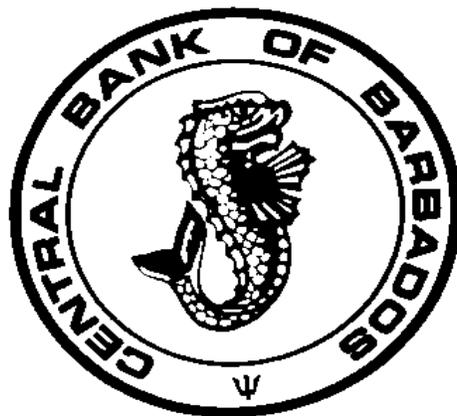


**A FRAMEWORK FOR INTEREST RATE POLICY IN BARBADOS**

BY

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**CENTRAL BANK OF BARBADOS**

## 1. Introduction

This paper explains the rationale behind taking an alternative approach to interest rate policy, which fits the Barbadian reality. It is an approach that better suits the circumstances of small open economies like Barbados, and is a practical alternative to conventional policy frameworks, which have been ineffective in producing the desired outcomes.

Conventional wisdom is that interest rates are a tool of monetary policy to be used principally in the control of domestic inflation. However, the scope of monetary policy to control inflation is limited in countries like Barbados, where perhaps 80 percent of inflation is imported (see Worrell, 1997a). It has been the experience in Barbados that monetary policy cannot relieve any pressure that might aggravate imported inflation; for instance, it will not achieve low domestic inflation rates in an environment where international oil and commodity inflation is high.

Moreover, both theory and practical experience indicate that whatever impact interest rates may have on the availability of domestic credit and spending, is attenuated if local banks, firms and households have recourse to funds from abroad. In this event, it is possible to avoid an interest squeeze at home by borrowing abroad more cheaply. Trading firms and conglomerates will have direct access to sources of foreign funds, and it will profit banks to bring funds in from abroad to satisfy the credit needs of households.

In these circumstances, interest rate policy cannot fulfill its conventional role. Interest rate changes by themselves have little or no effect on inflation, and domestic rates have to be kept in line with comparable international rates, in order to avoid incentives for destabilising inflows and outflows of capital. Apart from the conventional view, there is a longstanding unconventional view of interest rate policy; that rates should be kept low in order to maximise the demand for finance for investment. However, this objective cannot be achieved if foreign interest rates are higher, because there will be an incentive for an outflow of funds, thereby starving the domestic system of investible liquidity.

A key element in the Central Bank's policy objectives is to preserve stability in the local economy by ensuring the adequacy of international reserves. Therefore, this interest rate policy framework provides a mechanism to better manage the spread between domestic and international interest rates, to avoid undue pressure on the international reserves.

In view of these limitations, the role of interest rate policy in open economies like Barbados is best seen as lending confidence to the overall policy stance of the authorities by offering market guidance on the interest rate structure that best suits existing circumstances.

Using this approach, there are two factors that would inform the interest rate policy: (a) the trend in international interest rates and; (b) whether there is a perceived need for a temporary inflow of finance to supplement domestic liquidity. These two factors would guide the Central Bank of

Barbados (Central Bank) in determining its (internal) notional policy rate, with an allowance for the appropriate spread.

It is proposed that the three-month Treasury bill (T-bill) rate be used as the market-determined benchmark rate. This is because the T-bill auction process provides an institutional mechanism for an ongoing market interaction between the financial institutions and the Treasury. Other Government securities coupons would be based on this T-bill rate, to ensure a relatively smooth yield curve for longer maturities. Where warranted, the Central Bank's intervention in the T-bill market would signal to the market the need for interest rate adjustments, if there is a sustained change in the U.S. and domestic interest rate spread or if there is a continuous shortfall in T-bill auctions.

The Central Bank's discount rate (which is a formality, because banks seldom borrow from the Bank) will be linked to the T-bill rate. Financial institutions will be free to set loan and deposit rates, except that there will be a floor on the rate on savings deposits only.<sup>1</sup> This floor is not a policy rate; it is intended to protect the savings of households of modest means. This rate may change less frequently, and will not be related to the policy rate.

This policy paper explains the rationale for the new framework, and offers some insight into its intended operation. Section 2 discusses interest rate trends in Barbados, focusing on those rates and related variables that inform the framework. Section 3 provides the formal justification that underpins the proposed interest rate policy framework. Section 4 describes the framework for Central Bank intervention in the T-bill market and the forecasting structure to support the interest rate policy. Section 5 concludes.

## **2. Interest Rate Trends in Barbados**

Since the early 1970s, domestic interest rates have generally mirrored the trends in U.S. interest rates, a reflection of Central Bank's policy of ensuring an appropriate spread, where necessary, between domestic and foreign rates. As illustrated in Figure 1, which plots the Barbados and U.S. three-month Treasury bill rates over the past four decades, the domestic rate has followed generally the movements in the U.S. rate. There were, however, episodes when the movements in the rates were not in line. The most noticeable periods of divergences were: (1) the late 1970s into the early 1980s and from 1984 to 1990 when the U.S. treasury bill rate was consistently above the domestic rate; (2) the period 1991 to 1996 in which the domestic rate on treasury bills was higher; and (3) from 2003 onwards, characterised by a significantly higher domestic rate compared to a U.S. rate which fell to near zero. In general, the spread between the rates has

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<sup>1</sup> This represents a change in policy. On March 15, 1994 the Bank's policy rate was changed from the minimum savings deposit rate to the minimum rate of interest payable on all interest bearing deposits, which is commonly referred to as the minimum deposit rate.

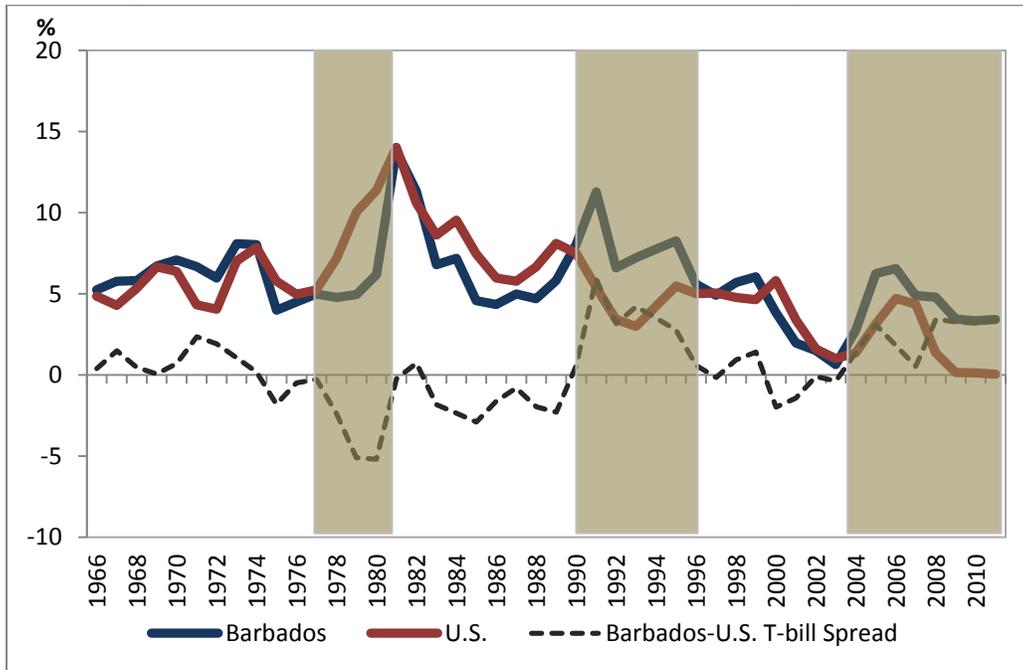
exhibited an overall upward trend, reaching a peak of slightly above five percentage points in 1991.

During the late 1970s, the U.S. Treasury bill rate rose sharply in response to the Federal Reserve's interest rates increases to combat inflation. The upward trend in U.S. interest rates continued into the early 1980s and the U.S. Treasury bill rate reached a peak of around 14 percent in 1981. Ever mindful of the widening spread between domestic and U.S. rates, the Central Bank took remedial action, bringing rates back in line to narrow the spread. As a result, the domestic treasury bill rate jumped by 700 basis points to 13.8 percent. However, this strategy switched to one of interest rate reductions, in view of the existing recessionary conditions and the need to lower the borrowing costs of firms. When the downward trend in U.S. rates emerged in 1982, domestic interest rates were lowered accordingly and the domestic Treasury bill rate fell faster than its U.S. counterpart.

At the end of 1984, the yield on local treasuries averaged 6.9 percent, which was slightly lower than the previous year. In the ensuing two years, U.S. interest rates were still high (averaging 9.5 %), as the demand for funds to finance the fiscal deficit attracted inflows. From 1987, U.S. rates began to rise again and remained above the domestic rate until 1990. In 1991, the existing balance of payments crisis conditions were accompanied by a tightening of liquidity in the banking system. The Central Bank raised the discount rate and the requirement by banks to hold a higher proportion of government securities. As a result, the domestic T-Bill rate rose to almost 10 percent relative to the U.S. rate, which was already on a downward trend. Throughout the 1990s and into the early part of the 2000s decade, both rates fell, with the domestic rate again declining faster than the U.S. rate. From 2004 onwards, the domestic rate picked up, reached a high of 6.6 percent and remained above the U.S. rate. Indeed, the U.S. rate fell sharply in 2007 with the onset of the financial crisis, and the Federal Reserve implemented a series of quantitative easing, which pushed the average yield on U.S. 3-month Treasuries to zero.

Similarly, the three-month LIBOR, which is an international benchmark for short-term interest rates, has remained near zero since 2008 (see Figure 1A in appendix).

**Figure 1: Three-month Barbados and U.S. Treasury Bill rates**



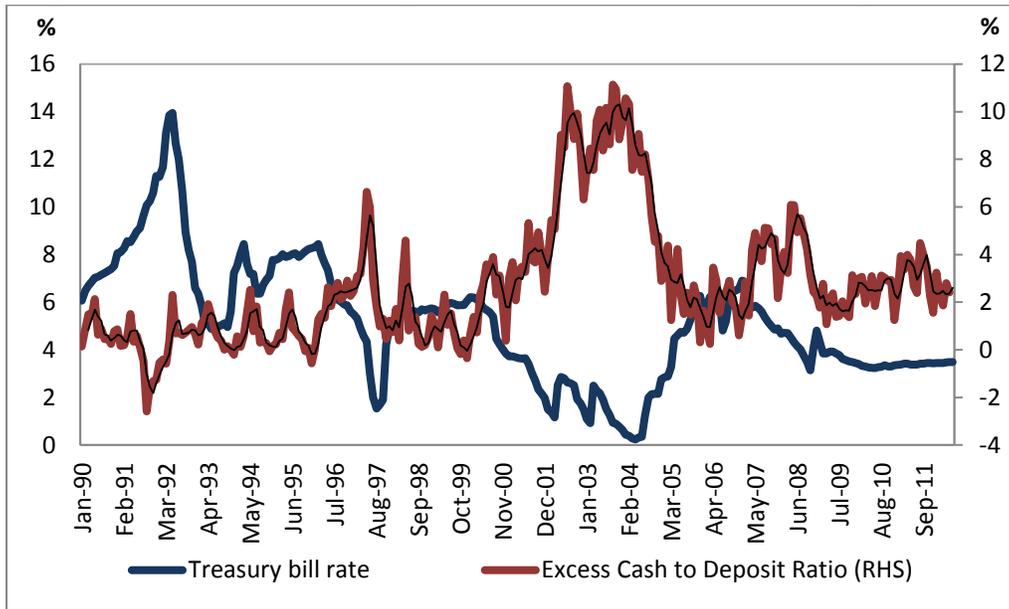
Source: Central Bank of Barbados

The relationship between the ratio of bank’s excess cash holdings to deposits and the Treasury bill rate is provided in Figure 2 below. The main inference one may glean from this chart is the inverse relationship between the liquidity measure and the Treasury bill rate<sup>2</sup>. This relationship was supported by a strong negative correlation coefficient (70%). During the early 1980s, the spike in Treasury bill rates was associated with only slight decreases in excess liquidity. However, the more pronounced decline in the excess liquidity position of banks was associated with sharp increases in Treasury bill rates in the early 1990s. The other noticeable movements in Treasury bill rates were observed during the period 2001-02, when rates fell sharply, owing to the rapid buildup in liquidity.

In general, the case can be made that during periods of high excess liquidity, as measured in this case by excess cash holdings to deposits of commercial banks, the Treasury bill rate exhibits a downward trend. A nice corollary to this observation is that oversubscriptions of Treasury bills usually occur in periods of high excess liquidity, which are also associated with lower average Treasury bill rates. This is clearly illustrated in Figure 3 during the years 2002 to 2005 when excess bank liquidity was consistently high and T-bill rates were generally low, a critical fact that helps to inform the Central Bank’s proposed interest rate policy framework. The data also shows that at times the Central Bank intervened to purchase T-bills when there were under-subscriptions (see Figure 4).

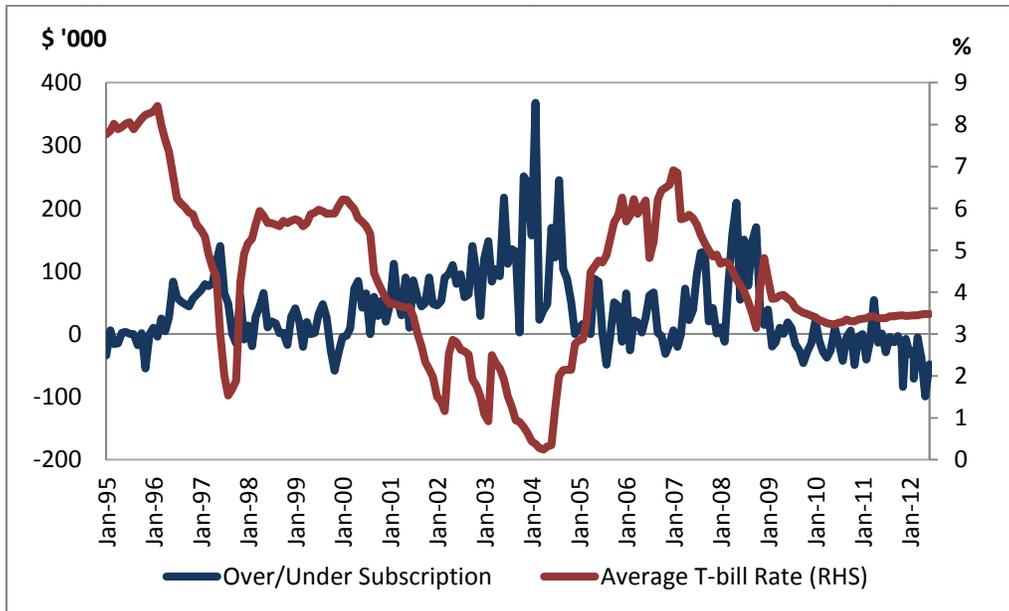
<sup>2</sup> This inverse relationship is also observed when other measures of liquidity are used.

**Figure 2: Excess Cash to Deposit Ratio and Domestic Treasury Bill Rate**



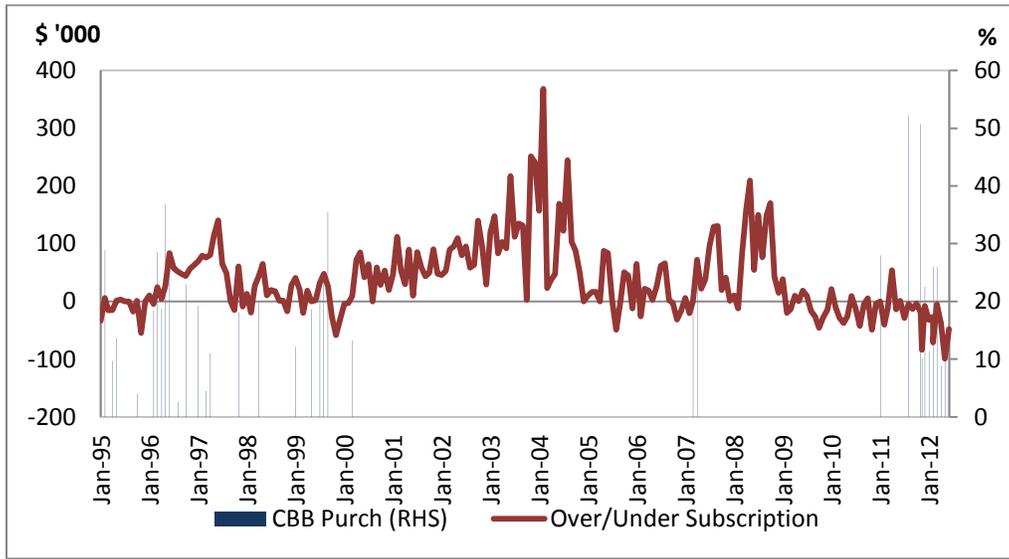
Source: Central Bank of Barbados

**Figure 3: Over and Under Subscriptions of Domestic Treasury Bills**



Source: Central Bank of Barbados

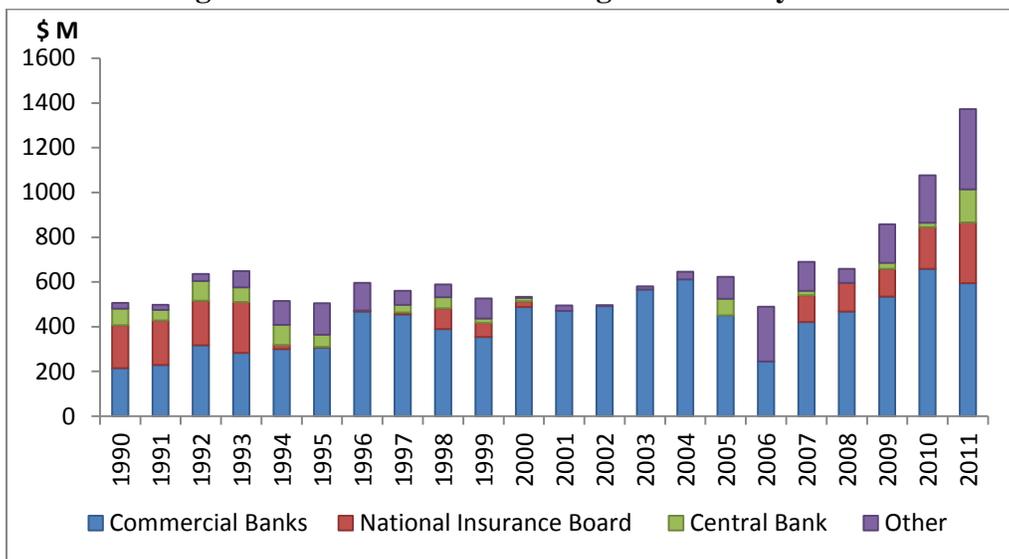
**Figure 4: Over/Under Subscriptions and CBB Primary Purchases as a Proportion of Total Issue Size**



Source: Central Bank of Barbados

Figure 5 indicates that commercial banks have been the leading player in the T-bill market for decades, accounting for about 90 percent of total Treasuries outstanding, during the early 2000s. After reaching a peak level in 2004, commercial banks' holdings of T-bills fell in the ensuing two years, and thereafter gradually picked up each successive year, until 2010. However, in 2011, banks' holdings of Treasuries declined by roughly \$65 million. Since 2007, the National Insurance Scheme (NIS) and trust companies have been steadily increasing their holdings of T-bills by an annual average of \$37 million and \$16 million, respectively.

**Figure 5: Total Investor Holdings of Treasury Bills**



Source: Central Bank of Barbados

### 3. The Logic of the Policy Framework

In modern economies like Barbados, capital flows relatively freely across borders through a variety of channels. These include traditional channels such as transfer pricing, informal channels and the exchange of services in kind, as well as more recent practices, such as multi-currency treasury management, economising on the use of trade credits, and the establishment of multi-currency investment funds in international financial centres. With the resulting high degree of capital mobility, so long as there is a fair degree of comparability between Barbadian interest rates and U.S. rates, the flows of finance in and out of Barbados are determined by investment opportunities, trade transactions, payments patterns and the like (see Worrell, 1997b). Theoretically, any divergence of rates outside the range of currency conversion costs and the country's risk premium will motivate an inflow or outflow of funds. These flows have the effect of correcting the interest rate disparity.

The openness of the financial account, therefore, results in parity between the Barbados and U.S. interest rates, once an allowance is made for the cost of converting U.S. to Barbadian dollars (and the cost of reversing that transaction, if desired), plus any additional risk premium which the country may have attracted. Worrell, Craigwell and Mitchell (2006) studied the Central Bank's pattern of purchases and sales of foreign exchange, and found evidence in support of the interest parity for Barbados.

Implicitly, the adjustment of domestic interest rates is therefore a market-driven process, which does not require policy intervention, as suggested by Jackman, Craigwell and Doyle-Lowe (2012). However, if left to its own devices the adjustment may be lagged, characterised by domestic rates that are inconsistent with economic factors and financing requirements. The objective of Central Bank's interest rate policy is to smooth the process of adjusting domestic interest rates in response to changes in foreign rates, to minimise potential losses in foreign reserves. As the record shows, in tranquil times the Barbados T-bill rate has been little different from the U.S. rate, but it might be inappropriate to follow the U.S. rate closely in some circumstances, as in the current ongoing international recession. A clearly articulated policy on the part of Central Bank will also help to secure a rational structure for the Government's yield curve, with higher interest yields on longer maturities.

From the Central Bank perspective, the Barbados Treasury bill rate is estimated to be equal to the U.S. T-bill rate plus a premium based on the historical difference between the U.S. and Barbados T-bill rates. In many cases, the premium can be expected to remain unchanged. However, there are circumstances that may suggest a higher or lower premium, and these will be taken into account, particularly in instances where there may be some undue impact on the international reserves. The factors which might affect the Barbados country premium include:

- a) the extent of liquidity in the domestic financial system;
- b) the size of the public sector borrowing requirement, and;
- c) the rate of inflation, to some extent.

The extent of excess liquidity in the financial sector may result in a lowering of the Barbados country interest premium relative to the U.S. rate. This would manifest itself, as it does now, through a reduction in the bid rates at the T-bill auction. Under the new arrangements, the Central Bank would not intervene to arrest the fall in rates, until there is credible evidence that a new and sustainable premium has been established in the market. More generally, the Central Bank is not likely to intervene to influence rates, whenever the T-bill rate fluctuates between 5% bands of the target reference rate, to ensure that an appropriate level of significance is maintained. As such, the functional form that triggers a rate adjustment is:

$$r_t^b = \pm 5\% * r_t^{*T} \quad (1)$$

such that if the target reference rate is 3%, then the Central Banks acceptable range would be between 2.85% and 3.15%. At the end of each T-bill auction, the Central Bank would assess the average T-bill rate,  $r_t^b$ , against the target reference rate<sup>3</sup>,  $r_t^{*T}$ , to determine if further adjustment is required.

The second factor, one that might have the opposite effect on the country premium, is a rise in the public sector borrowing requirement. If the available domestic liquidity were insufficient to meet the Government's financing needs, there might be some tendency for Treasury rates to rise, with the possibility of attracting greater foreign inflows. However, the preferred course of action in this circumstance has been for Government to borrow abroad directly, rather than offering higher domestic rates. Therefore, the effect of increased foreign financing on domestic rates may be insignificant.

The third consideration, the rate of inflation, is frequently employed in the literature as an explanation of the determination of domestic interest rates. For this reason, the possible effect of inflation on interest rates was also considered. Studies such as Downes (1985); Worrell (1997); Greenidge & DaCosta (2009) show interest rates are statistically significant in the inflation models for Barbados. What is unclear for countries like Barbados is the relationship in the reverse direction, i.e. the impact of inflation on interest rates. In practice, economies which have a fixed exchange rate, an open financial account and a high degree of imported inflation have not been very successful in using interest rates to control inflation or even economic output. Perhaps, if such an impact is detected in the reverse direction, it may suggest that misperceptions play a role in the determination of interest rates.

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<sup>3</sup> The Central Bank's target reference rate is also based on the average U.S. rates and its perceptions about the spread, so that short-term volatility does not affect the target directly.

In order to inform our intuition about the possible impact of these three factors on the country premium, econometric tests of the relationship among them were undertaken. The results are shown in the Appendix (Tables 1A and 2A). They suggest that the domestic T-bill rate is positively impacted by changes to the U.S. T-bill rate and the size of the fiscal balance to GDP ratio. Further, inflation had a positive statistical effect in the model, and the excess liquidity ratio has a negative impact on the T-bill rate. These findings are consistent with our expectations.

## **4. Operationalising the Interest Rate Policy Framework**

### *4.1 Historical Perspective on Monetary Policy*

Given the parity of the exchange rate, the key macro-economic policy target is the international reserves of the Central Bank. This is because Barbados must ensure that it maintains a supply of foreign reserves to meet the demands for foreign currency in order to maintain the parity and credibility of the exchange rate.

Historically, the Bank has adopted the following monetary policy instruments:

- (1) Moral suasion (first resort policy tool);
- (2) Changes in the discount rate (i.e., the rate at which banks borrow from the Central Bank; it is generally used to act as a signal for credit conditions);
- (3) Commercial bank reserves requirements (5% cash and 10% government securities); a foreign reserve requirement, which is currently set at 2% of banks' foreign currency liabilities, was implemented in 2006;
- (4) The minimum deposit rate (a higher rate signals tighter credit conditions and vice versa);
- (5) Occasional interventions in Treasury bill auctions; and
- (6) Trading of Government securities and the purchase, sale and repurchase of Government securities.

The experience has been that moral suasion has worked reasonably well, while the other policy instruments have had little or no impact on interest rates at banks (i.e., mainly loan rates). It has been the case that banks have not been as responsive as desired to policy changes, and when there was a change, it occurred with a significant lag. Indeed, the traditional implementation of monetary policy changes in Barbados has not had the expected effect on the primary target variable, i.e. international reserves.

#### 4.2 *Current Treasury Market Operations*

The Treasury Department undertakes domestic borrowing on behalf of the Government by issuing Barbados dollar denominated Treasury Bills in the domestic capital market. These issues are by public auction and the issuance calendar is based on the refinancing requirements for maturing Treasury Bills (so as to limit rollover risk), as well as Government's forecast for cash-flow requirements in the given fiscal year. The Ministry of Finance approves the issuance calendar at the start of the fiscal year, and the Treasury Department implements the T-bill programme. Treasury bills are dematerialised and a sub-registry is maintained at the Barbados Central Securities Depository. Approximately each fortnight, the Treasury Bills Committee meets to make decisions of the acceptance of bids received by the closing date of a particular auction. There are varied instances where bids may be rejected due to the tender rate being too high, compared to the previous average tender rate. The allotted T-bills are either for a tenure of three (3) or six (6) months, depending on the bids received (see Chapter 106 of the Laws of Barbados, Treasury Bills and Tax Certificates). These auction results are made public on the Central Bank's website ([www.centralbank.org.bb](http://www.centralbank.org.bb)).

As mentioned previously, in instances where there is the under-subscription of a T-bill auction, the Central Bank may be called upon to take-up the shortfall. Beyond this financing provisioning for Government, the Central Bank may choose to enter the primary market for T-bills in order to influence the average tender rate. Under both circumstances, the Central Bank is bound by the self-imposed limit on its holdings of Government securities purchased in the primary market.

#### 4.3 *New Interest Rate Policy Operations*

Under the proposed framework, the traditional interest rate tools would be managed as follows:

- a) ***The Minimum Deposit Rate*** – will no longer be the Bank's policy rate but will instead be referenced as the minimum savings deposit rate payable. This rate will be set to protect the real value of the savings of private individuals.
- b) ***The Discount Rate*** – the Central Bank's discount rate will no longer be adjusted to signal the direction of domestic interest rates. Instead the rate will be determined using a base rate of the 3-month T-bill rate plus a spread.

#### 4.4 *Liquidity Forecasting Framework*

The proposed liquidity forecasting framework to be adopted follows a methodology used by the Central Bank of The Gambia, see Worrell et al. (2008). A liquidity forecast is produced on a fortnightly basis by the Central Bank, in conjunction with the Treasury Department, taking into account the Government's cash flows of revenue and expenditure and its financing operations,

consisting of maturing and re-issuance of T-bills, as well as available liquidity in the banking system.

Forecasting the cash flows of Government is arguably the most vital and difficult task in the liquidity forecasting framework. However, as alluded to previously, this amount as well as the maturing amount of T-bills is taken into consideration in determining the amount to be tendered in each fortnight. Furthermore, the level of liquidity in the banking system is estimated based on an internal model and compared to a three-month rolling average benchmark<sup>4</sup>. This comparison is used to inform the proportion of an institution's excess cash holdings that is likely to be invested in additional T-bills. Therefore, the expected allotments are determined by the assumptions about the amount of T-bills that are likely to be rolled-over, the excess liquidity position and other (macro and microeconomic) expectations. Central Bank intervention may become necessary if there is a shortfall between the amount offered for tender and the expected allotment (see Table 1). The Central Bank also closely monitors the average T-bill rate in reference to the Central Bank's internal target reference rate to determine whether its intervention should signal the need for a rate adjustment. Following the auction process, an assessment of the forecasts would be based on the actual data and adjustments made for the next auction.

**Table 1: Framework of the Liquidity Forecast\***

	09/26/2012	10/03/2012	10/17/2012
<b>Amount offered for Tender</b>	95.4	123.8	211.1
<b>T-bills Maturing During Period</b>	94.6	117.7	130.2
<b>Excess Liquidity Position</b>	3.2	3.4	3.1
<b>Expected Allotment</b>	84.3	123.8	161.1
<b>Expected Shortfall</b>	11.1	0	50
<b>Central Bank Intervention</b>	11	0	50
<b>Central Bank Target Rate</b>	n.a.	n.a.	n.a.
<b>Average T-bill Rate</b>	3.52	3.53	3.54

Source: Central Bank of Barbados;

\*Based on actual data at the given time periods.

<sup>4</sup>The three month rolling average is widely used in the literature to control for volatility.

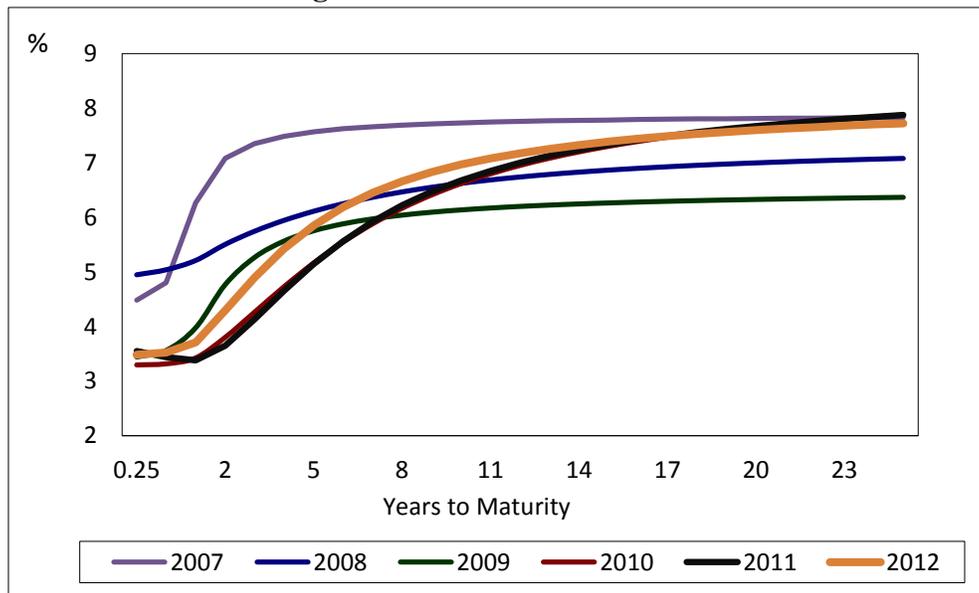
#### 4.5 Interest Rate Adjustment and the Estimation of Notional Yield Curve

When the Central Bank intervenes in the market to influence the T-bill rate, the intention is to signal to the market the direction in which interest rates should go. Consecutive bids above the previous average T-bill rate (by the Central Bank) will tend to drive the average rate upwards, until the target rate is achieved. The movement from one rate to a new rate is to be done in an incremental manner and may take several rounds of intervention.

Adjustments to short-term rates would change the shape of the notional yield curve at any point in time. Interest rate changes would be mostly reflected at the short-end of the curve. If long-term fundamentals are expected to be unchanged, the notional yield curve would pivot only on the short end. However, changes in long-term expectations may result in a shift in the entire curve. The Central Bank would, therefore, publish a quarterly notional yield curve to provide guidance to the market.

Given the under-developed secondary market in Barbados, market prices and yields for securities issues across the full maturity spectrum are not readily available. Therefore, to estimate a notional yield curve the coupon rates for the respective issues are employed as proxies for yields. An interpolation technique<sup>5</sup> is applied to the tenures where no Government securities issues are outstanding in the market to generate a smooth notional yield curve. Figure 6 depicts the year-end yield curves in Barbados for the period 2007 to 2011 and the yield curve as at June 2012.

**Figure 6: Notional Yield Curves**



Source: Central Bank of Barbados

<sup>5</sup> The interpolation technique used is based on the Nelson and Siegel, (1987) framework.

## 5. Conclusion

The experience in Barbados clearly shows that conventional approaches to monetary policy have not produced the intended policy outcomes. As a result, this paper outlines a general framework for providing market guidance on interest rates. This approach involves direct intervention in the auction market for 3-month T-bills, which is intended to ensure that interest rates behave in an orderly manner and are kept inline with comparable U.S. rates. Therefore, other interest rates are expected to be benchmarked against this market determined rate because the failure to maintain smooth adjustments in the benchmark reference interest rate, particularly with reference to the U.S. equivalent rate, may result in destabilising inflows and outflows of funds.

Two critical factors that will trigger policy intervention are the movements in U.S. T-bill rates relative to the domestic rate and the domestic liquidity conditions. The importance of these variables within the proposed framework was further validated using an econometric approach.

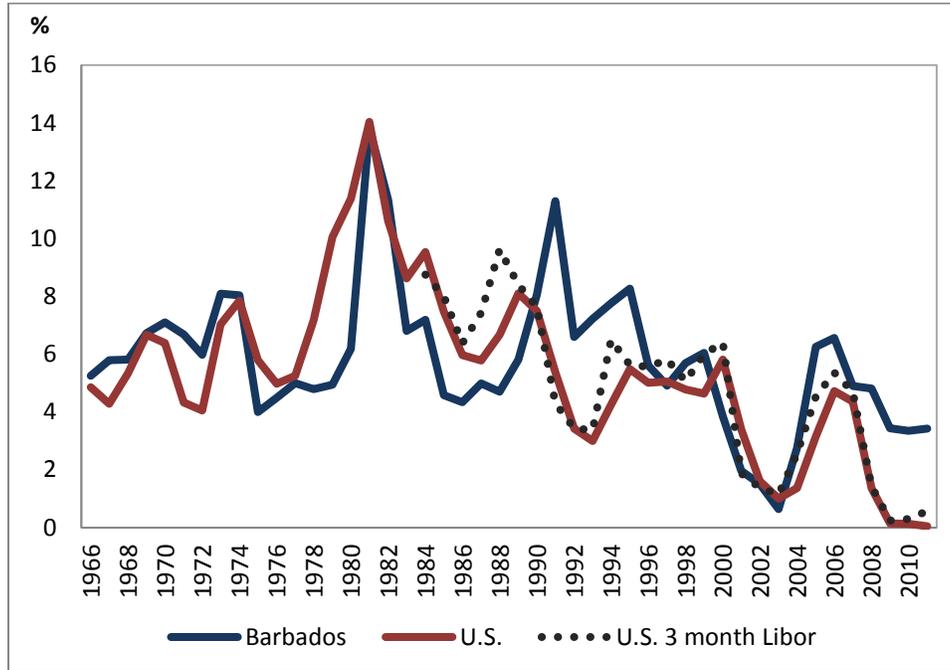
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## 7. Appendix

### 7.1 Support Charts

**Figure 1A: Three-month Barbados and U.S. Treasury Bill rates and LIBOR**



### 7.2 Econometric Framework

Given the notion of interest rate parity between Barbados and the U.S. [as discussed in Worrell et al. (2006); Jackman et al. (2013); Jackman (2012A); Jackman (2012B)] the basic framework for pricing Barbados Treasury securities would be linked to the U.S. Treasury alternative rate plus some premium such that:

$$r_t^b = r_t^{eu} + \rho_t \quad (1)$$

where  $r_t^b$  is the T-bill rate in Barbados;  $r_t^{eu}$  is the expected rate on the U.S. 3-month T-bill and  $\rho_t$  is the premium defined as the difference between the Barbados and U.S. 3 month Treasury bill rate. Generally,  $\rho_t$  can assumed to follow a random walk process, where:  $\rho_t = \rho_{t-1} + \varepsilon_t$  and the error term ( $\varepsilon_t$ ) has a mean of zero and variance of 1. At times  $\rho_t$  may be influenced by liquidity in the domestic financial system, the size of the public sector borrowing requirement and, to some extent the rate of inflation. These factors are tested econometrically in the functional form

$$r^b = f(r^u, lq, inf, fb) \quad (2)$$

where  $r^b$  is the average rate on the 3-month T-bills in Barbados;  $r^u$  is the average rate on the 3-month U.S. T-bill;  $lq$  is the excess cash to deposit liquidity ratio in commercial banks;  $inf$  represents the inflation rate and  $fb$  is the fiscal balance to GDP ratio.

**Table 1A: Unit Root Test**

	ADF	PPP	KPSS
US T-bill (Ut)	-2.12	-1.758	1.207+++
D(ut)	-5.438***	-10.462***	0.068
Barbados T-bill (Bt)	-2.184	-2.071	1.078+++
D(Bt)	-10.528***	-10.638***	0.042
Excess Cash (Lq)	-2.355	-3.544***	0.68++
D(Lq)	-4.101***		0.0701
Inflation Rate (P)	-3.234**	-2.327	-3.234++
D(P)		-4.655***	0.1155
Fiscal Balance to GDP ratio (FB)	-2.741*	-19.13***	1.584+++
D(FB)	-15.64***		0.094

**Table 2A: Parameter Estimates**

	Coefficient	Std.Error	t-value	t-prob
DBT_1	0.325607	0.01655	19.7	0
DUT_2	0.0889573	0.02987	2.98	0.0034
DU_7	0.132327	0.02888	4.58	0
DP_4	0.0460538	0.01678	2.75	0.0068
DLQ_2	-0.0270339	0.005518	-4.90	0
DLQ_3	-0.0299218	0.005767	-5.19	0
DLQ_4	-0.0163527	0.006051	-2.70	0.0077
DLQ_7	-0.0193631	0.005588	-3.47	0.0007
DFB_11	0.0148554	0.004448	3.34	0.0011
DFB_12	0.0131766	0.005061	2.60	0.0102
DM2_9	-1.16713	0.2632	4.44	0
DM2_10	-1.55183	0.2668	-5.82	0
DM2_11	-0.879477	0.2464	-3.57	0.0005

**AR 1-2 test:**  $F(2,144) = 1.4576 [0.2362]$       **Hetero test:**  $F(26,132) = 0.97579 [0.5048]$   
**ARCH 1-1 test:**  $F(1,252) = 0.73754 [0.3913]$       **RESET23 test:**  $F(2,144) = 0.62124 [0.5387]$   
**Normality test:**  $\text{Chi}^2(2) = 8.5587 [0.0139]^*$

The results correspond with the hypotheses about T-bill rate discussed in Worrell (1997). Our results are generally satisfactory and are consistent with our *apriori* expectations. Further, the variable DM2 (change in M2) was used as a crude monthly proxy for the general economic environment. The main concern is that there is some non-normality in the residuals. This phenomenon may partially be explained by the volatility in the variable over the estimation period and the significant number of saturation dummies used to address the volatility.