AN ANALYSIS OF BANK LIQUIDITY IN THE BAHAMAS
(2001-June 2012)

by

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ABSTRACT

This paper provides an analysis of liquidity trends in The Bahamas over the 2001-June 2012 period. The study finds that the significant build-up in domestic liquidity observed over the last four years, also occurred in a number of countries, both developed and developing, and reflected several economic factors. Specific to The Bahamas, the accumulation in liquidity was driven by a slowdown in credit demand and the adoption of more cautious approaches to lending by the banks, due to heightened loan delinquencies. In addition, the contraction in output and the expansion in Government borrowing—particularly from external sources—have all played a major role in the significant augmentation in both excess reserves and excess liquid assets in the domestic banking system. The paper showed that the build-up in liquidity is likely to persist in the near-term and conditions should moderate gradually, as the economy recovers. Moreover, the Central Bank's use of securities such as Treasury Bills may be effective in producing changes in liquidity over the short-term.

SECTION 1: INTRODUCTION

In 2008, against the backdrop of mortgage market collapse, liquidity shortages and financial market upheaval, a global recession ensued and shifted the landscape of regulatory and monetary policy framework. World GDP growth decelerated from 5.4% (2007) to 2.8% (2008) and by end–2009 the world economy had contracted by 0.6%. In the United States, The Bahamas' largest trading partner, real GDP fell by 3.6% in 2009 and employment conditions deteriorated, as the country's jobless rate climbed from 4.6% in 2007 to 9.3% by the close of 2009.

Given the strong inter-linkages between the Bahamian and United States economies, particularly as it relates to tourism and foreign investment, the global recession also led to a downturn in domestic economic activity. Specifically, in 2008, real GDP contracted by 2.3%, and fell by a further 4.9% in the following year, as tourism output and private sector construction activity slowed substantially. In particular, air arrivals fell by 6.4% in 2008, and contracted further by 10.1% in 2009, before recovering to growth of 3.4% in 2010. Similarly, construction sector indicators also deteriorated over the period, as foreign investment activity stagnated and on the domestic side, the number of permits issued and the value of construction starts plunged by 24.1% and 9.7%, respectively in 2009. Given the downturn in these key industries, the unemployment rate rose from 8.7% in 2008 to 14.2% by the end of 2009 and remained elevated at 14.7% in May-2012. In this environment, Government introduced a series of measures aimed at providing support for the economy. However, with the negative effect of the recession on its revenue and the increase in expenditure to support a series of new programmes, the deficit widened considerably from approximately 1.8% of GDP in FY07/08 to 4.7% of GDP by FY10/11, while the corresponding debt to GDP ratio advanced to 55.9% at end-2011 from 36.9% at end-2007. The adverse effects of the recession on the business sector and the labour market resulted in a surge in banking sector arrears, which grew from 12.4% of total loans in 2008 to 19.3% in 2011, while growth in private sector credit slowed from 5.3% in 2008 to a marginal 0.9% in the following year, and averaged 0.4% between 2010 and 2011, due in large measure to banks' adoption of conservative lending policies and reduced consumer demand.

Benefitting from the slowdown in credit growth, heightened Government borrowing and several significant one-off foreign currency transactions, liquidity in the banking system rose substantially. As evidence, net free cash reserves more than doubled to $445.5 million at end-June 2012 when compared to $164.8 million at end-2008, and represented 7.2% of Bahamian dollar deposit liabilities, vis-à-vis 2.9% in 2008. Similarly, surplus liquid assets, a broader measure of liquidity, advanced to $982.3 million by the end

of the first half of 2012, almost four times higher than 2008's level of $258.1 million, exceeding the statutory minimum by 99.1% by end-June, 2012, compared to 28.3% in 2008.

The build-up in liquidity witnessed since 2008 also characterized several other economies, in response to a number of external and domestic factors. Typically, when the crisis began to intensify in 2009, central banks worldwide initiated a number of measures to support economic activity and boost credit growth. For instance, in the United States, the Federal Reserve implemented a series of "quantitative easing" measures to spur economic activity, which contributed to a surge in liquidity. Further, it is important to note that an augmentation in liquidity can be the result of market forces, as was the case in countries such as Japan, India and Turkey, which were forced to employ monetary policy tools to deal with excess liquidity. Additionally, in the Caribbean, countries such as: Trinidad & Tobago, Jamaica and Barbados reported robust liquidity expansion arising from the economic downturn

Although elevated liquidity is beneficial, as banks have sufficient funds on hand to meet customer demands when they arise, the build-up in liquidity could also pose potential risks and challenges in terms of the implications for the domestic economy and indeed the Central Bank's monetary policy, both in the short and long term. This paper therefore seeks to examine the factors which affect liquidity in the banking system and based on the results, prescribe potential monetary policy options which the Central Bank can pursue to address the issues raised. The remainder of this paper is structured as follows: section 2 examines pertinent literature relating to liquidity in the banking system, while section 3 highlights existing best regulatory practices in liquidity management and section 4 analyses trends in excess reserves and excess liquid assets in The Bahamas over the period 2001 to 2011. Section 5 presents the results of an empirical analysis of both excess reserves and excess liquid assets. The main findings and policy recommendations are summarized in section 6.

SECTION 2: LITERATURE REVIEW

A number of authors have explored the subject of excess liquidity in the banking system and its impact on Central Banks' ability to effectively influence monetary policy. In recent years, particularly since the onset of the global economic crisis, liquidity build-up has gained more prominence in economic literature.

In a study conducted by Caprio and Honohan (1991), the problems of excess banking system liquidity and the appropriateness of Governments' responses to situations of excess liquidity with respect to both industrialized countries and developing countries were examined. The authors identified excess liquidity as either the share of liquid assets in bank portfolios (due to a reduction in lending), or the holdings of money by the nonbank public. Further, the study recognized the causes of excess liquidity as either involuntary rationing or voluntary behaviour. With respect to industrialized economies, it was noted that excess liquidity—as evidenced by decreased treasury yields and increased spreads between low-risk and high-risk assets—was tantamount to contractionary monetary policy. Consequently, monetary expansion would facilitate aggregate demand for credit where excess liquidity exists. For developing countries, excess liquidity was attributed to administrative limits on expanding credit and constrictive monetary policy. In particular, cash balances at banks in centrally planned economies primarily represent household savings, due to a lack of alternative savings media. The researchers concluded that excess liquidity conditions do not call for a tightening of monetary policy, but an examination of the underlying causes and/or information deficiencies, and the adoption of more appropriate actions, including structural reforms.

Further, Khemraj (2010) hypothesized that before banks in less developed countries (LDCs) can make a loan, they must require a minimum rate of interest that compensates for risks, marginal transaction costs and the rate of return on "safe foreign" assets. He proposed that banks consequently accumulate excess liquidity in cases where the marginal borrower is unwilling to pay the minimum rate. In this study, excess liquidity was identified as the difference between banks' total liquidity and total required liquidity. For the study, nine developing countries, known for persistent excess liquidity conditions, including The Bahamas, were analyzed. Locally weighted polynomial regressions were conducted to extract liquidity preference curves for each country. The main finding was that the fitted liquidity curves tended to become flat and the flatness occurred at a very high rate of interest, thus indicating that banks viewed loans and excess liquidity as perfect substitutes at high interest rates, which implied that banks would not lend to the marginal borrower if they were unwilling to pay the rate of interest. From the findings, Khemraj also deduced that the banking sector in LDCs is oligopolistic and not competitive. Further, two of the key implications of the study are that comparatively high interest rates will occur if the loan market in LDCs is liberalized and high loan rates would be constrictive to economic development and employment creation in economies where banks provide most business financing.

Specific to the Caribbean, Maynard and Moore (2006) conducted an empirical assessment of excess reserve dynamics using an autoregressive distributed lag (ARDL) model. The authors found that liquidity growth is a function of shocks to the currency-to-deposit ratio—a measure of consumers' transactions—the business cycle, the interest rate on Treasury bills and the banking sector's financing to the Government, as proxied by the net domestic assets. The study noted a significant rise in banks' excess liquidity during the 2001 recessionary period, which Maynard and Moore attributed to monetary expansion, coupled with a moderation in credit. Further, the authors determined that for the period under review, the accumulation in reserves was largely occasioned by demand-side factors.

The research paper by Anderson-Reid (2011), using a cointegration-ARDL model, noted similar results for the determinants of excess liquidity in the commercial banking system of Jamaica in both the long and short-term. In addition to achieving significant results for the variation in the currency-to-deposit ratio, income deviation from trend, income volatility and the interest rate of the Bank of Jamaica's 180-day Treasury bill, the author also found strong results for the relationship between liquidity and the Central Government's deficit. Anderson-Reid further observed that despite an increase in the Central Bank's reserve requirement, in an effort to combat the effects of the global financial crisis, commercial banks averaged reserves of $57.9 million over a 12-year period ending December 2010, some $19.2 million above the requirement.

Aikaeli (2006) utilized an autoregressive distributed lag model of banks' demand for excess reserves to ascertain the factors that bring about excess liquidity in commercial banks in Tanzania. The author concluded that excess liquidity positively correlated to an elevation in the cost of funds, credit risks, the volatility of deposit holders' cash preference, the bank borrowing rate and variations in loan returns or credit risk in both the short-term and over the long-term. In addition, the author found that in the short-run, the possibility of banks incurring illiquidity costs had a positive influence on excess liquidity, prompting them to accumulate more reserves.

Given the importance of bank liquidity in providing a buffer during periods of economic crisis, Moore (2007) conducted an assessment of the performance of a number of forecasting models—behavioral, linear time series and non-linear time series—to determine how well they capture the dynamics of liquidity in times of crises for sixteen Latin American and Caribbean countries. The author concluded that the behavioral model was best at forecasting liquidity trends for several of the countries under review in

both the long and short-term. Further, Moore found that the non-liner model outperformed the others, on average, over very short time periods, thus concluding that a combination of models may be useful in predicting liquidity dynamics.

There were a number of studies pertaining to the implications of the persistent build-up in bank liquidity. In the research by Maynard and Moore (2006), it was noted that, in periods of high levels of liquidity the fiscal authorities were concerned that banks will utilize excess reserves to engage in 'growth-enhancing' opportunities. The authors determined that in Barbados, excess reserves generally have an inverse relationship to the business cycle, which led them to conclude that commercial banks have a propensity to hold more excess reserves during recessionary periods, which can have the adverse impact of extending a recession. Anderson-Reid (2011) in her analysis of the Jamaican banking system, suggested that excess liquidity poses challenges to the effective implementation of Central Bank policy, as it enables banks to offer additional credit to customers, despite a very tight monetary policy position by the Central Bank. Similar sentiments were expressed by Ganley (2004) in his study, which found that a significant build-up in liquidity could lead to an expansion in domestic consumption activity and consequently higher inflation. Finally, Agenor et.al (2004) indicated that liquidity build-up can possibly undermine monetary policy's ability to sway the rate of inflation, as well as economic output.

SECTION 3: LIQUIDITY MANAGEMENT: EXISTING BEST REGULATORY PRACTICES IN THE CARIBBEAN

In the Caribbean, foreign reserve management is a critical element of any strategy of economic development. According to Blackman (1981), the issue of reserve management for economic development hinges on the structural dependence of most developing countries on foreign trade, the wild fluctuations in the export earnings of these countries, along with the steady demand for imported necessities, the technological and financial dependence on the industrial economies and the need to allocate scarce foreign exchange resources from low priority uses to strategic development activities.

Moreover, a number of objectives have been cited for reserve management. One major objective encompasses the holding of liquid assets to cover both seasonal and cyclical variations in foreign exchange inflows. Central Banks must maintain considerable sums of foreign exchange in the form of liquid assets, owing to the seasonality and lumpiness of receipts from sale of primary commodities which

regional economies export. In so doing, the Central Bank ensures the reliable availability of foreign exchange to meet essential import needs.

In the region, liquidity management policies are similar, in that, Central Banks utilize both direct and indirect (market based) monetary policy instruments in an effort to effectively and efficiently manage liquidity levels (see Appendix Table 1). Specifically, in The Bahamas, a small open economy, with a fixed exchange rate regime, the Central Bank of the Bahamas uses five primary monetary policy instruments in order to sustain the fixed parity of the Bahamian dollar, as well as to maintain stable credit and economic conditions within the country. These instruments include the statutory reserve requirement ratio, the Bank discount rate, selective credit controls, open market operations and moral suasion. Similarly, for Barbados, which also has a fixed exchange rate regime, the management of the foreign reserves is concentrated on maintaining an adequate cushion of reserves in order to resist pressure to adjust the parity of the Barbados dollar. Therefore, in the effective management of liquidity, the Central Bank of Barbados has traditionally relied on statutory reserve requirements, the discount rate and moral suasion. For the Eastern Caribbean Central Bank (ECCB), the used of monetary policy instruments is limited, with its main objective being to safeguard the value of the fixed exchange rate against external shocks. Consequently, the ECCB manages liquidity chiefly through reserve requirements and to a lesser extent through standing facilities.

For Jamaica, the management of liquidity is through two main operational tools, that of open market operations and the required reserves. However, given that Jamaica has a flexible exchange rate regime, another instrument used by Bank of Jamaica to manage liquidity is intervention in the foreign exchange market, that is, the direct purchases and sales of foreign currency. Like its Jamaican counterpart, the Central Bank of Trinidad & Tobago, which manages a floating exchange rate system, utilizes statutory reserve requirements, open market operations and policy interest rates, namely the repurchase rate, in its management of liquidity. In mid-2002 the Central Bank of Trinidad & Tobago introduced the use of the Repurchase (Repo) rate, which refers to the rate that the Central Bank charges commercial banks for collateralized overnight financing and is the Central Bank's chief policy interest rate used to influence commercial banks' interest rates. Another instrument used by the Central Bank in liquidity management is the Special Liquidity Facility. With regard to this facility, the Central Bank may request from time to time, that commercial banks deposit some proportion of their prescribed liabilities in an interest-bearing facility at the Central Bank for an agreed time-frame, in addition to maintaining the primary and secondary reserves requirement.

Important to note is that, countries in the Caribbean have a long history of using the statutory reserve requirement ratio as a liquidity management tool. The required ratios are stipulated in all of the Central Bank Acts, along with the respective fines that are imposed on commercial banks if they fail to meet the outlined requirement (see Appendix Table 2 & Figure 1). For instance, the Central Bank of the Bahamas Act mandates that the statutory reserve level be stationed at 5.0%. The statutory reserve requirements of The Bahamas have remained unchanged since its implementation in 1974, despite the fact that the Bank does have the ability to raise the ratio to a high of 20.0%. In relation to liquidity requirements, the following measures are in place: "the minimum required liquid assets represent 20% of bank demand deposits, 15% of savings and fixed deposits, and 15% of borrowings due to/from the Central Bank" (CBOB, 2012). According to the Central Bank Act, the penalty for not meeting the specified reserve and liquidity requirements include the application of a fine that does not exceed twice the annual discount rate for everyday that a deficit occurs.

In Jamaica, the Bank Act stipulates that banks must maintain a cash reserve of no less than 5.0% of their total liabilities. In addition to this, banks in Jamaica must ensure that their liquid assets on hand are no less than 15% of their prescribed liabilities. The penalty for non-compliance is a fine of one hundred-and-fifty thousand dollars ($150,000) initially, and five thousand dollars ($5,000) for each additional day that the offence continues (Bank of Jamaica, 2010).

For the ECCB, the Bank Agreement Act states that, "with approval of the Council the Bank may, from time to time prescribe the maintenance of required reserves, including marginal required reserves, against deposits and other similar liabilities specified for this purpose. Such reserves shall be maintained either by way of cash holdings with each financial institution or by way of deposits with the Bank." Since 1994, all commercial banks were required to maintain reserves of 6% on average weekly deposits. This does not mean that the reserve amount will be the same for all banks. However, it does indicate that because the requirement is based on all deposits at a given time, the amount held from bank to bank will differ. Any financial institution that fails to maintain the required reserves which will be charged at an annual rate not exceeding five percentage points above the highest rate fixed by the Bank for any operations on the amount of the deficiency for so long as the deficiency persist.

Trinidad & Tobago also manipulates the reserve requirement ratio. This reserve requirement ratio is currently set at 17.0% of total prescribed liabilities, an increased from 2007's ratio of 11.0%. In addition,

the bank also chooses from time to time to employ the use of secondary reserves, which currently stand at 2.0% of total liabilities. In the event that an institution fails to comply with the above specified rules, "the Central Bank shall notify such licensed domestic institution of the deficiency, and the institution shall pay to the Central Bank interest on the amount of the deficiency at such rate, not in excess of one-tenth of one per cent per day, as the Central Bank may set by notice published in the Gazette and in at least two daily newspapers published and circulated in Trinidad and Tobago". Note that, with the current penalty measures, Trinidad & Tobago currently has the most lenient penalty structure in place when compared to that of their regional counterparts.

With reserve requirements of 25.0%, Barbados has the highest ratio in the region (see Appendix Figure 1). The reserve fund is calculated from net profits obtained each year by each banking institution and represents no less than 25.0% of total profits per annum. This rate has remained constant since the mid-1990s. Based on Section 33 of the Central Bank Act, the penalty for not meeting the outlined requirements entails: "an annual rate charge that does not exceed twice the rate fixed at the time of such failure" to meet the requirements outlined in Section 33 of their Bank Act (Central Bank of Barbados, 2011).

SECTION 4: ANALYSIS OF BANK LIQUIDITY IN THE BAHAMAS OVER THE PERIOD 2001-2011

Liquidity in The Bahamas is defined as a bank's ability to fund increases in assets or meet collateral obligations at a reasonable cost as they fall due without incurring unacceptable losses[2]. For banks in the domestic banking system, the narrowest measure of liquidity is net free cash reserves which are primarily the cash holdings of banks, either held in till cash or at the Central Bank. From these cash holdings, banks are legally required to maintain a portion called "statutory reserves" against their Bahamian dollar deposit liabilities. The broader measure of liquidity is liquid assets, which includes notes and coins held in till cash or at the Central Bank, Government securities, net interbank demand/call deposits and other specified assets, such as public financial institutions bonds[3]. All banks are required to maintain an average ratio of liquid assets called "minimum required liquid assets" in relation to their Bahamian dollar deposit liabilities.

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[2] See Banks and Trust Companies (Liquidity Risk Management) Regulations, 2012, section 2(1).
[3] See Central Bank's Operating Circular LR 8/796 July, 16th 1996.

Figure 2 provides a breakdown of the three distinct periods, where liquidity was affected by several key factors. Over the years of 2001-2004[4], economic activity in The Bahamas slowed and the Central Bank implemented a credit ceiling to provide support for the country's external reserves. With a restrictive credit policy in place, lending growth moderated from 9.2% in 2001 to 2.1% in 2003[5]. In addition, Government issued a combined $492.3 million in internal debt between 2002 and 2003. As a consequence of these measures, bank liquidity expanded, as net free cash reserves advanced from $56.5 million at end-2001, representing 1.6% of deposit liabilities, to $271.6 million or 6.5% of deposit liabilities at the close of 2004. Further, with the capital account restrictions in place regarding their overseas investments, banks increased their holdings of Government securities, including Registered Stock. Resultantly, the surplus liquid assets, increased from $67.4 million at end-2001 to $232.5 million at end-2004, to account for 34.3% of the statutory minimum, versus 11.8% in the prior period.

Following the removal of the credit freeze in August 2004, there was a rapid drawdown in liquidity, in the subsequent years, as banks attempted to meet the pent-up demand for credit. Credit growth surged to 12.7% in 2005, and advanced by an additional 14.4% and 9.5% in 2006 and 2007, respectively, as the economy grew by an average of 2.5% over the three year period, buoyed by a combined $1,270.0 million in foreign tourism-related investments and average growth of 4.8% per year in tourist expenditure. Consequently, net free cash reserves fell by over half, from $271.6 million at end-2004 to $190.1 million at end-2007, to represent 3.6% of deposit liabilities. Similarly, banks' surplus liquid assets plunged from $232.5 million at end-2004 to a mere $151.9 million at end-2007, which was 17.7% above the statutory minimum.

The onset of the global economic and financial crisis, which directly affected the domestic economy in 2008, led to a broad-based, robust build-up in liquidity, reflecting increased Government borrowing to fund its deteriorating deficit, as well as one-off foreign currency inflows, the largest of which related to the Government's $300 million external bond issue and the receipt of approximately $210.0 million in foreign currency proceeds from the sale of its 51% interest in the Bahamas Telecommunications Company (BTC) in April 2011, the majority of which were utilized to reduce local debt obligations. This four year period (2008-2011) was also characterized by anemic credit growth, which averaged 1.7% and the adoption of conservative lending practices by the banking system, due to the surge in arrears and non-performing loans as a percentage of total loans, from 9.7% and 4.5% at end-2007, to 19.3% and 13.0% at end-2011,

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[4]The Bank's credit freeze was in place from September 2001 to August 2004
[5] Credit growth increased to 7.4% in 2004, due to the lifting of the credit freeze in August of that year.

respectively. Hence, banks' excess reserves more than doubled over the four year period and stood at $370.6 million or 6.2% of deposit liabilities at end-2011, while surplus liquid assets ballooned by almost six-fold to $896.4 million, which was 92.5% in excess of the statutory minimum.

SECTION 5: EMPIRICAL ANALYSIS OF LIQUIDITY IN THE BAHAMAS

In order to investigate the determinants of excess reserves (ER_RES) and excess liquid assets (ELA) in the banking system, an analysis was conducted of several models proposed by studies conducted for the Caribbean. This review included the paper produced by Maynard and Moore, which posited that excess reserves in Barbados—a country similar to The Bahamas due to its fixed exchange rate regime and capital controls—were affected by customer characteristics, the macroeconomic environment and the Government's fiscal strategies. The authors utilized an ARDL model and noted that excess reserves were positively affected by the level of excess reserves in the prior period, and negatively impacted by the level of required reserves (as a ratio to domestic assets), the ratio of income to trend income, the coefficient of variation of the income to trend income, the Treasury bill rate and the level of net domestic assets in the banking system, which they utilized as a proxy for Government financing. Similarly, Anderson-Reid employed a cointegrating ARDL model to explore determinants of excess reserves in Jamaica, and noted that there was a long-run positive relationship between excess reserves, the output gap[6], Government's fiscal deficit and the level of required reserves, while the coefficients on the cash to deposit ratio and the volatility of income ratio were negative.

Based on the findings of the previous authors, two models of excess liquidity in the Bahamian banking system were investigated using the Vector Autoregressive (VAR) methodology over the period 2001 Q1 to 2011 Q4. Although this technique differed from the two previous studies, it is similar to the ARDL model because the VAR methodology utilises lags of both the dependent and explanatory variables in the short-run models and allows for the investigation of short-run dynamics such as impulse response functions. The variables chosen, including several utilized in the two aforementioned Caribbean studies, sought to capture the impact of the macroeconomic environment, Government's financing decisions and the commercial banks' preferences on liquidity in the banking system. The quarterly real GDP series used in both models was obtained from the study by Jordan and Tucker (2012), which employed the Chow-Lin procedure to disaggregate the annual series into quarterly values. In addition, external reserves were

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[6] i.e. the ratio of income to trend income

included in both initial models, to capture the potential impact of significant one-time transactions on liquidity in the banking system, while a Dummy variable was added to assess the effect of the imposition of a credit ceiling between September 2001 and August 2004 on liquidity. Table 3 (Appendix) shows all of the variables included in the model, along with their expected signs. Logs of all of the variables with the exception of the Treasury bill rate and the credit ceiling were utilized in the model.

Given the potential problem of estimating a large number of regressors within the VAR framework, which would significantly limit the number of lags in the model given the short data series, it was first necessary to eliminate insignificant regressors in both the ER_RES and ELA models. This was conducted using an Ordinary Least Squares (OLS) framework, whereby explanatory variables which were insignificant based on their associated p-values, were deleted from the model and the equation re-estimated until only significant variables remained. Table 4 shows the significant regressors for the two models along with their respective p-values.

The results indicate that excess reserves (Model 1) are positively affected by the net domestic assets (NDA) of the banking system which implies that, *ceteris paribus*, as the Government's deficits are financed by money creation or overseas borrowing, this raises the level of banks' excess reserves. In addition, the negative coefficient for private sector credit (PCREDIT) indicates that as banks utilize their resources to support lending to their clients, it drains liquidity from the banking system. Meanwhile, the negative relationship with the Treasury bill rate (T_BILL) shows the potential trade-off between banks decisions to hold either unremunerated reserves at the Central Bank, or short-term securities. Given that the variables are estimated in log form, increases in NDA appear to have the most significant effect on excess reserves, as a 1.0% increase in this variable tends to raise the level of excess reserves by 7.9%, *ceteris paribus,* while a 1.0% advance in private sector credit leads to a 4.7% contraction in excess reserves. Changes in T_BILL had the smallest impact of less than 0.5%. In addition, as expected, the period when the Central Bank imposed a CEILING which restricted banks "*to provide new credit only to the extent of resources provided from ongoing repayments"* was associated with a build-up in excess reserves in the banking system.

With regards to the excess liquid assets regression (Model 2), the NDA and T_BILL and CEILING variables were also significant; as well as RGDP; however PCREDIT was not significant in the model. All of

the explanatory variables have the expected signs and both models appear to be very good fits for the data, as indicated by the R-squared values of 0.83 for excess reserves and 0.79 for excess liquid assts.

The models were then tested for the presence of a long-run cointegrating relationship using the Johansen and Julius technique[7]. Both models were cointegrated as given by the Akaike Information Criterion or AIC statistic and had valid error correction models, which showed that a long-run relationship existed among the variables in the system[8].

The short run dynamics of both models were then investigated using Generalized Impulse Response functions. As postulated by Pesaran and Shin (1998), the advantage of Generalized Impulse Response functions lays in the fact that they are insensitive to the ordering of the variables in the models and hence the time profile of the responses remains unchanged regardless of the ordering of the variables[9]. Figure 3 (Appendix), shows that a one standard deviation positive shock to LNDA results in a positive responses for ER_RES, which builds-up over the first year and reaches a maximum 0.23% by the end of the seventh quarter. Thereafter the aggregate effect diminishes but still remains positive over the three year (12 quarter) period. A one standard deviation shock to PCREDIT produces a weaker positive response to ER_RES, which reaches a peak of 0.21% by the end of the fifth quarter; however, the accumulated responses diminish over the remaining periods and turn negative by the end of the of the twelfth quarter—the inverse occurs for the T_BILL variable, although this represents the strongest absolute response of the three shocks.

In contrast to LER_RES model, a one standard deviation shock to LNDA (Figure 4) produces a negative response to ELA which reaches its lowest level of -0.4% by the end of the eighth quarter, and then tapers to under -0.1% by the end of the twelfth quarter. A shock to T_BILL produces a negative response profile for LELA similar to model 1, which reached an aggregate low of 0.43% by the sixth quarter and then rapidly diminishes until it turns slightly positive by the end of the review period. A one standard deviation innovation to LRGDP causes a positive response to LELA, with the accumulated responses reaching a

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[7] For the purpose of the VAR model, which required that all of the explanatory variables be integrated of the same order, the dummy variable CEILING was excluded from the two models. All of the other variables were integrated of order I(1).
[8] The results for both models, which are available from the authors, showed that there were three co-integrating equations. The ER_RES error correction term was valid in model 1; however, in model 2 only the error correction term for the T_BILL variable was significant at the 5% level.
[9] This is in contrast to the orthogonalised impulse response functions, which are sensitive to the ordering of the variables in the model.

maximum of 0.46% by the end of the sixth quarter, but then rapidly declines until it turns marginally negative by the end of the time horizon.

Overall, the results for models 1 & 2 show that the explanatory variables have significant effects on both LER_RES and LELA; however, the aggregate effects are relatively short-lived and reduce in their intensity over time. In addition, although the coefficient of the T_BILL variable is relatively small in the long-run, its effects on liquidity in the short-run are significant, implying that the use of Treasury Bills may be effective in increasing and reducing liquidity in the banking system over a short time period.

SECTION 6: CONCLUSION AND POLICY IMPLICATIONS

This study has sought to analyse trends in liquidity over the period 2001 to 2012, with emphasis on the last four years, when liquidity has surged to record levels. The analysis showed that the patterns witnessed in The Bahamas are similar to those experienced in other Caribbean countries and in the context of the local economy, the increase in liquidity is due to a number of economic factor including the slowdown in private sector credit growth, given the high level of delinquencies in the banking system and the adoption of more cautious approaches by banks. In addition, the decline and subsequent slow growth in economic output and rise in Government borrowings have all played a role in leading to the rapid accumulation of excess reserves and excess liquid assets in the banking system.

From a monetary policy perspective, this situation is unlikely to reverse in the near-term, given the challenges faced by customers in servicing existing loans and the weak level of consumer demand. Further, potential foreign currency inflows from a few large-scale foreign investment projects and tourism earnings, should provide additional support for bank liquidity. In addition, there are limited avenues for banks to invest in foreign assets, given the Exchange Control restrictions[10], which should also result in these institutions continuing to hold significant levels of liquidity.

The study also showed that the over the medium to long-term, as economic growth accelerates and employment conditions improve, there may be opportunities for the Central Bank to utilize indirect instruments of monetary policy to impact banking sector liquidity.

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[10] Commercial banks in The Bahamas are required to maintain an open B$ position of no more than $5.0 million, in accordance with Exchange Control Restrictions.

APPENDIX

Table 1: MONETARY POLICY INSTRUMENTS

Bank Name	Statutory Reserve Requirements	Interest Rate Controls	Credit Controls	Moral Suasion	Open Market Operations	Repurchase Rate	Intervention in Foreign Exchange Market	Standing Liquidity Facility
Central Bank of the Bahamas	√	√	√	√	√			
Central Bank of Barbados	√	√		√				
Eastern Caribbean Central Bank	√							√
Bank of Jamaica	√				√		√	
Central Bank of Trinidad & Tobago	√				√	√		√

Source: Central Banks websites

Table 2: Reserve Requirements and Penalties		
Country	Reserve Requirement	Penalty
Central Bank of Jamaica	**Minimum Reserve Requirement: 5.0% or more** **Liquid assets on Hand: 15% or more**	**Fine of 150,000 and $5,000 for each additional day in breach.**
Central Bank of The Bahamas	**Minimum Reserve Requirement: 5.0%** **Minimum required liquid assets:** **20% of bank demand deposits** **15% of savings and fixed deposits** **15% of borrowings due to/from**	**Fine a maximum of twice the annual discount rate for everyday that a deficit occurs.**
Bank of Barbados	**Minimum Reserve: 25% of total profits per annum.**	**Fine an annual rate charge, not exceeding twice the rate fixed at the time of such failure.**
Central Bank of Trinidad and Tobago`	**•Minimum Reserve 17.0% of total prescribed liabilities** **•Secondary Reserves:2.0% of total liabilities**	**Fine: interest on the deficiency 1/10% per day.**
Eastern Caribbean Central Bank	**Minimum Reserve Requirement: 6.0%**	**Fine an annual rate not exceeding five percentage points above the highest discount/rediscount rate fixed by the Bank for as long as the deficiency continues.**

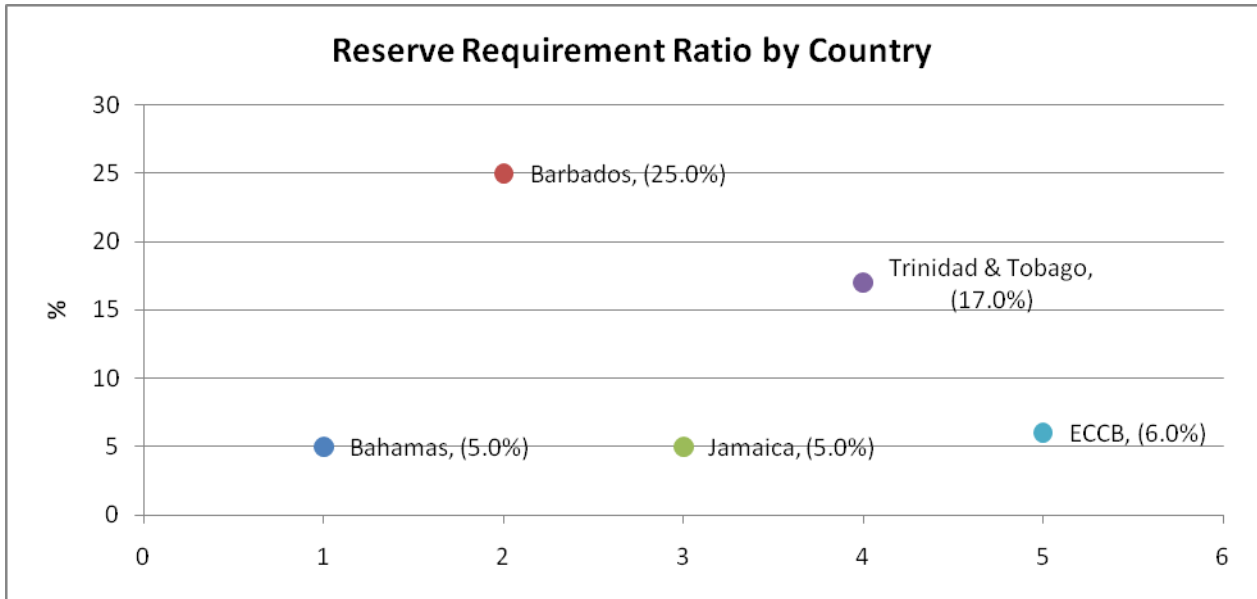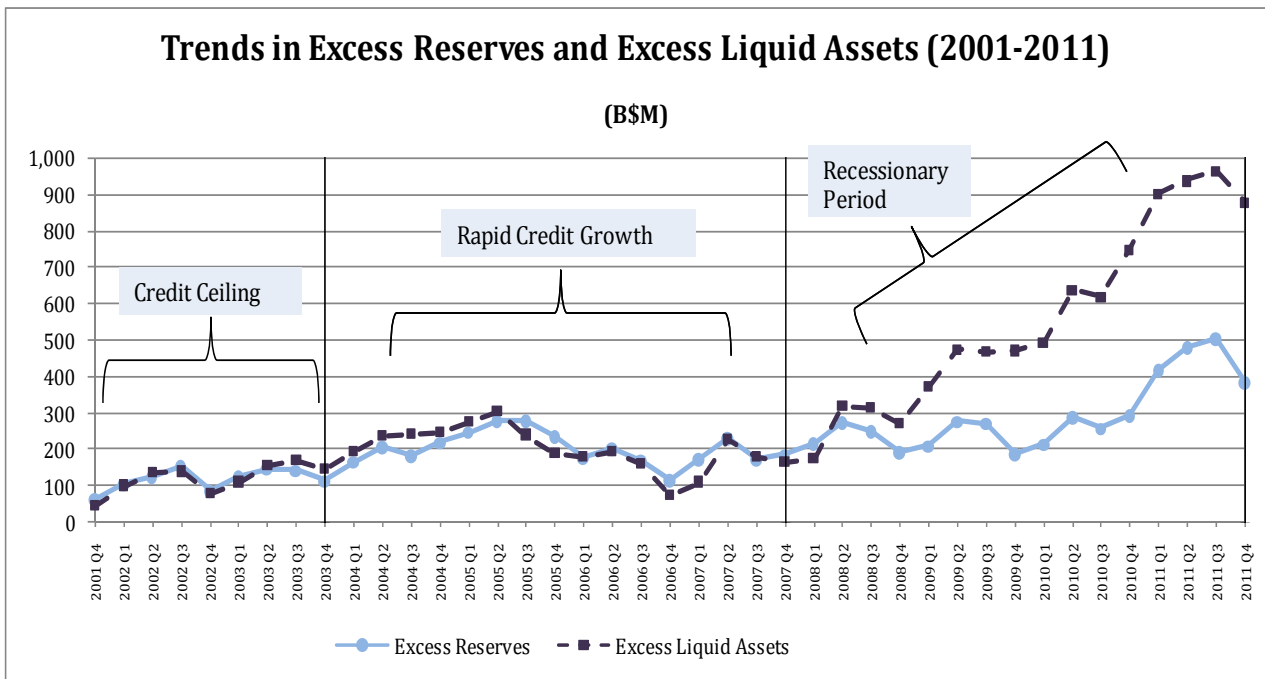*Source: The Individual Central Banks Acts*

Figure 1

Reserve Requirement Ratio by Country

Figure 2

Trends in Excess Reserves and Excess Liquid Assets (2001-2011)

(B$M)

TABLE 3: VARIABLES USED IN REGRESSIONS AND EXPECTED SIGNS

Variable		LER_RES	LELA
Net Domestic Assets	**LNDA**	+	+
Real GDP	**LRGDP**	-	-
Real GDP/Trend GDP[1]	**LRGDPH**	-	-
Private Sector Credit	**LPCREDIT**	-	-
External Reserves	**LRES**	+	+
Treasury Bill Rate	**T_BILL**	-	-
Credit Ceiling	**CEILING**	+	+
Source: The Central Bank of the Bahamas and the Department of Statistics. [1]Trend real GDP obtained using the *Hodrick-Prescott Filter*			

TABLE 4: *DETERMINANTS OF EXCESS RESERVES AND EXCESS LIQUID ASSETS*

	LER_RES	*LELA*
LNDA	7.919403 (0.0004)*	5.011077 (0.0000)*
LRGDP	—	-3.871010 (0.0468)*
LPCREDIT	-4.675056 (0.0232)*	—
T_BILL	-0.223796 (0.0000)*	-0.359196 (0.0000)*
CEILING	0.354178 (0.0051) *	0.727321 (0.0006) *
C	-21.99819 (0.0000) *	-7.620736 (0.5934)
R-squared *Adjusted R-squared* *F-Statistic* *Durbin-Watson stat*	0.834966 0.818040 49.32888 1.300556	0.793366 0.772173 37.43488 1.155644
* indicates significance at the 5% level		

Figure 3

Accumulated Response of LER_RES to Generalized One S.D. Innovations

Figure 4

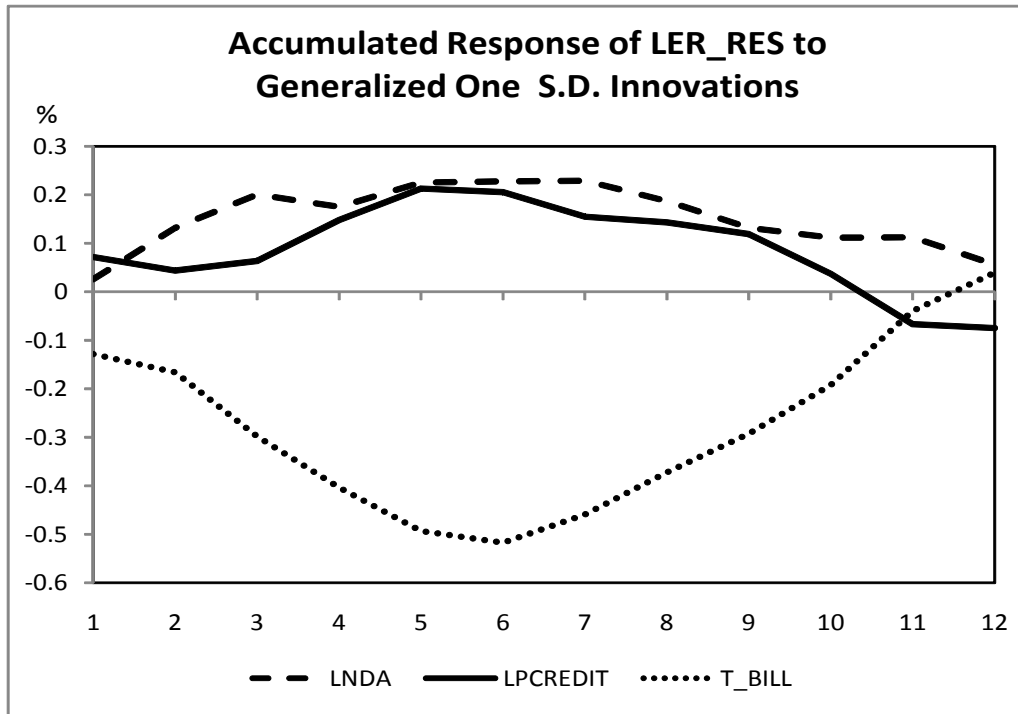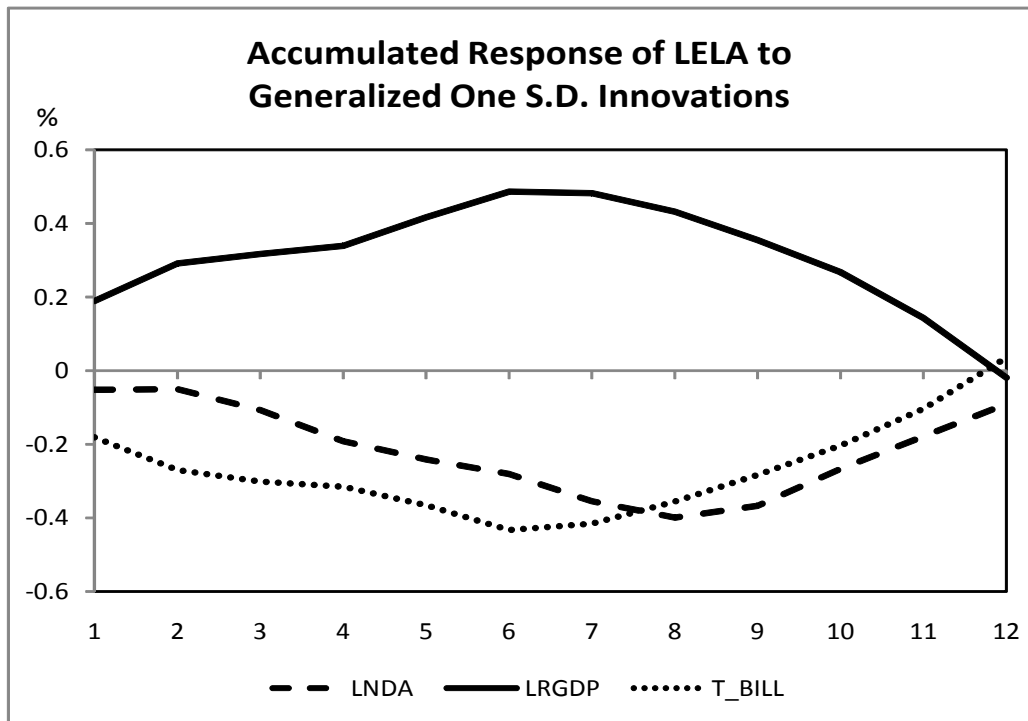**Accumulated Response of LELA to Generalized One S.D. Innovations**

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