits. Therefore, interest rate instability resulting from financial consolidation would significantly impact the profitability of that sector and thus the financial stability of the financial system.

Finally, the creation of conglomerates through M&A increases the systemic risk within the financial system. Financial sector consolidation may increase contagion risk by increasing the average size of exposures as the number active players in the interbank market are likely to decline, for example as seen in the UK banking system at the height of the European debt crisis (see Section 3.2.3 & Figure 5.32). In other words, as the interbank market becomes more complete and interconnected each bank holds a lower share of interbank assets.³

In summary, the emergence of financial conglomerates with involvement in the payment and settlement systems in different sectors, as well as the increasing liquidity interdependence of different systems, further serves to accentuate the need for prudent regulation to monitor the potential systemic risks associated with these major financial M&A.

Furthermore, the supervision of these financial conglomerates poses a unique risk to the stability of the financial system given the size and reach of the combined entities. Financial conglomerates may be able to circumvent the system and avoid proper oversight through regulatory arbitrage. These arbitrage opportunities exist by taking advantage of loopholes within the legal framework of the local jurisdiction, for example a difference between the liquidity ratio requirements for DTIs and SDs. The implications of this practice may result in institutions being critically undercapitalized as well as significant subsidiary underfunding during periods of financial distress.

4. Financial System Sectoral Exposures

4.1 Overview

Deposit-taking institutions’ (DTIs) exposures to household and corporate sector debt increased marginally for 2012, while non-bank financial institutions’ (NBFIs) exposure to these debt categories remained virtually flat in comparison to 2011. This performance occurred amid weak domestic economic conditions including, a decline in real GDP growth, increased unemployment levels and heightened uncertainty regarding the timing and content of an agreement with the International Monetary Fund (IMF) on the country’s medium-term macroeconomic programme. Despite relatively higher exposure to household and corporate sector debt in 2012, DTIs’ loan quality ratio for both categories of debt recorded an improvement in comparison to the previous year. For NBFIs, the ratio deteriorated sharply for the review year and was mainly due to the operation of one institution.

DTIs’ exposure to public sector debt continued to decline during 2012. This decline may have been influenced by the protracted uncertainty regarding the timing and content of an agreement with the IMF. This uncertainty increased sovereign risk in the financial system as the Government was unable to extend the maturity profile of its debt stock or to issue a greater proportion of fixed rate relative to variable rate debt in accordance with its debt strategy. Similar to DTIs, NBFIs, with the exception of pension funds, reduced their exposure to public sector debt in 2012 relative to 2011.

4.2 Household Debt and DTIs Exposure

Household debt incurred with DTIs continued to expand for 2012. This expansion occurred amid weak domestic economic conditions including, a decline in real GDP growth, increased unemployment levels and heightened uncertainty regarding the timing and content of an agreement with the IMF on the country’s medium-term macroeconomic programme. For 2012, household sector debt grew by 15.9 per cent, relative to 9.5 per cent growth for the previous year.

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

2 Real GDP contracted by 0.3 per cent relative to growth of 1.3 per cent in 2011. Additionally unemployment levels increased to 13.7 per cent, up from 12.7 per cent in 2011.
representing the highest annual growth prior to the global financial crisis in 2008. However, this was notably well below the pre-crisis level, reflecting continued low demand conditions (see Figure 4.1).³

The growth in household sector credit for 2012 was largely due to an increase of 22.5 per cent in consumer loans, primarily installment credit, compared to an expansion of 15.5 per cent the prior year.⁴ Installment credit growth during 2012 was influenced by lower import duties and relaxation of other restrictions on imported used motor vehicles as well as lower interest rate charges on these categories of loans by banks. In particular, for 2012, interest rates on installment credit for each DTI sub-sector declined to a range of 13.6 per cent to 17.9 per cent, relative to a range of 16.6 per cent to 19.2 per cent for 2011 (see Table 4.1).⁵ Growth in household debt was also supported by a 7.9 per cent increase in mortgage loans, representing an improvement over growth of 2.8 per cent recorded for 2011. The stronger expansion in mortgage loans occurred within a context of aggressive marketing of loan products by banks, in addition to lowering of mortgage rates among building societies and commercial banks during the review period.⁶

Household sector debt accounted for approximately 55.5 per cent of DTIs’ credit portfolio at end-2012, slightly up from 54.1 per cent at end-2011 and was 4.6 percentage points above the average for the prior five years. Additionally, household debt to DTIs’ assets increased, albeit marginally, during the review period to 26.1 per cent relative to 24.2 per cent at end-2011. The increase mainly reflected the performance of the commercial banks as the share of household debt to DTIs’ assets for building societies and FIA licensees was virtually unchanged (see Figure 4.2). Similar to 2011, household sector loan quality ratio improved during the review year. Specifically, household

⁴ For 2012, installment credit increased to JS14.5 billion, in comparison to JS6.8 billion the previous year.
⁵ These interest rates exclude building societies.
⁶ Commercial banks mortgage loans rate declined to 9.9 per cent at end-2012 from 10.6 per cent at end-2011.
non-performing loans (NPLs) as a share of total household loans for DTIs declined to 5.4 per cent at end-2012 relative to 6.0 per cent at end-2011, reflecting a faster pace of increase in household debt relative to household NPLs. The improvement in the ratio was reflected across all DTI sub-sectors, in particular building societies (see Figure 4.3). However, of note is that the ratio at end-2012 was 0.2 percentage point higher in comparison to the average ratio for the past five years. The decline in the ratio was also partly due to the continued increase in net loan charge-offs since 2011. 7 Specifically, for 2012, net loan charge-offs increased by 34.2 per cent to $3.1 billion.

Notably, DTIs’ household coverage and capital ratios showed mixed results for 2012 relative to 2011. 8 The household coverage ratio at end-2012 reflected improvement relative to the end of the prior year. This was influenced by a 47.2 per cent increase in provisioning relative to a 6.5 per cent increase in household NPLs (see Figure 4.4). However, the capacity of banks to withstand losses arising from NPLs, as measured by the ratio of household sector NPLs to regulatory capital, deteriorated marginally to 14.6 per cent at end-2012 relative to 14.3 per cent at the end of the previous year. This was due to household NPLs growing at a faster pace relative to regulatory capital.

4.2.1 Household Sector Performance

The debt servicing capacity of the household sector, as measured by the ratio of total household debt to disposable income, is estimated to have deteriorated slightly by 1.3 percentage points to 18.3 per cent at end-2012 relative to end-2011 (see Figure 4.5). 9,10 This was attributed to a faster pace of growth in household sector debt of 15.3 per cent relative to growth of 7.0 per cent in disposable income for the year. 11

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7 Net loan charge-offs is computed as charge-off loans less bad loans recovered.
8 Coverage ratio is measured as the ratio of loan loss provisions plus prudential provisioning to non-performing household loans.
9 Total household debt is proxied by the sum of residential mortgage loans, consumer loans (which includes credit card receivables) and National Housing Trust loans.
10 Disposable income for 2012 was estimated based on the annual estimated growth rate in nominal GDP.
11 The deterioration in debt servicing capacity occurred in a context where the performance in economic activity has continued to remain weak relative to pre-crisis levels.
4.3 Corporate Sector Debt and DTIs Exposure

Corporate sector debt held by DTIs expanded by 12.1 per cent for the review period relative to growth of 5.9 per cent for 2011 and an average growth of 13.2 per cent for the previous five years (see Figure 4.6). This increase mainly reflected growth of 9.7 per cent in lending for private commercial purposes as this category represented 95.4 per cent of total corporate sector loans at end-2012. Further, DTIs’ holdings of corporate sector debt to DTIs’ assets increased slightly by 0.7 percentage point to 18.7 per cent at end-2012. Additionally, at end-2012, corporate sector debt accounted for 39.8 per cent of total loans relative to 40.1 per cent at the end of the previous year (see Figure 4.7).

The marginal increase in DTI exposure to corporate sector debt reflected growth in lending to most economic sectors, in particular Distribution (31.5 per cent), Manufacturing (51.3 per cent) and Electricity, Gas & Water (53.9 per cent) (see Figure 4.8). The expansion in Distribution largely represented syndicated foreign currency loans for debt refinancing and the provision of working capital. Growth in Manufacturing reflected new local currency loans for Food & Other Drink, Sugar, Building Materials and Other Manufactures. New loans to Electricity Gas & Water were related primarily to power generation.

4.3.1 Corporate Sector Loan Quality

Following a sharp increase in corporate sector loan quality for 2011, the ratio of corporate sector NPLs to total corporate sector loans declined by 4.3 percentage points to 9.9 per cent at end-2012. However, the ratio at end-2012 was well above the previous five year annual average of 5.7 per cent which underscored DTIs’ heightened susceptibility to credit exposure from the corporate sector (see Figure 4.9). The improvement in the asset quality ratio for the business sector was mainly reflected in the loan portfolio of the commercial banks and FIA licensees which recorded ratios of 9.4 per cent and 0.4 per cent, respectively, at end-2012 relative to respective ratios of 12.1 per cent and 1.8 per cent.

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

12 Corporate sector debt includes loans for commercial purposes, loans to other financial institutions and notes & debenture holdings of DTIs.
cent at end-2011. In examining the delinquency rate by sector, the loan quality ratio for all economic sectors, with the exception of *Entertainment, Mining & quarrying* and *Professional & Other Services*, improved for 2012. Notably, there were strong improvements in the ratios for *Manufacturing, Tourism* and *Agriculture* (see Figure 4.10).

4.3.2 Performance of Companies listed on the Jamaica Stock Exchange (JSE) for 2012

Consistent with the general uncertainty in the economy, the JSE Main Index declined by 3.4 per cent for 2012 in contrast to the gain of 11.8 per cent recorded for the previous year (see Figure 4.11). In particular, the performance of the Main JSE Index for 2012 occurred against the background of a weak domestic economy and uncertainty regarding the signing of an agreement between the IMF and the GOJ. In addition, substantial depreciation in the value of domestic currency during the review period as well as the returns on money market securities provided relatively attractive investment options for investors. Specifically, the monthly returns on the JSE Index averaged negative 0.3 per cent while those on the money market securities and gains on foreign currency investments were 0.5 per cent and 0.6 per cent, respectively. The poor performance of the index was in spite of improved earnings of some listed companies.¹³ Notably, there were several announcements of favourable business plans by listed corporate entities during the review period which led to growth in the index during the last quarter.¹⁴

The weak performance of the JSE Index was reflected in lower market indicators for 2012. Of note, the number of transactions declined by 16.3 per cent relative to growth of 27.0 per cent for the previous year. In addition, the volume of stocks traded declined by 7.7 per cent following a fall of 41.3 per cent for the prior year. However, the value of stocks traded increased by 1.1 per cent relative to growth of...

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¹³ These improved earnings were mostly for small capitalization stocks.
4.3 per cent for 2011. The advance-to-decline ratio was 6:24 at end-2012 in comparison to 28:7 at end-2011, underscoring the weak performance of the JSE Main Index during the review period. **Manufacturing** and **Finance** accounted for five of the top ten declining stocks with average price declines of 18.3 per cent and 15.8 per cent, respectively. On the other hand, **Insurance** accounted for two of the top six advancing stocks and recorded an average price appreciation of 34.5 per cent for 2012.

For 2012, listed corporate sector entities’ financial leverage ratio increased slightly by 1.0 percentage points to 81.9 per cent relative to end-2011 (see Figure 4.12). Of note, companies within the financial sector remained highly leveraged while companies within **Retail** and **Other** recorded the lowest leverage ratios for the review period.

Consistent with weak domestic economic activity, overall profitability of listed companies declined for 2012 relative to the previous year (see Figure 4.13). The asset utilization ratio as measured by average return on assets (ROA) for listed companies declined to 2.8 per cent in 2012 from 3.6 per cent in 2011, reflecting lower net profit positions across most sectors. Notably, all listed sectors on the JSE with the exception of **Other** and **Conglomerate** recorded declines in ROA relative to the previous year. **Communications** recorded the steepest decline in ROA, primarily as a result of the operation of one entity. Similarly, the ratio of net profits to revenues for listed entities declined in 2012 relative to 2011. This ratio declined to 13.7 per cent from 23.0 per cent in 2011. Furthermore, **Retail**, **Conglomerate** and **Finance** continued to record the highest profit margin ratios while **Communications** and **Manufacturing** recorded the lowest ratios (see Figure 4.14).

The weighted price to earnings (P/E) ratio for listed companies deteriorated in 2012 relative to 2011.

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15 Financial leverage ratio is measured as the ratio of total debt to total assets. A debt to asset ratio in excess of 65.0 per cent is typically associated with excessive debt.

16 ROA measures net profits as a proportion of average total assets. The weighted ROA for all listed entities was weighted by the market capitalization for each sector.

17 This implies that for every $1.00 of revenue generated, $0.14 went to the companies’ profit.
At end-2011, the weighted P/E ratio across the sectors averaged 1.0 relative to a ratio of 1.8 for 2011 (see Figure 4.15). With the exception of Finance, Conglomerate and Insurance, all sectors recorded P/E ratios below 1.0. Notably, Manufacturing recorded a negative P/E ratio of 1.5x largely due to the operations of three manufacturing sector entities which recorded negative earnings per share.

The solvency ratio for listed companies continued to be relatively high. However, at end-2012, the capital to asset ratio was 18.0 per cent compared to 19.1 per cent at end-2011. Notably, with the exception of Insurance, all other sectors on the Exchange recorded declines in their solvency ratios for 2012 relative to the prior year. Of note Communication recorded a negative ratio and was due largely to the operations of one entity as this institution’s liabilities exceeded its asset position. In addition, Finance recorded a solvency ratio of 11.1 per cent, well above the regulatory benchmark of 6.0 per cent (see Figure 4.16).

There was an improvement in the ratio of operating expenses to revenues in 2012 (see Figure 4.17). This ratio declined to 76.4 per cent across sectors in 2012 relative to 81.8 per cent in 2011. The improvement reflected the performance of companies across all listed sectors.

4.4. Public Sector Debt & DTIs Exposure

Within a context of heightened uncertainty regarding the timing and content of a funding arrangement between the GOJ and the IMF, public sector debt held by DTIs declined for 2012. This was reflected in a reduction in the ratio of public sector loans and securities to DTIs’ assets to 17.3 per cent at end-2012, relative to 19.7 per cent at end-2011 (see Figure 4.18). The performance was mainly influenced by a 8.5 per cent decline in DTIs’ holdings of public sector securities for the review period.

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18 The P/E ratio is calculated as the market value per share divided by the per share earnings of a company. The ratio was then weighted by the market capitalization of each listed company.

19 Exposure to public sector debt is measured by public sector loans and securities as a share of DTIs assets. Public sector comprises Public Entities and Central Government.
Public Sector Indebtedness & Performance

Public sector debt as a share of GDP grew marginally to 130.4 per cent at end-2012 from 129.0 per cent at end-2011, reflecting a faster growth in the debt stock of 8.1 per cent relative to 7.2 per cent for 2011 (see Figure 4.19). The growth in the total debt stock was primarily influenced by an increase in domestic debt as growth in external debt was negligible given postponement of related loans from multilateral financial institutions.

For 2012, the domestic and external debt stock grew by 12.7 per cent and 2.8 per cent respectively, relative to respective growth of 10.4 per cent and 3.7 per cent for 2011 (see Figure 4.20). The increase in domestic debt primarily reflected deficit financing in a context of weaker than projected revenue flows. On the other hand, the marginal uptick in external debt was associated with the depreciation in the exchange rate as the stock fell in US dollar terms, consequent on net amortization of Central Government external debt.20

Notwithstanding the increases in domestic and external debt, the fiscal stability ratio (FSR), which captures the stability of government finances, remained virtually flat at 1.22 at end-2012 relative to 1.23 at end-2011 (see Figure 4.21).21 This performance occurred against the background of curtailment in expenditure which resulted in a lower fiscal deficit relative to the previous year.

Notably, in 2012, uncertainties regarding the timing and content of a funding arrangement with the IMF affected the Government’s ability to issue a greater proportion of fixed rate relative to variable rate debt as well its ability to extend the maturity profile of the debt stock. These factors resulted in deterioration in the sustainability of the debt profile during 2012. Specifically, for 2012, the share of domestic fixed rate instruments declined by 0.47 percentage point to 56.0 per cent at end-2012 while the share of variable rate instruments grew

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20 The decline in the stock of Central Government external debt over the period largely reflected the maturity of a GOJ Euro-denominated 200 million bond in July 2012.

21 The FSR is computed as the ratio of overall fiscal balance to total revenue less 1 (one). The closer the FSR is to zero indicates more stable government finances.
by 0.49 percentage point to 43.9 per cent at the close the review period (see Figure 4.22). Additionally, the proportion of domestic debt due to mature up to 1 year increased sharply to 16.4 per cent at end-2012 from 5.7 per cent at end-2011, indicative of increased refinancing risk in the near-term (see Figure 4.23). In terms of external debt, this portfolio continued to be dominated by medium-to-long-term fixed rate instruments, thereby containing its vulnerability to interest rate shocks (see Figure 4.24).

4.5. Non-Bank Financial Sector Exposure

4.5.1 Private Sector Debt & Securities Dealers Exposure
Consistent with the weak economic environment, the exposure of the twelve largest securities dealers (SDs) to private sector debt remained low during 2012. The ratio of private sector debt to assets for the SDs was virtually flat at 1.6 per cent at end-2012 relative to end-2011 (see Figure 4.25). Notably, of the twelve SDs, only six institutions had exposure to private sector debt, which ranged between 0.8 per cent and 66.5 per cent of total assets.

Private sector debt held by SDs as a proportion of capital stood at 12.1 per cent at end-2012. Relative to 2011, this represented a slight decline of 0.3 percentage point in the ratio. This was due mainly to a decline in capital relative to private sector debt.

The SDs loan quality ratio, as measured by private sector NPLs to private sector loans, deteriorated to 10.1 per cent at end-2012 relative to 4.5 per cent at end-2011 (see Figure 4.26). The deterioration in the loan quality ratio for the top twelve SDs, was largely reflected across three major institutions and ranged between 3.2 per cent and 18.6 per cent. The coverage ratio for SDs also deteriorated to 85.1 per cent at end-2012 relative to 158.5 per cent at end-2011.

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22 Private sector loans incorporate loans to corporate sector entities and personal (household) loans.
23 The high ratio of 66.5 was as a result of the operations of one institution which had a reclassification of their loans during the latter part of 2012. Excluding this institution the ratio would range between 0.8 per cent and 3.0 per cent of total assets.
This performance reflected a faster pace of decline in provisioning relative to NPLs. Notably, provisioning declined by approximately 47.0 per cent and was mainly due to the operation of one institution.

### 4.5.2 Public Sector Debt & Securities Dealers Exposure
SDs’ holdings of public sector debt declined during 2012. The ratio of public sector debt to assets fell to 43.0 per cent at end-2012 from 48.5 per cent at end-2011 (see Figure 4.27). This reduction reflected a decline of 11.1 per cent in the holdings of public sector securities. Similarly, public sector debt holdings to capital declined steadily to 320.5 per cent at end-2012 from 363.4 per cent at end-2011. However, the ratio was significantly higher than a ratio of 91.3 per cent for DTIs at end-2012.

### 4.5.3 Public Sector Debt & Insurance Sector Exposure
Similar to the SDs, exposure to public sector debt declined for the insurance sector during 2012. The ratio of public sector debt holdings to assets fell slightly to 56.3 per cent at end-2012 relative to 57.1 per cent at end-2011 (see Figure 4.28). Of note, this ratio was 60.6 per cent and 40.2 per cent for the life and general insurance companies, respectively, at end-2012 relative to respective ratios of 62.3 per cent and 37.6 per cent at end-2011. As a proportion of capital, public sector debt holdings for the insurance sector declined to 246.3 per cent at end-2012 relative to a ratio of 248.4 per cent at end-2011 (see Figure 4.29). The lower ratio was influenced by the life insurance sector which recorded a ratio of 286.9 per cent at end-2012 while the general insurance companies recorded a ratio of 136.9 per cent.

### 4.6 Other Asset Exposures
The insurance sector’s exposure to equities and real estate investments continued to be relatively small compared to their exposure to public sector debt. For 2012, the ratios of equity investments to assets and real estate investments to assets for

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24 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.
the insurance sector was 1.8 per cent and 1.2 per cent, respectively, in contrast to ratios of 1.4 per cent and 1.0 per cent for 2011. In comparison, the exposures of SDs and DTIs to equity investments on average remained virtually flat at 0.5 per cent and 1.0 per cent, respectively, for 2012 relative to 2011 (see Figure 4.30).

### 4.7 Pension Industry Exposure to Governments Securities, Equities & Real Estate

At end-2012, the pension industry continued to have the highest exposure to Investments in Governments Securities as well as Investment Arrangements, relative to other investment classes (see Table 4.2). For the review period, exposure to Investments in Governments Securities and Investment Arrangements was 44.9 per cent and 26.6 per cent, respectively. This represented an increase relative to values of 44.5 per cent and 25.9 per cent, respectively, recorded at end-2011. For the same period there was a slight decline in exposure to equities investments to 10.8 per cent from 11.7 per cent at the end-2011. This could be attributed to increased investor uncertainty in the domestic economy. However, pension fund exposure to real estate remained unchanged at 5.2 per cent.

### Table 4.2 Investment classes as a per cent of total assets

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<th>2011</th>
<th>2012</th>
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<td>23.0</td>
<td>25.9</td>
<td>26.6</td>
</tr>
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<td>Other Investments to Assets (%)</td>
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<td>259.1</td>
<td>283.0</td>
<td>288.1</td>
</tr>
</tbody>
</table>

**Notes**

<sup>1/</sup> Governments securities includes Government of Jamaica securities and other sovereign securities from the US, UK and Canada.

<sup>2/</sup> An investment arrangement describes investments in deposit administration contracts and pooled funds.

25 The data for the industry represents data for the pension fund as at end-September 2012.

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

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

28 Exposure is computed as a per cent of total assets.

29 Investment arrangement includes investments in deposit administration contracts and pooled funds.
Box 4.1 Impact of Macroeconomic Shocks on Banking Sector Household Debt Exposure

Household sector debt as a share of total debt held by the Jamaican banking system totaled 55.5 per cent at end-2012, a sharp increase relative to 37.2 per cent at end-2002. This underscores the heightened relevance of bank lending to the household sector in Jamaica. Research on credit markets typically focuses on lending to firms, while households are mainly viewed as suppliers of funds, rather than as debtors. However, recent events show that lending to households can have strong implications for the health of banks’ balance sheets, particularly during economic downturn. Against this background, the monitoring of banks’ exposure to household debt and the analysis of its driving forces are important for the assessment of the outlook for financial stability. Accordingly, this box seeks to highlight the main factors which influenced the performance of household sector debt over the past ten years. In particular, changes in real economic activity and interest rates on the performance of household debt extended by the banking sector.

Following the global recession which commenced in 2008, Jamaica’s real GDP declined by 3.5 per cent for 2009 and thereafter, 0.2 per cent on average for the period 2010-2012, associated with increased unemployment. Additionally, interest rates spiked at 24.5 per cent in 2008 relative to a rate of 13.3 per cent at end-2007. Furthermore, it was also observed that there was an immediate response of the recession on household sector default rate (see Figure 1.0). Of note, the default rate deteriorated progressively during the period 2008 (4.2 per cent) to 2010 (7.0 per cent) from a low of 3.3 per cent at end-2007 (see Figure 2.0). These developments would have contributed to the sharp deceleration in the growth of household sector debt to 3.0 per cent for 2009 relative to growth of 24.8 per cent for 2008. Although increasing to 15.9 per cent in 2012, household sector debt remained well below the average pre-crisis growth of approximately 28.1 per cent for the period 2002-2007. By extension, economic downturns generally result in banks becoming significantly more cautious in the extension of credit and to take steps to bolster their capital and liquidity positions. Moreover, the persistent tightness of credit conditions faced by many borrowers as well as the generally weak demand for bank-intermediated credit, have continued to affect lending subsequent to the crisis.

Despite the reduction in household sector debt and the rise in bank loan quality ratio amid the weak economic activity, the banking system remained profitable and well capitalized. However, regulators need to monitor the strong concentration of bank portfolios on the housing market and lead banks to maintain its exposures within a narrowly defined range. Additionally, promoting the use of dynamic provisioning by banks should be encouraged so as to mitigate against risk to financial stability in period of stress.

Figure 1.0: Trend in Household Sector Debt and Key Macroe-Variables: 2002-2012.

Figure 2.0: Trend in Household Sector Debt and Loan Quality Ratios: 2002-2012.

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1 Household debt incurred with the banking sector is proxied by the sum of residential mortgage loans and consumer loans (which includes credit card receivables).
2 The unemployment rate increased to 11.6 per cent in 2009 and 13.7 per cent in 2012, relative to 9.3 per cent just before the 2008 global financial crisis.
3 The 180-day treasury bill rate is used as the macroeconomic interest rate variable.
4 Default rate is proxied by the ratio of household sector NPLs to household sector loans.
5 Dynamic provisioning involves banks maintaining higher provisions in good times so as to adjust for bad time.
5. Risks Assessment of the Financial Sector

5.1 Overview
Deposit-taking institutions (DTIs) remained robust to hypothetical liquidity, market and credit shocks during 2012. However, there was increased exposure to liquidity, interest rate and credit risks at end-2012 relative to end-2011. In particular, exposure to liquidity risk increased for 2012 in a context where there was a significant fall off in excess reserves as well as less short-term assets available to finance short-term liabilities. Similarly, based on duration factors, there was higher exposure to interest rate risks. In contrast, exposure to credit risk decreased as a result of improvements in the loan quality ratios for DTIs. The impact of improved loan quality ratios on credit risk exposure was, however, partially offset by increased exposure of foreign loans to non-foreign currency earners.

The non-banking financial sector also remained robust to a wide range of market and liquidity shocks during 2012. However, based on aggregate stress test result securities dealers reduced their exposure to interest rate risk but their exposure to liquidity funding risk increased.

5.2 Aggregate Stress Test Assessment for DTIs
Deposit-taking institutions (DTIs) remained robust to hypothetical liquidity, market and credit shocks at end-2012 relative to end-2011. However, based on aggregate stress test results the exposure to credit risks as defined by the value of past due loans less than three months becoming non-performing remained significant for the year (see Figure 5.1). In addition, the exposure of DTIs to interest rate risk increased, while foreign exchange risk and liquidity funding risk exposure remained negligible relative to end-2011. Of note, however, there was deterioration in some liquidity, foreign exchange and market risk indicators while credit risk indicators improved relative to end-2011 (see Figure 5.2).

\[\text{Figure 5.1} \quad \text{Relative exposures of DTIs based on aggregate stress test results}\]

\[\text{Figure 5.2} \quad \text{Evolution of risk indicators for DTIs}\]

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1 In Figure 5.1 the size of each node is scaled in proportion to the total value of exposure arising from the aggregate stress test results at end-2011 and end-2012.
5.3 Liquidity Funding Risk Assessment for DTIs
The DTI sector continued to rely primarily on deposits to fund its activities for 2012 albeit less than for 2011. Deposits as a proportion of total funding decreased to 71.5 per cent at end-2012 from 80.1 per cent at end-2011. In terms of other sources of funding, DTIs relied significantly more on ‘other borrowing’ relative to the preceding year and marginally less on inter-bank funding. Specifically, ‘other borrowing’ and deposits grew by 518.3 per cent and 9.9 per cent for 2012, respectively, the impact of which was partially offset by a 10.6 per cent reduction in inter-bank funding. Borrowings and inter-bank funding accounted for a monthly average of 7.0 per cent and 13.5 per cent of the funding base of DTIs for 2012, respectively, relative to respective averages of 4.0 per cent and 16.3 per cent for 2011. There was also a significant increase in the annual growth of the DTI’s funding base to 23.8 per cent for 2012 relative to a five-year average growth of 6.9 per cent.

Trends in several indicators of liquidity risk reflected an increase in the liquidity risk exposure of the DTI sector during 2012 relative to 2011. In particular, the loans-to-deposit ratio increased to 68.1 per cent at end-2012 from 66.8 per cent at end-2011 (see Figure 5.3). The increase in this ratio was a result of an increase in the annual growth rate of loans which was partially matched by a slight deceleration the growth rate of deposits. Furthermore, the statutory liquidity ratio of the system trended downwards for the year, as DTIs recorded a ratio of 26.7 per cent at end-2012 relative to 30.8 per cent at end-2011.

Additionally, DTIs reserves of liquidity in excess of those prescribed by the Bank declined steadily over the review year indicating elevated liquidity risk exposure (see Figure 5.4). In addition, the ratio of short-term assets to short-term liabilities for DTIs deteriorated at end-2012 relative to end-2011, with the exception of the building societies sub-sector, indicating slightly elevated short-term liquidity risk for commercial banks and FIA licensees (see Figure 5.5). At end-2012, 77.4 per cent and 43.2
per cent of short-term liabilities were backed by short-term assets for building societies and commercial banks, respectively. In contrast, only 17.2 per cent of short-term liabilities were backed by short-term assets of the FIA licensees sub-sector, a significant decline relative to the 26.9 per cent obtained in the prior year.

During 2012, liquidity funding stress tests indicated that all DTIs were adequately capitalised to absorb hypothetical losses associated with a decline in deposits. Specifically, after a hypothetical 10.0 per cent decline in average deposits, the post-shock capital adequacy ratios (CARs) for all DTIs remained above the regulatory benchmark of 10.0 per cent.\(^2\) However, there was a slight decrease in the median post-shock CAR of the system during 2012 which reflected increased susceptibility of banks to liquidity funding risk (see Figure 5.6).

\section*{5.4 Market Risk Assessment of Deposit-Taking Institutions}

The composition of the investment portfolio of commercial banks and building societies was more heavily weighted in Jamaica Dollar denominated securities at end-2012. In contrast, the FIA licensees sub-sector held the largest proportion of their portfolio in foreign currency securities. Relative to end-2011, all sub-sectors within the DTI system increased their position in foreign currency securities. The impact of these increases was partially offset by a slight downward adjustment in holdings of Jamaica Dollar securities for the commercial bank and building society sub-sectors (see Figure 5.7).

Perception of DTIs stability as reflected in equity prices was improved relative to 2011. This improvement was reflected in the trend decline in the median implied volatility of assets for publicly-listed DTIs. In addition, there was a narrowing and lowering of the inter-quartile range for the implied volatility of assets for publicly-listed DTIs relative to end-2011 (see Figure 5.8).

\(^2\) The ‘hair cut’ (% loss in value) applied in the stress testing framework on liquidating each category of assets are: items in course of collection (10.0%), non-liquid investments (25.0%), accounts receivables (25.0%), loans & advances (25.0%), fixed assets (50.0%) and other assets (50.0%). The resultant losses are written off against the capital buffers first and then statutory capital.
The duration of domestic bonds held by DTIs increased to 0.8 at end-2012 from 0.7 at end-2011 (see Figure 5.9). This represented a reversal of the decline in duration for the sector for 2011. The duration trend for 2012 was largely influenced by the commercial bank and the building society sub-sectors. The movements in domestic bond duration factor highlighted a slightly higher exposure to interest rate risk on domestic investments at-end 2012 relative to end-2011. On the other hand the duration of foreign currency securities held by DTIs declined marginally to 2.4 at end-2012 from 2.6 at end-2011.

There was significant volatility in the foreign exchange market during 2012 compared to the relatively stable trend the previous year. This instability was particularly noticeable after the first quarter of 2012 as there was a noticeable increase in volatility in the ensuing quarters of the year (see Figure 5.10). At end-2012, the exchange rate was US$1:J$92.98, reflecting a depreciation in the Jamaica Dollar of 7.4 per cent for 2012. The increased volatility in the foreign exchange market along with the increase in duration of foreign currency securities resulted in a deterioration as well as a widening of the inter-quartile range of DTIs VaR estimates (see Figure 5.11).

The DDVPC captures the dollar value loss of a percentage point increase in domestic bond yields as a proportion of the capital base.

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3 The DDVPC captures the dollar value loss of a percentage point increase in domestic bond yields as a proportion of the capital base.
5.5 Interest Rate Risk Assessment for DTIs
The movements in the domestic bond duration factor for DTIs highlighted a slightly higher exposure to interest rate risk on domestic investments for 2012.

In contrast, there was a slight reduction in interest rate risk exposure of DTIs for foreign currency securities at-end 2012. Specifically, the domestic dollar value of a percentage point to capital (DDVPC) for DTIs increased to 0.2 per cent at end-2012 from 0.1 per cent at end-2011. On the contrary, at-end 2012 the DDVPC for foreign currency securities declined by 0.6 percentage point to 0.1 per cent relative to end-2011 (see Figure 5.12).

For the review period, interest rate risk stress tests indicated that all DTI sub-sectors were adequately capitalised to absorb losses associated with large but plausible hypothetical increases in interest rates. However, both the inter-quartile range and the median quarterly post-shock CAR decreased after a hypothetical increase of 1 100.0 basis points in interest rates (see Figure 5.13). Further, consequent on the relatively small movements in yields in bond markets and the trend declines in the duration on domestic securities targeted by DTIs, the risk of the system to reductions in interest rates declined even further during 2012.

5.6 Foreign Exchange Risk Assessment for DTIs
The net open position (NOP) of the DTI system was lower at-end 2012 relative to end-2011. DTIs reduced their long position in foreign currency assets by 14.2 per cent to the equivalent of US$286.4 million at-end-2012 relative to end-2011 (see Figure 5.14).4 This decrease in the NOP was observed across each of the DTI sub-sectors. Consequently, DTIs’ exposure to foreign currency risk lessened as reflected in a lower NOP to capital of 24.2 per cent, relative to 30.6 per cent at end-2011. On the contrary, DTIs expanded their risk exposure to non-foreign currency earners during the review year. This was reflected in an increase in DTIs loans to non-foreign exchange earners to the

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4 Long position in foreign currency assets include all currencies converted to US dollars.
equivalent of J$19 554.5 million at end-2012 relative to J$18 361.0 million at end-2011 (see Figure 5.15). Further, loans to non-foreign exchange earners as a proportion of total loans extended by DTIs increased by 1.1 percentage points to 17.0 per cent compared to end-2011.

At end-2012, all DTIs were adequately capitalised to absorb losses associated with significant hypothetical depreciations of the Jamaica Dollar vis-à-vis the U.S. dollar. Specifically, after a hypothetical 30.0 per cent depreciation, the median post-shock CARs across all DTI sub-sectors trended upwards except for one sub-sector, relative to the average median post-shock CARs for 2011 (see Figure 5.16). The median post-shock CAR for commercial banks remained relatively flat and comfortably above the 10.0 per cent CAR benchmark during 2012. Building societies were minimally affected by the shocks applied in 2012 and generally exhibited slightly elevated median post-shock CAR relative to 2011. In contrast, the median post-shock CAR for the FIA licensees sub-sector declined for the first three quarters of 2012 reflecting increased risk exposure to foreign exchange rate-related shocks. However, increased levels of resistance to a foreign exchange rate shock for the FIA licensees sub-sector was observed at end-2012. This was reflected in the increase in the median post-shock CAR as well as a narrowing of the inter-quartile range reflecting a significant increase in the CAR for one institution in the December 2012 quarter. Of note, the pre-shock CAR for the DTI sector increased to 21.0 per cent at end-2012 from 15.0 per cent at end-2011.

5.7 Credit Risk Assessment of DTIs
For 2012, exposure to credit risk remained the most significant risk to DTIs based on aggregate stress test results (see Figure 5.17). The DTI sector remained largely exposed to credit risk despite an improvement in the NPLs to total loans ratio. In particular, the non-performing loans (NPL) ratio improved to

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5 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.
6.8 per cent at end-2012 from 8.9 per cent at end-2011 and the write-off rate was unchanged at 1.6 per cent of total loans at end-2012 relative to end-2011. Of note, the write-off rate peaked at 2.1 per cent at end-July with the lowest write-off rate of 1.6 per cent at end-October 2012 (see Figure 5.18). Nonetheless write-off rates remained elevated relative to a five year historical average of 1.2 per cent. At the same time, provisioning ratios increased for building societies and FIA licensees but declined for commercial banks during 2012. The building societies sub-sector recorded an increase in the ratio of provisioning to NPLs to 66.2 per cent at end-2012 from 62.6 per cent at end-2011. Similarly, the ratio of provisioning to NPLs increased by 33.1 percentage points to 106.8 per cent at end-2012, relative to end-2011 for FIA licensees. In contrast, the ratio of provisioning to NPLs declined by 4.6 percentage points to 73.4 per cent for commercial banks relative to end-2011. The loan loss provision to NPLs ratio for commercial banks declined to 74.0 at end-2012 from 78.6 at end-2011, this was driven by the commercial bank sub-sector.

The median NPL to capital ratio for DTIs was slightly lower for 2012 relative to 2011 (see Figure 5.19). The ratio averaged 27.6 per cent for the review year relative to an average of 28.2 per cent recorded for 2011. In addition, a narrowing of the inter-quartile range for NPLs to capital for DTIs underscored a lower exposure to credit risk. This ratio decreased to within an inter-quartile range of 17.7 per cent to 36.0 per cent at end-2012 relative to a range of 18.5 per cent to 49.3 per cent at end-2011. However, the maximum ratio of NPLs to capital recorded across all DTIs increased sharply to 159.0 per cent from 154.1 per cent at end-2011.

\[\text{Write-off rate} = \frac{\text{charged off assets}}{\text{loans, advances & discounts (net of provisions)}}\]
In a context of improved loan quality measured by the NPLs to total loans ratio for the DTI sub-sector, the CARs for all sub-sectors were adequate to absorb a hypothetical 30.0 per cent increase in NPLs at end-2012 (see Figure 5.20). Specifically, both the commercial bank and the building society sub-sectors showed consistent levels of robustness against large but plausible hypothetical shocks to NPLs over the review year. The FIA licensees post-shock CAR was consistently susceptible to the hypothetical shock for most of the year. However, there was a significant improvement in the FIA licensees’ ability to absorb the hypothetical increase in NPLs for the December 2012 quarter resulting from improved capital positions as well as significant reduction in NPLs in the December 2012 quarter.  

Reverse stress testing exercises conducted for the building society and FIA licensee sub-sectors suggest that it would take a larger increase in the NPLs at end-2012 to cause the most vulnerable institution to have its CAR fall below 10.0 per cent relative to end-2011 (see Figure 5.21). Specifically, at end-2012 it would take a 180.0 per cent increase in NPLs for the first building society and FIA licensee to breach the regulatory minimum CAR relative to respective increases of 160.0 per cent and 20.0 per cent at end-2011. In contrast, reverse stress testing assessments of the commercial bank sub-sector revealed increasing susceptibility to credit-related risks as it would take a smaller increase in NPLs at end-2012 to cause the most vulnerable institution to have its CAR fall below 10.0 per cent. Specifically, at end-2012, it would take a 10.0 per cent increase in NPLs to bring the CAR of the weakest institution below the 10.0 per cent benchmark relative to an increase of 20.0 per cent in NPLs at end-2011.

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7 Improvement in the loan quality of FIA licensees was attributable to the sale of a portion of one entity’s stock of NPLs to a non-deposit taking affiliate.
8 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.
5.8 Liquidity Funding Risk Assessment of Securities Dealers

Liquidity funding risk exposure of the securities dealers sector as measured by the ratio of short-term assets (less than three months) to short-term liabilities improved significantly at end-2012 relative to end-2011. The ratio of short-term assets to short-term liabilities increased sharply to 28.4 per cent from 16.6 per cent at end-2011 (see Figure 5.22). The increase in the ratio reflected a 50.6 per cent increase in short-term assets to $31 960.00 million at end-2012 as well as 12.2 per cent decline in short-term liabilities to $112 413.06 million at end-2012.

The liquidity funding stress test for the twelve largest securities dealers, involving a hypothetical 10.0 per cent reduction in retail repo-liabilities showed that all entities would have post-shock CARs above the regulatory minimum of 10.0 per cent (see Figure 5.23). The average median post-shock CAR during 2012 was 31.6 per cent. However, the reduced exposure to liquidity funding risk was reflected in both an upward trend and widening of the inter-quartile range of the post-shock CARs over the year. The median post-shock CAR remained relatively flat over the year.

5.9 Market Risk Assessment of Securities Dealers

For 2012, the investment portfolio of the securities dealers sector remained tilted towards Jamaica Dollar denominated bonds albeit to a lesser degree relative to the previous year. In particular, securities dealers held on average 54.1 per cent of their investment portfolio in Jamaica Dollar securities compared to 45.3 per cent in foreign currency securities (see Figure 5.24). This is in comparison to the previous year when at end-2011 securities dealers held 59.1 per cent of their investment portfolio in Jamaica Dollar securities and 40.3 per cent in foreign currency securities. Investments in equity securities remained marginal for the year. There was lengthening of the durations of security dealers domestic and foreign currency bond portfolios during 2012. This was more pronounced for in the foreign currency bond portfolios. Which increase this was more pronounced in their foreign currency bond portfolio which recorded an increase in duration to 2.5 at end-2012 from 2.3 at end-2011 (see Figure 5.25).
Concurrent with the lengthening in duration, the downside risk of the sector increased during 2012. The highest value-at-risk (VaR) estimate for the year was 1.0 per cent of the sector’s investment portfolio, higher than the maximum of 0.3 per cent which obtained during 2011 (see Figure 5.26). This was driven by the increased volatility in yields in foreign currency bonds.

Equity prices of SDs reflected negative perception on stability relative to 2012. This deterioration was reflected in the trend increase in the median implied volatility of assets for publicly-listed SDs. Of note, however, there was a narrowing of the inter-quartile range for the implied volatility of assets for publicly-listed SDs relative to end-2011 (see Figure 5.27).

### 5.10 Interest Rate Risk Assessment of SDs

Interest rate risk stress testing revealed that securities dealers were vulnerable to large hypothetical shocks to interest rates. The twelve largest SDs recorded a median post-shock CAR of 13.3 per cent after a hypothetical increase of 1 100.0 basis points in interest rates at end-2012 relative to 21.1 per cent for 2011 (see Figure 5.28).

### 5.11 Foreign Risk Assessment of SDs

The exposure of the securities dealers sector to foreign exchange rate risk increased during 2012. Of note, the NOP of the securities sector decreased to US$42.7 million at end-2012 from US$58.2 million at end-2011. Consequent on this, the proportion of NOP to regulatory capital declined to 6.2 per cent at end-2012 relative to 9.2 per cent at end-2011. The overall median ratio of NOP to capital also declined to 9.3 per cent at end-2012 relative to 14.8 per cent at end-2011 (see Figure 5.29). Against this background, the post-shock CARs of the securities dealers sector remained above the 10.0 per cent benchmark as a result of the contemplated 30.0 per cent depreciation in the exchange rate (see Figure 5.30).

### 5.12 Liquidity Funding Risk Assessment of Insurance Companies

Post-shock minimum continuing capital surplus requirements (MCCSRs) for the life insurance sector declined during 2012.
Despite this decline, the MCCSRs for life insurance companies remained comfortably above the regulatory benchmark of 150.0 per cent, signalling resiliency of the sector to absorb the contemplated shocks. Most of the resulting MCCSRs reflected declines in the actual ratios rather than the impact of the liquidity shock. On the other hand, the general insurance sector’s resiliency to the contemplated shocks from funding sources was relatively unchanged throughout the year.

5.13 Market and Interest Rate Risk Assessment of Insurance Companies

There was slightly higher exposure of the life insurance sector to market risk during 2012. The average VAR estimate for the sector increased to 0.7 per cent at end-2012 from 0.2 per cent the previous year (see Figure 5.32). This outturn occurred in the context of higher bond yields on GOJ foreign currency denoted bonds throughout the year. Of note, however, the duration on the foreign bond portfolio was unchanged at 5.3 years at end-2012 relative to end-2011. Similarly, the duration on the domestic bond portfolio decreased slightly to 1.6 years from duration of 2.0 years at end-2011.

Life insurance companies’ balance sheets remained robust to large but plausible hypothetical increase of 1 100.0 basis points in interest rates during 2012 as the post-shock MCCSRs, despite declining, were comfortably above the regulatory benchmark of 150.0 per cent (see Figure 5.33).

5.14 Contagion Risk Assessment of the Domestic Financial System

Activities in the domestic inter-bank market declined at a slower pace relative to 2011. In particular, borrowing in the inter-bank sector declined on an annual basis by 1.2 per cent during 2012, relative to a 0.8 per cent reduction in 2011. Of note, these declines were spurred by increased uncertainty related to counter-party and liquidity risk in this segment of the market.
Concurrent with the reduction in inter-bank activity during 2012, there were sharp and persistent increases in inter-bank interest rates as the periods of non-trading in the inter-bank market declined relative to 2011. For instance, the maximum inter-bank rate for 2012 increased to 18.0 per cent from a maximum rate of 12.0 per cent for 2011 (see Figure 5.34).

However, the number of days with no reported trading activity decreased to 28 for 2012 compared to 50 and 41 recorded in 2011 and 2010, respectively.

At end-2012, the commercial banks were net borrowers in the inter-bank market while securities dealers and FIA licensees were generally net lenders. The securities dealers sector had the largest net exposure on average over the year, both in dollar value as well as relative to the size of their capital base, in the inter-bank market. (see Figure 5.35). This is contrast to the prior year where FIA licensees had the largest net exposure to counter-part risk (see Figure 5.36). However, the exposure to counter-party risk of the insurance sector and the building societies sector remained negligible at end-2012 similar to end-2011.

Stress testing of counter-party risk exposures for the financial system revealed that the commercial bank sector was most vulnerable to contagion risk emanating from foreign financial institutions. One particular building society was also vulnerable to counter-party risk from foreign institutions. However, following the hypothetical shock there were no domino impact leading to second round effects. The median post-shock CARs were 4.3 per cent, 13.4 per cent, and 8.0 per cent for the commercial bank, building society sub-sectors and the securities dealer sector, respectively (see Figure 5.37).

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9 A large exposure is one that exceeds 10% of a lending bank’s regulatory capital at the end of a period.

10 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 5.34  Daily ranges for inter-bank rates

Figure 5.35  Network of large exposures between financial institutions (net credit exposure-to-capital)

Figure 5.36  Large exposures between financial institutions (net credit exposure-to-capital)

Figure 5.37  Counterparty risk exposures for the financial system at end-2012 (Scenario: Impact on CAR of the failure of institution(s) on financial entity with large net credit exposure)
6. Payments System Developments

6.1 Overview

During 2012, growth in currency slowed against the background of contraction in economic activity, weaker domestic and external demand as well as increased economic uncertainty. Nonetheless, growth in overall average monthly Automated Banking Machine (ABM) and Point-of-Sale (POS) volumes and values remained strong during 2012, increasing by 10.3 per cent and 11.9 per cent, respectively, despite contractions in real wages and weaker growth in net remittance flows. Conversely, growth in the average value and volume of transactions by cheque declined significantly during the year in the context of the lowering of the upper limit on transactions in the Automated Clearing House (ACH). The decline in large value payments cleared in the ACH resulted in a further reduction of settlement risks and continued improvements in payment system credit risk during the review period.

Against this background, activities in the JamClear systems – JamClear-Real Time Gross Settlement (RTGS) and JamClear-Central Securities Depository (CSD) – increased in value during 2012. Furthermore, transactions via the RTGS as a proportion of the total value of transactions in the RTGS and ACH increased to 93.9 per cent at end-2012 relative to 91.0 per cent at end-2011.

6.2 Traditional Means of Payment

Growth in currency in circulation slowed to 3.6 per cent during 2012 relative to growth of 9.0 per cent for 2011. The slower growth in currency occurred against the background of weaker performance in real sector activities during 2012. Real GDP contracted by 0.3 per cent during the review period relative to growth of 1.3 per cent during 2011. Furthermore, growth in currency during the review period was generally in line with the average increase of 6.0 per cent over the last 3 years but remained well below the average growth of approximately 15.0 per cent for the five years prior to 2008 when the global crisis intensified. In addition, the average monthly level of currency in circulation as a share of GDP remained at 3.7 per cent at end-2012 while
average currency in circulation as a share of M1 increased marginally to 45.0 per cent relative to 44.4 per cent at end-2011 (see Figure 6.1).

Similar to 2011, there were declines in the average volumes and values of transaction by cheque during 2012. Average monthly volume and value of transactions by cheque fell by 5.2 per cent and 18.8 per cent to 1.5 million and $207.7 billion, respectively. In addition, there was a decline in the proportion of inter-bank cheque payments to 48.0 per cent at end-2012 relative to 52.0 per cent at end-2011 (see Figure 6.2 and Figure 6.3). This decline largely reflected the impact of the reduction in the value threshold on transactions processed in the ACH to $3.0 million in April 2012. As a result, there was an improvement in payment system safety during the year. Furthermore, the volume and value of proprietary or intra-bank cheque payments were higher relative to inter-bank cheque payments for 2012. The average size of intra-bank cheque payments ($142,716.4) was higher than the average size for inter-bank cheque payments ($130,247.4) for the review period.

6.3 Electronic Payment Instruments
Relative to a fall in the use of cheques, growth in the use of electronic payment instruments remained strong during 2012. Average monthly ABM and POS values increased by 11.9 per cent to $33.4 billion relative to an increase of 13.7 per cent for 2011. There was, however, stronger growth in ABM and POS volumes which grew by 10.3 per cent to 5.6 billion in comparison to growth of 6.1 per cent for 2011. The performance for 2012 was largely attributable to the contraction in real wages, higher unemployment levels and weaker growth in net remittance flows. Real wages fell by 3.2 per cent relative to an increase of 1.5 per cent for 2011. The unemployment rate increased to 13.7 per cent from 12.8 per cent for 2011 reflecting a contraction in employment and an increase in the labour force. Additionally, net remittance flows grew marginally by 0.7 per cent in comparison to growth of 6.3 per cent for 2011.

1 Real wages reflects employee average real earnings per week based on all economic sectors.
Regarding ABM transactions, average monthly ABM values increased by 10.2 per cent for 2012 to $19.0 billion relative to an increase of 9.5 per cent for 2011 (see Figure 6.4). However, this outturn remained below the two-year average of 25.6 per cent for 2008 and 2009, a recessionary period marked by relatively high levels of inflation expectations. Additionally, average monthly ABM volumes increased by 8.4 per cent relative to an increase of 4.4 per cent for 2011. This increase in ABM usage may be indicative of a possible preference for cash usage by consumers.

Average monthly POS values grew by 14.3 per cent for 2012 to $14.4 billion. However, this represents a slowdown when compared to growth of 20.0 per cent in 2011 (see Figure 6.5). On the other hand, average monthly POS volumes grew by 13.6 per cent for 2012 relative to growth of 9.1 per cent for 2011. In addition, the performance of measures of payment system safety through these payment instruments improved during 2012, specifically ABM and POS intra-bank value and volumes as a share of overall values and volumes increased to respective values of 69.0 per cent and 66.0 per cent at end-2012 (see Figure 6.6 and Figure 6.7). Average monthly values of US dollar and Jamaica Dollar-denominated credit card transactions done via the internet increased by 15.2 per cent and 28.2 per cent respectively in 2012. However, there were declines in the volume of both the US and Jamaican dollar-denominated credit card transactions using the internet (see Figure 6.8 and Figure 6.9). In particular, this outturn was largely due to stronger volatility in the foreign exchange market in the second half of the year relative to the first half. The depreciation in the Jamaican dollar vis-à-vis the US dollar accounted for the increase in transaction values while the volumes decreased.

Regarding cards in circulation, Jamaica Dollar denominated debit cards increased to approximately 2.1 million from 1.9 million at end-2011 (see Figure 6.10). Similarly, credit cards in circulation increased to 208 774 at end-2012 from 196 671 at end-2011. At the same time, credit card receivables of DTIs increased significantly by 15.2 per cent to J$23 744.7
million at end-2012 relative to an increase of 1.4 per cent at end-2011. The increased usage of credit cards might be linked to the decrease in real wages and higher inflation for the period relative to 2011. These factors could have resulted in more consumers choosing to postpone or delay cash payments through the use of credit in an effort to mitigate the loss in disposable income.

The number of ABM terminals in operation by commercial banks declined to 424 at end-2012 relative to 423 at end-2011. In addition, during the year, the number of terminals decommissioned totalled 12 while 13 terminals were installed during the period. There were also 16,565 POS terminals in operation by commercial banks at end-2012 relative to 14,336 POS terminals in operation at end-2011 (see Figure 6.11).

6.4 Large Value Transfer System

There was lower payment system credit risk during 2012. Transactions via the RTGS, as a proportion of total value of transactions in the RTGS and ACH combined, increased to 93.9 per cent for 2012 relative to 91.0 per cent for 2011. This outcome was largely attributable to an increase in RTGS transactions and a decrease in cheque clearing activities in the ACH. During 2012, there was an increase in activities in the JamClear-RTGS system. In particular, the total value of RTGS transactions was $13,331.3 billion, reflecting an increase of 6.7 per cent relative to 2011 (see Figure 6.12). In addition, RTGS volumes totalled 220,510 for 2012, increasing by 29.4 per cent relative to 2011 (see Figure 6.13). Consequently, the average RTGS credit transfer totalled $60.5 million, 17.5 per cent below the average RTGS credit transfer of $73.3 million for 2011.

Regarding JamClear-CSD transactions, there was a reduction in average monthly volumes by 6.7 per cent to 15,882 for 2012. However, the average monthly value of CSD transactions increased to $1,830.0 billion for 2012 from $1,804.0 billion for 2011 (see Figure 6.14). Furthermore, GOJ variable rate notes continued to be the most liquid securities in terms of volumes of transactions processed in the
JamClear-CSD reflecting heightened uncertainty in the bond market during 2012. Additionally, during the last quarter of 2012, there was an uptick in the volume of GOJ CPI-indexed notes reflecting an increase in the inflation expectation against the background of an increase in the inflation rate (see Figure 6.15).

In addition, in terms of transaction size, the variable rate notes accounted for the largest values traded during most months of the year. Furthermore, there was a general increase in the size of the Fixed Rate USD (FR USD) notes traded. In particular, in December 2012, there was a sharp increase in the size of FR USD notes. This outturn was influenced by the depreciation in the exchange rate during the period (see Figure 6.16).

Of the sixteen participating institutions utilizing the BOJ intra-day repo facility, the percentage of funds demanded by four institutions remained well over 50.0 per cent during most of the review period and may be indicative of liquidity concentration risks in the payment system (see Figure 6.17). The use of the facility increased by 54.4 per cent relative to 46.1 per cent for 2011. The Bank’s provision of intra-day repos totalled $837 918.2 billion at end-2012 relative to $543 590.0 billion at end-2011 and was concentrated mainly in the same four institutions. The median size of funds demanded by institutions was higher in the first half of the year. Money market flows were higher in the second half of the year, particularly; there were stronger OMO net maturities. Funds demanded during the second half of the year totalled $365 744.0 million relative to a total of $472 174.0 million up to end-June 2012 (see Figure 6.18).

RTGS monthly transaction values continued to show that the bulk of funds demanded and supplied were mainly concentrated within three institutions during 2012. This highlights the level of skewness in the system and the likelihood of disruptions. The implications of this degree

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2 Transactions processed in the JamClear-CSD include a wide range of transaction types such as repurchase and reverse repurchase transactions, pledges and primary issues.

3 Volumes traded and transactions size are both net of entitlement proceeds.
of concentration are further compounded by the interdependencies which exist within the payment system framework. This is in a context where payment system disruptions could potentially jeopardize payment system safety (see Box 6.1). The median percentage of funds demanded and supplied also remained relatively low during the year with most institutions being low net demanders and suppliers of funds (see Figures 6.19 and 6.20).

An analysis of the Risk Index for payment system concentration showed that payment concentration remained high for the review year.\(^4\) The Index value for the two most active banks increased to an average of 33.9 per cent for 2012 relative to an average of 29.6 per cent for 2011. The average Risk Index value for the remaining banks fell to an average of 2.7 per cent for 2012 relative to an average of 3.0 per cent for 2011 (see Figure 6.21). The Herfindahl index of payment activity averaged 0.2, similar to the previous year thereby signalling a fairly strong degree of concentration (see Figure 6.22).\(^5\)

6.5 Traditional Versus Electronic Means of Payment
During 2012, ABM and POS were the dominant means of payment in terms of volumes but ranked lowest in terms of values when compared to cheques and RTGS transactions (see Figures 6.23 and 6.24). More specifically, for the review period, transaction values for cheques, ABM and POS and RTGS totalled $2,492.0 billion, $400.0 billion and $13,331.3 billion while transaction volumes totaled 19.0 million, 66.7 million and 220,510.0, respectively.

6.6 Other Payment System Developments
There have also been several developments in the retail payment systems in Jamaica during 2012.\(^6\) The Guidelines for Electronic Retail Payment Services was published by

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\(^4\) This measure is computed based on payments made and received by each bank as a share of overall payments for the system.

\(^5\) The Herfindahl index is computed as:

$$HI_{payments} = \sum_{i=1}^{N} \left( \frac{\text{Bank}_i \text{ Payments}}{\text{Total Payments}} \right)^2$$

where if the Index is equally divided between N participants, then the Herfindahl measure of concentration equals 1/N.

BOJ and is intended to promote confidence in electronic means of payment and encourage financial inclusion. Additionally, the first phase of the automation of Government payments began in 2012. This facility is intended to allow the Government of Jamaica to make large value and time critical payments through the RTGS. It is expected that system safety and efficiency will be enhanced by eliminating the use of cheques to settle these transactions. Furthermore, Bill Payment Service Providers were subject to a new reporting regime whereby they must submit monthly reports on payment activities to the BOJ. Another important development was the formation of the Market User Group in order to establish a fixed income trading platform in Jamaica.
Figure 6.22 Herfindahl index of payment concentration

Figure 6.23 Volumes of transactions by payment instruments

Figure 6.24 Values of transactions by payment instruments
Box 6.1 Interdependencies & Oversight within Payment Systems

The level of concentration in the payment, clearing and settlement system in Jamaica highlights the interdependencies which may be present within the system. Furthermore, some of the major participants in the payment, clearing and settlement system have strong linkages to the smaller participants. Interdependencies are also created in instances where all participants rely on a common service provider. The objective of this box is to analyze these interdependencies within the payments architecture in Jamaica as well as the oversight role of the Bank, given that disruptions within the system could potentially jeopardize payment system safety and financial stability.

The payment systems literature has shown that disruptions in payment and settlement systems may be transmitted to the wider financial system (Bank for International Settlements (BIS), 2008). International evidence has also shown that larger financial institutions may have settlement activities in multiple systems, both domestically and abroad. Therefore, the financial system on a whole is exposed to common sources of operational, liquidity and credit risks introduced by these large participants with significant activities. The pattern and extent of interdependencies can result in the transmission of disruptions far beyond the original source as well as increase the speed at which these disruptions are transmitted.

Furthermore, evidence has shown that effective risk management steps have to be in place to predict, control and limit such disruptions. The impact of these disturbances is reduced in an environment where proper controls are placed at both the institutional and system levels. Specifically, firms should consider risks on a broader perspective rather than at the localized level. Therefore, timely and accurate information sharing is vital alongside proper coordination of activities. If these processes are in place then the effects of disruptions can be easily mitigated or avoided. Interdependency among firms has also led to a significant change in the risk profile of payment and settlement systems globally. The safety of the process has improved as well as a general reduction in credit and liquidity risk through the use of the central bank as a settlement medium. Having the central bank as the settlement medium eliminates information asymmetries that would be present otherwise, thereby strengthening confidence within the payment system. Another crucial role of the central bank is to ensure that adequate liquidity is always available within the financial system to settle payments on time, which also entails offering intraday liquidity to support settlement of payments.

In Jamaica, the JamClear-RTGS, JamClear CSD and the Automated Clearing House (ACH) form the core of the payment, clearing and settlement system. Due to the relatively small size of the payment system, institution-based interdependencies are likely to be strong. Consequently, disruptions may quickly feed through the entire system by initially affecting a few participants. Therefore, technological or operational problems originating within the JamClear-RTGS system are likely to result in consequences for the JamClear-CSD system and visa-versa given the close linkages between the participants in both the securities and money market. The interrelationships within the system must be acknowledged as important considerations in risk management strategies as well as the setting of standards. As such, the BOJ has maintained a risk-based methodology in its oversight of the payment system.

This approach means that the Bank establishes strategies to identify and deal with risks associated with payment and settlement systems in order to avoid systemic risks that could ultimately incapacitate the wider economy. The Bank in its role also follows principles of transparency, cooperation and adherence to international standards. In particular, these principles are applied to the Bank’s activities as an intermediary within the payment, clearing and settlement system. The Bank also maintains a collaborative approach in its oversight of the system. Periodic assessments are done and changes in regulation are done to mirror changes in international standards. Additionally, non-compliance with regulation and standards are met with sanctions. Continuous data collection is another important strategic tool employed by the Bank in its oversight.
Sources:
The Interdependencies of Payment and Settlement System, 2008, Bank for International Settlements
Payment System Oversight Policy, 2012, Bank of Jamaica

2 The payment systems are assessed against international standards developed by the Bank for International Settlement (BIS) and the International Organization of Securities Commissions (IOSCO).
Articles
Section I: Introduction
The aim of this article is to identify the systemic risk drivers relevant for the ‘forward-looking’ modeling of the dynamics of GOJ sovereign credit risk. Importantly, these systemic drivers would also impact the external credit ratings of private institutions operating in Jamaica as they face the same underlying economic risk factors as the sovereign. In particular, estimating the relative impact of these economic variables is carried out for the purposes of developing a robust forward-looking financial stability framework for GOJ sovereign credit risk, which has direct implications for foreign investors’ perception of counterparty risk inherent in Jamaica’s financial sector.¹

An Artificial Neural Network model is employed to simulate GOJ sovereign risk ratings for 2012 given their well-established proficiencies for pattern recognition and prediction especially in regard to complex unstructured relationships among economic relationships. The application of ANN to predict default probabilities was motivated by desire of researchers to simulate the learning processes that take place in the biological brain and nervous system when reacting to changes in the system’s internal and external environment. Specifically, an ANN is built up of a group of many artificial neurons (processing units or nodes) interacting in parallel with their individual memories (synapses), creating networks through weighted connections. The aim of this network is to transform the inputs into outputs through the recognition and comprehension of the behavioral patterns of the environmental changes, similar to their biological counterparts.

Section II: Numerical Assignment of Rating
In terms of defining the comprehensive credit rating (CCR) measure of GOJ sovereign credit rating in this exercise, numerical values were assigned to each alphanumeric foreign currency sovereign risk rating assigned by Standard and Poor’s. Similar to Gande and Parsley (2010), the numbers range from 0 (‘selected default’ rating) to 21 (‘AAA’ rating) to obtain an explicit credit rating (ECR) (see Table 1).² Then information on the credit outlook (COL), ranging from -0.2 to +0.2, is added to CCR to attain the CCR, that is, CCR = ECR + COL (see Table 2).

Table 1. Explicit Credit Rating

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Table 2. Credit Outlook

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</tbody>
</table>

¹ Consistent with the standards sets by the Basel Committee, Jamaican financial institutions completed a phased implementation of 100.0 per cent risk weighting on all Government of Jamaica (GOJ) foreign currency denominated instruments in 2012. This new regulation was introduced for institutions regulated by the Bank of Jamaica (BOJ) and Financial Services Commission (FSC) in June 2010, as part of the Standby Arrangement with the IMF, and reflected the very high debt burden of the Government of Jamaica (GOJ) of over 130.0 per cent of GDP.

Section III: Data

This study investigates the appropriate key macroeconomic variables affecting the Jamaica’s sovereign credit risk. The specific explanatory variables utilized include 3-month lagged values of the US-Jamaica currency exchange rate, the real Government of Jamaica (GOJ) 180-day Treasury bill rate (Tbill), external debt to exports, net international reserves to imports, real effective exchange rate, terms of trade index, current account of the BOP, real GDP growth and the unemployment rate (UR). As reflected in past country reports by external credit ratings agencies, these variables have historical bearing with regard to influencing GOJ credit risk.

The sovereign rating series were derived from S&P ratings of GOJ Global bonds. The data set spans 128 months from May 2001 to December 2012. Note that to avoid estimating a spurious relationship between the rating series and macroeconomic variables the actual S&P ratings between August 2009 and February 2010 were substituted with the rating for July 2009 of 6.8 (i.e., ‘B-’ with a negative outlook). That is, the anticipation of an impending domestic debt exchange by the GOJ, which was believed to constitute a coercive debt exchange resulted in a ratings downgrade ‘CCC’ and then ‘SD’ in January when the Jamaica Debt Exchange (JDX) was announced. However, GOJ rating was upgraded to ‘B-’ with a stable outlook following the success of the JDX, which achieved over 99.0 per cent participation rate, and the approval of US$1.27 billion Stand-By Arrangement with the IMF.

In terms of data preparation for ANN simulation, all independent variables are converted to 12-month moving averages and then normalized to avoid disproportional measurement of variable contributions to the predicted ratings due to diverse dimensions and units of input. The normalization process transforms all the converted independent variables in the training set, $X_i$, to have values between -1 and 1 as given by using the mean and standard deviation of $X_i$, denoted as $\mu_i$ and $\sigma_i$, respectively. The macroeconomic variables are transformed by applying the normalization process to avoid spurious contribution results (see Figure 1).

Figure 1. Transformed macroeconomic variables after normalization

Section IV: Methodology

The feedforward ANN typology (with no feedback information transfer) used in this paper consists of a Multi Layer Perceptron (MLP) with three basic layers: the input layer, a hidden layer and the output layer. Technically, the network output $y_{h,j}$ for at each node (neuron) $j$ in the hidden layer $h$ can be expressed:

$$y_{h,j} = f \left( w_{h,0} + \sum_{i=1}^{N_i} w_{h,j,i} x_i \right),$$

where $w_{h,j,i}$ is the weight which connects input node $i$ to node $j$ in the hidden layer weight matrix $W_{h} \ , w_{h,0}$ is the bias weight in the hidden layer associated with a vector of ones, $x_i$ is the $i^{th}$ element of the associated input vector $X=(x_1, x_2, \ldots, x_{N_i})^T$ and $N_i$ is the number of nodes in the input layer, which is found empirically. The hidden layer activation function $f$ is the nonlinear hyperbolic tangent function which is continuous and differentiable and produces an output value between -1 and 1 as defined by $f(u) = (1-e^{-bu})/(1+e^{-bu})$, where $b$ is the slope parameter and $u$ is the result of the weighted sum of the node inputs. All information in the input layer is fed-forward to the hidden layer with no feedback loop from output to input nodes.
Since the output of the hidden layer is an input in the output layer, the output of the network is computed as:

\[ y_{o,k} = g \left( w_{o,0} + \sum_{j=1}^{N} f \left( w_{h,0} + \sum_{i=1}^{N} w_{h,i} x_i \right) w_{o,k} \right) \]

The identity function \( g(u) = u \), for each \( u \) used in the output layer. In this case, the output of a neuron is simply the function of the linear combination of hidden unit’s activation.

The learning process determines adjustments to the set of weight values. Supervised learning for a training pattern \( p \) is assumed where each node \( k \) has a predefined threshold or target value \( (t_{p,k}) \) used to train the network. If the network output \( (y_{p,o,k}) \) does not exactly match the threshold, the error signal for the training process is given as

\[ \epsilon_{p,o,k} = t_{p,k} - y_{p,o,k} \]

The squared aggregate of these errors is minimized using the cost function \( J_p \) to determine the optimal solution where the computed outputs are within an acceptable tolerance of the target outputs with respect to the input units. The squared error for a training pattern \( p \) is given as

\[ J_p(w) = \frac{1}{2} \sum_{k=1}^{N} \epsilon_{p,o,k}^2 \]

In the case of the overall training set of \( p \) patterns, the squared error is

\[ J(w) = \sum_{p=1}^{P} J_p = (Y', w) \]

where \( Y' \) is the output vector and \( w \) is the weight vector. The optimal solution \( w^* \) must satisfy the condition \( J(w^*) \leq J(w) \) and the necessary condition for optimality is \( \Delta J(w) = = (\partial E/\partial w) = 0 \), where \( \Delta \) is the gradient operator.

The modification of synaptic weight vector \( \Delta w \) of the network is calculated after each presentation of a single pattern or at the end of an epoch. The weight update equation of the training algorithm is

\[ w(t+1) = w(t) + \Delta w(t) = w(t) - \eta(t)\nabla(t)J(t) \]

where \( \eta \) is called the learning rate which defines the proportion of error (step size) for updating the weights and \( \nabla \) is the gradient vector.

The most common gradient descent technique to optimize the mean square error is the delta rule or backpropagation algorithm. However, this type of training algorithm will typically find local minima of the error function that are far from the global minimum and often lead to slow training. A second order optimization method called Conjugate Gradient (CG) which uses a numerical approximation for the second derivatives (Hessian matrix) is more powerful than the backpropagation algorithm in terms of efficiency and ability to find the global optimum. The CG method is employed in this study. The CG method chooses a suitable direction vector \( \textbf{p} \) to update the weight vector as

\[ w(t+1) = w(t) + \eta(t)p(t) \]

where, at the initial weight vector \( w_0 \)

\[ p_0(t) = -\nabla_0(t) \]

At the minimum of the line search

\[ \frac{\partial}{\partial \eta} J[w(t+1) + \eta(t)p(t)] = 0 \]

yields

\[ \nabla(t+1)' \cdot P(t) = 0 \]

In order to reduce the likelihood of finding one of the multiple local minima rather than the global minimum, the CG algorithm is combined with a stochastic search method called simulated annealing (Kirkpatrick et al, 1983).\(^3\) This search technique introduces random noise \( T \) into weight update equation which is systematically decreased at a constant rate \( d \). This optimization method presents the weights with the training data and allows a random change of

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search location on the error surface with probability given by
the Boltzmann factor

\[ P = \exp \left( \frac{- (J_1 - J_2)}{dT} \right) \]

which permits a more comprehensive search process.

**Section IV: Network Results**

Before, the ANN model is estimated the data set is partitioned into two samples, a validation or forecasting sample and an estimation sample. The forecasting sample selected covered the last 12 monthly observations for the overall sample, which is approximately 10.0 per cent of the data set. The estimation sample was further randomly subdivided into the training set (60.0 per cent of estimation sample) and testing set (remaining 40.0 per cent).

Various one-hidden-layer MLPs were estimated with the number of hidden nodes ranging between one and six. The MLP with a typology with one hidden layer with three nodes achieved the largest decline of the training Root Mean Square Error (RMSE) to 0.01912, with a correct classification rate of 100.0%, as well as the lowest test RMSE of 0.1110, with a correct classification rate of 100.0%.

Finally, sensitivity analysis was conducted on the ANN training data to provide information about relative significance of each independent variable. The results indicate that the main contributions to GOJ sovereign risk were from External Debt/Exports, Fiscal Balance and NIR/Imports of 17.7%, 15.8% and 15.5%, respectively (see Table 3).

The predictive power of the ANN model is investigated by forecasting using the out-of-sample independent variables for the period January 2012 to December 2012 and then comparing with actual S&P ratings. Out-of-sample performance results show that the model was able to accurately predict the credit rating for the first half of 2012 (see Table 4). One of the primary drivers of the uptick in predicted rating for the second half of 2012 was the improvement in the fiscal balance. Notwithstanding this improvement, the uncertainty surrounding the signing of an arrangement with the IMF would have restricted a rating upgrade by S&P during 2012.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Debt/Exports</td>
<td>17.7041%</td>
</tr>
<tr>
<td>Fiscal Balance</td>
<td>15.7536%</td>
</tr>
<tr>
<td>NIR/Imports</td>
<td>15.4966%</td>
</tr>
<tr>
<td>Real GDP</td>
<td>14.4835%</td>
</tr>
<tr>
<td>Exchange Rate (US$/J$)</td>
<td>13.8485%</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td>10.9129%</td>
</tr>
<tr>
<td>Real GOJ Treasury Bill Rate</td>
<td>4.3884%</td>
</tr>
<tr>
<td>Current Account Balance</td>
<td>4.1188%</td>
</tr>
<tr>
<td>Terms of Trade</td>
<td>1.9182%</td>
</tr>
<tr>
<td>Real Effective Exchange Rate</td>
<td>1.3754%</td>
</tr>
</tbody>
</table>

Figure 2. Actual vs. Predicted Sovereign Credit Rating

\[ \text{Note that the actual ratings series does not reflect the S&P downgrades in August 2009, November 2009 and January 2010, as these were due to expectations of a GOJ involuntary debt exchange and not due to changes in fundamental variables. As such, the July 2009 rating is held constant to end-January 2010 for the simulation exercise.} \]
Table 4. Out-of-sample results

<table>
<thead>
<tr>
<th>Out-of-sample period</th>
<th>Actual rating</th>
<th>Predicted rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-12</td>
<td>5.8</td>
<td>5.8</td>
</tr>
<tr>
<td>Feb-12</td>
<td>5.8</td>
<td>5.8</td>
</tr>
<tr>
<td>Mar-12</td>
<td>5.8</td>
<td>5.8</td>
</tr>
<tr>
<td>Apr-12</td>
<td>5.8</td>
<td>5.8</td>
</tr>
<tr>
<td>May-12</td>
<td>5.8</td>
<td>5.8</td>
</tr>
<tr>
<td>Jun-12</td>
<td>5.8</td>
<td>6.0</td>
</tr>
<tr>
<td>Jul-12</td>
<td>5.8</td>
<td>5.9</td>
</tr>
<tr>
<td>Aug-12</td>
<td>5.8</td>
<td>5.9</td>
</tr>
<tr>
<td>Sep-12</td>
<td>5.8</td>
<td>6.0</td>
</tr>
<tr>
<td>Oct-12</td>
<td>5.8</td>
<td>6.0</td>
</tr>
<tr>
<td>Nov-12</td>
<td>5.8</td>
<td>6.0</td>
</tr>
<tr>
<td>Dec-12</td>
<td>5.8</td>
<td>6.6</td>
</tr>
</tbody>
</table>

Section V: Concluding Remarks

The aim of this paper is to formulate an ANN model to predict the sovereign risk of the Jamaican Government. Neural networks offer an important advantage over traditional models of classification because they are able to capture complex empirical relationships. The results reveal that the ratio of external debt to exports (12-month moving average) is the most significant leading variable on GOJ sovereign risk rating (17.7%). The other macroeconomic variables contributing over 10% to the probability of GOJ default are fiscal balance (15.8%) and NIR to imports (15.5%), real GDP (14.5%), US$/JS exchange rate (13.8%) and the unemployment rate (10.9%). Given the significant exposure of Jamaica’s financial sector to GOJ sovereign default risk these variables should be monitored closely in the assessment of financial stability.
**Development of a Loan Quality Forecast Model for the DTI Sector**

**Section I: Introduction**

Recent banking crises have highlighted that a rapid build-up of bad loans can substantially undermine financial sector stability. This can materialize where a prolonged and accelerated deterioration in credit quality can translate to a continuous negative effect on banks’ profitability and capital through loan losses. The global financial crisis which commenced in 2008 and the subsequent recession in many economies increased householders’ and firms’ defaults rates, causing significant losses for banks. In response to the recession, the Jamaican deposit taking institutions (DTIs) showed system wide deterioration in loan quality. The loan quality ratio for the DTI sector, as measured by the ratio of non-performing loans (NPLs) to total loans, increased sharply to 4.7 at end-2009 from 2.9 at end-2008 (see Figure 1). Against this background, the regular monitoring and assessment of loan quality, possibly with an early warning system which can alert regulators of potential vulnerabilities is therefore crucial to maintaining a stable financial system and prevent systemic crises. In this context, the objective of this article is to examine one such early warning tool, involving the development of a loan quality forecast model for the DTI sector. Section II of the article provides an outline of the methodology employed in forecasting loan quality while section III provides a three quarter ahead forecast of DTIs’ loan quality ratio to end-2013. In section IV there is a discussion of the forecast model diagnostics as well as an evaluation of the forecast result. Finally, Section V provides the conclusions from the analysis.

**Figure 1**

Evolution of DTIs’ Loan Quality Ratio: 2002 – 2012

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1 See Bofondi and Ropele (2011).
2 NPLs represents principal and interest payments outstanding 3 months and over.

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**Bank of Jamaica Financial Stability Report 2012**

**Section II: Framework for Forecasting Loan Quality**

A number of loan quality forecast models were examined, all of which incorporate the impact of the domestic macroeconomic environment on DTIs’ loan quality ratio. Ultimately, a VEC framework was utilized to generate loan quality forecasts, as it captures the dynamic relationships within the data as well as long and short run effects.

Macroeconomic variables examined included the real GDP growth rate, the unemployment rate, the overall average weighted loan rate (AWLR), the REER and the exchange rate. Different VEC models were estimated using DTI data for the period March 2000 to December 2012, while three-quarter-ahead loan quality forecasts were generated for the period June 2013 to December 2013. However, the VEC model which provided the best in-sample and out-sample forecasts includes a sub-set of the macroeconomic variables which were examined. The variables included in the final model are:

i. the real GDP growth (GDP);
ii. the loan quality ratio (measured as NPLs to total loans);
iii. the average weighted lending rate (awlr);
iv. the inflation rate (inf) and
v. a dummy variable (December 2008 to December 2011).

Equation (1) below outlines the general model used to estimate the relationship between the variables.

\[
\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + Bx_t + \varepsilon_t \quad (1)
\]

where:

is the vector of endogenous variables which have been outlined above and the parameter matrices and are contained in the matrix. In addition, and specify the long run component of the model with containing the

3 Studies examined include Bikker and Metzemakers (2002), Baboucek and Jancar (2005) and Foilosa (2007).
4 OLS and VAR models were estimated but provided weak in-sample and out-sample forecasts.
5 This variable captures the global crisis period and the JDX and initial post-JDX periods.
co-integrating relation while represents the speed of adjustment coefficients.

Preliminary checks were carried out to examine the stationarity of the variables and all variable were found to be I(1). VEC models can be utilized where non-stationary variables are of the same order since the variables may move together in the long run and are possibly driven by a common stochastic trend. The model was used to generate in-sample and out-sample forecasts of loan quality (see Figure 2).  

Section III – Loan Quality Forecasts
DTIs’ loan quality ratio is projected to decline gradually over the next three quarters. The ratio is forecasted to decline to respective values of 6.3 per cent, 6.1 per cent and 5.8 per cent at end-June 2013, end-September 2013 and end-December 2013, respectively. This performance is largely driven by the anticipated improvements in GDP growth and the AWLR.

Section IV – Forecast
Evaluation & Model Diagnostics
Several measures were used to examine the strength and fit of the generated forecast. The smaller the mean absolute error, mean squared error and Theil U values, the more accurate, on average, the forecast of a model. The accuracy of the forecast model is substantiated by the values of the evaluations statistics shown in Table 2.

<table>
<thead>
<tr>
<th>Table 2: Forecast Evaluation Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean error</td>
</tr>
<tr>
<td>Mean square error</td>
</tr>
<tr>
<td>Mean absolute error</td>
</tr>
<tr>
<td>Theil’s U</td>
</tr>
</tbody>
</table>

Model Diagnostics
The VEC model was subject to several post estimation diagnostic tests. The VEC model is stable and relevant tests show the absence of serial correlation and heteroskedasticity in the model.

Section IV: Conclusion
Credit risk is one of the main risks faced by banking institutions and the careful management of which is crucial for regulators in safeguarding stability. Furthermore, loan quality forecasts can be used as a possible earning warning tool by regulators in the measurement and management of credit risks in the financial system. Three quarter ahead forecast results for the DTI sector show continued improvement in loan quality to end-2013. Forecasts results are largely predicated on continued economic recovery and further declines in the overall average weighted loan rate. Loan forecasts are also useful for regulators in gauging the future pattern of loan loss provisioning by banking institutions and possible implications for profitability and capital adequacy in the sector.

Note: BOJ Forecasts of real GDP growth and inflation used in the estimation while forecasts of the AWLR were generated using the VEC model.
Figure 2
DTIs’ Loan Quality Ratio: March 2001 – December 2013
### Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asset Utilization</strong></td>
<td>This is a ratio which reflects the overall yield on earning assets.</td>
</tr>
<tr>
<td><strong>Automated Clearing House</strong></td>
<td>A facility that computes the payment obligations of participants, vis-à-vis each other based on payment messages transferred over an electronic system.</td>
</tr>
<tr>
<td><strong>Central Securities Depository</strong></td>
<td>An institution which provides the service of holding securities and facilitating the processing of securities transactions in a book entry (electronic) form.</td>
</tr>
<tr>
<td><strong>Certificate of Participation</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Concentration Risk</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Consumer Confidence Index</strong></td>
<td>An indicator of consumers’ sentiments regarding their current situation and expectations of the future.</td>
</tr>
<tr>
<td><strong>Credit Rating</strong></td>
<td>A rating assigned to a borrower, which may be alphabetic or numerical, which indicates the probability associated with the party paying back a loan.</td>
</tr>
<tr>
<td><strong>Credit Risk</strong></td>
<td>The risk that a counterparty will be unable to settle payment of all obligations when due or in the future.</td>
</tr>
<tr>
<td><strong>Deferred Net Settlement</strong></td>
<td>The settlement of transfer orders netted at designated times between or among counterparties in order to economize on the number and value of transactions.</td>
</tr>
<tr>
<td><strong>Delivery versus Payment</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Disposable Income</strong></td>
<td>The remaining income after taxes has been paid which is available for spending and saving.</td>
</tr>
<tr>
<td><strong>Financial Conglomerates</strong></td>
<td>Financial institutions under common ownership which undertake a wide range of activities such as banking, stock broking, insurance and fund management.</td>
</tr>
<tr>
<td><strong>Financial Intermediation</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Fiscal Deficit</strong></td>
<td>The excess of government expenditure over revenue for a given period of time.</td>
</tr>
<tr>
<td><strong>Foreign Exchange Risk</strong></td>
<td>The risk of potential losses which arise from adverse movements in the exchange rate incurred by an institution holding foreign currency-denominated instruments.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Funds Under Management/ Managed Funds</td>
<td>The management of various forms of client investments by a financial institution.</td>
</tr>
<tr>
<td>Gap Ratio</td>
<td>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.</td>
</tr>
<tr>
<td>Hedging</td>
<td>Strategy designed to reduce investment risk or financial risk. For example, taking positions that offset each other in case of market price movements.</td>
</tr>
<tr>
<td>Interest Margin</td>
<td>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.</td>
</tr>
<tr>
<td>Interest Rate Risk</td>
<td>The risk associated with potential losses incurred on various financial instruments due to interest rate movements.</td>
</tr>
<tr>
<td>Intraday Credit</td>
<td>Credit extended to a payment system participant that is to be repaid within the same day.</td>
</tr>
<tr>
<td>Large Value Transfer System</td>
<td>A payment system designated for the transfer of large value and time-critical funds.</td>
</tr>
<tr>
<td>Liquid Ratio</td>
<td>The ratio of average prescribed assets to average prescribed liabilities.</td>
</tr>
<tr>
<td>Liquidity Risk</td>
<td>The risk that a counterparty will be unable to settle payment of all obligations when due.</td>
</tr>
<tr>
<td>Net Open Position</td>
<td>The difference between long positions and short positions in various financial instruments.</td>
</tr>
<tr>
<td>Non-Performing Loans</td>
<td>Loans whose payments of interest and principal are past due by 90 days or more.</td>
</tr>
<tr>
<td>Off-Balance Sheet Items</td>
<td>Contingent assets and debts that are not recorded on the balance sheet of a company. They are usually noteworthy as these items could significantly affect profitability if realized.</td>
</tr>
</tbody>
</table>
**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 agrees 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.