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## **Exchange rate determination in Jamaica: A market microstructures and macroeconomic fundamentals approach**

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**EXCHANGE RATE REGIMES AND MONETARY AUTONOMY:  
EMPIRICAL EVIDENCE FROM SELECTED CARIBBEAN COUNTRIES**

by

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# **EXCHANGE RATE REGIMES AND MONETARY AUTONOMY: EMPIRICAL EVIDENCE FROM SELECTED CARIBBEAN COUNTRIES**

**Roland Craigwell, Kevin Greenidge and Tracy Maynard**

## ***Abstract***

This paper uses the error correcting methodology to investigate how pegged and non-pegged exchange rate regimes in a set of Caribbean countries affect the closeness of the relationship between changes in a base country rate and the local rate. This interest rate parity condition is subjected to effects arising from capital controls and common shocks related to inflation and external debt. The results support the standard theory that peg countries (like Barbados) follow the base country interest rate more closely than the managed float or flexible rate economies (such as Trinidad and Tobago and Jamaica). In addition, the paper supports the open economy macroeconomic policy trilemma proposition that only two of the following goals – stability in the exchange rate, national independence in monetary policy and free capital mobility- can be achieved simultaneously.

***Keywords:*** Exchange rates, Monetary policy, Error correcting mechanisms

***JEL Classification:*** F41, E52, C32

## **Introduction**

The trilemma or impossibility trinity of open economy macroeconomic policy, which refers to the situation that any two of the following goals – stability in the exchange rate, national independence in monetary policy and free capital mobility- can be achieved simultaneously, is a convenient way to categorise the choices that different economies make. Most developing countries in the pre- late 1970s and a minor set today, which includes economies like China, India and Barbados, maintained exchange controls and limited private capital movements. As a result, some of these countries pegged their exchange rates for extended periods, producing exchange rate stability, while others adjusted their currencies on occasion, offering considerable monetary autonomy. The main problem with this choice is that it imposes onerous restrictions on international transactions, reducing efficiency and contributing to corruption (Krugman and Obstfeld, 2006).

Consequently, in the last two decades or so capital mobility has increased substantially, largely because of the removal of capital controls and improvement in communications technology. The expansion in capital mobility, in turn, has made adjustable peg regimes very vulnerable to speculation, since capital would flee in anticipation of devaluation. Consequently, developing countries have moved either towards a rigidly fixed exchange rate and a renunciation of monetary autonomy as seen in those countries that have dollarised or adopted currency boards, or towards flexibly managed (or even floating) exchange rates. However, there are problems with these two extreme positions. A rigid system like the currency board can deprive a country of much needed flexibility, especially when dealing with financial crises where the central bank is lender of last resort. With respect to the fluctuating currency, developing countries often find the costs of such volatility hard to sustain because of the very open nature of their economies and because they are unable to borrow in their own currency, that is, they suffer from what is termed the original sin (see Eichengreen and Hausmann, 1999). Thus, countries claiming to “float” their currencies may display a “fear of floating” and instead limit currency fluctuations over long periods (Calvo and Reinhart, 2002).

The above discussion suggests that the choice of the exchange rate regime is fundamental to the performance of an economy and this decision helps to determine the monetary policy options or/and the ability to maintain open capital markets. This paper provides empirical evidence on these issues in a diverse set of Caribbean countries. In essence, the article looks at the impact that fixing the exchange rate has on monetary policy, measured by a short-term interest rate, by establishing the extent to which interest rates in pegged countries (Barbados and the Organisation of Eastern Caribbean States) follow base country interest rates and how they differ from economies that do not have fixed exchange rates (Jamaica, Guyana and Trinidad and Tobago). Following the trilemma result that, for instance, economies with a fixed exchange rate and open capital market increase the responsiveness of monetary policy (the base interest rate), the effect of capital controls on the relationship between interest rate behaviour of pegged and non-pegged countries is investigated.

After this introduction, this study continues with a section on the theory of exchange rate regimes and monetary autonomy. Then, the empirical framework is discussed followed by a review of the empirical literature. Next, the data, methodology and results are presented. The final section deals with the concluding remarks.

## **2. Theory**

The uncovered interest rate parity (UIP) condition can be utilised to explain the impact of exchange rate regimes on monetary independence. Consider the following UIP expression (in changes) when capital markets are open:

$$\Delta R_t = \Delta R_{bt} + \Delta E_t(e_{t+1} - e_t) + \Delta p \quad (1)$$

where  $\Delta$  is the first difference operator,  $R$  is the domestic nominal interest rate,  $R_b$  is the base country nominal interest rate,  $E$  is the expectation operator,  $e$  is the exchange rate,  $p$  is the difference in risk of the two assets (risk premium) and  $t$  is the time index.

In a fixed exchange rate system, since  $e_t$  is constant, the third term in Equation (1) becomes  $\Delta E_t e_{t+1}$ . Thus assuming  $p$  is very small or does not fluctuate with the change in interest rates and the expected future exchange rate remain the same, the local rate moves one on one with the base rate change, that is,

$$\Delta R_t = \Delta R_{bt} \quad (2)$$

However, this one on one correspondence is violated whenever there is a fluctuation in the expected future exchange rate or the risk premium. For instance, an increase in the base rate could cause investors to doubt the stability of the peg or alternatively a fall in the base rate in times of global uncertainty could lead to a negative correlation between  $\Delta R_{bt}$  and  $\Delta E_t (e_{t+1} - e_t) + \Delta p$  (see Shambaugh, 2004).

In the situation where the exchange rate is not pegged precisely but allowed to float within small bands, Svensson (1994) shows that the degree to which the domestic rate follows the base rate is reduced since  $\Delta E_t (e_{t+1} - e_t) \neq 0$  even if the peg is credible. As  $e_t$  can now change, long term monetary autonomy is lost, as the country must introduce policies to keep the parity credible. However, in the short term, the movement of  $e_t$  provides the pegged country with some latitude. For example, if the base rate rises, the country could depreciate the currency, leading to an expected appreciation of the currency in the future. This negative correlation between  $\Delta R_{bt}$  and  $\Delta E_t e_{t+1}$  will weaken the one on one relation between  $\Delta R_t$  and  $\Delta R_{bt}$ .

Under a floating exchange rate regime, the domestic interest rate does not have to respond to changes in the base interest rate or the expected exchange rate or for that matter, the risk premium. Instead, what is required is for the spot exchange rate to adjust in such a way that the expected change in the exchange rate is equal to the interest differential. In essence, the local rate can be set, and other factors can adjust to it. However, as Shambaugh (2004) points out there may be other reasons why the base and local rates could be highly correlated in this framework.

For example, they may share similar shocks or the country involved could have a “fear of floating” in the sense of Calvo and Reinhart (2002) in which local rates move with base rates to reduce exchange rate volatility.

The above theoretical results suggest that non-pegged countries should have more monetary autonomy than economies with fixed exchange rates. However, an important caveat is that the findings rely on the assumption of free capital mobility. If interest rates are set administratively or there are restrictions to international capital movements, there is no reason why  $\Delta R_t = \Delta R_{b,t}$  and hence, why pegged countries should lose monetary autonomy. This result follows directly from the open-economy trilemma policy framework mentioned above where if capital markets are closed the country can pursue domestically oriented monetary policy within a fixed exchange rate system.

### 3. Empirical Framework

The empirical framework used to test the above theoretical results is based on the following equation

$$R_{d,t} = \beta_0 + \beta_1 R_{b,t} + \beta_2 float_t + \beta_3 R_{b,t} * float_t + \beta_4 * CapLib_t + \beta_5 R_{b,t} * CapLib_t + \beta_6 * ED_t + \beta_7 \pi_t + \varepsilon_t \quad (3)$$

where  $R_{d,t}$  is the domestic country interest rate,  $R_{b,t}$  is the base country interest rate,  $float_t$  is a dummy variable which takes on a value of 1 during the periods of a floating exchange rate regime, hence in the case of a country like Barbados that has maintained a fixed exchange rate throughout the sample period, this variable is omitted,  $CapLib_t$  is a measure of capital account liberalisation,  $ED_t$  is the external debt to GDP ratio, and  $\pi_t$  is the inflation rate. In this setup  $\beta_1$  reflects the conditional effects of the base country interest rate on the domestic interest. In other words, it is the influence of the base country interest rate on the domestic interest under the fixed exchange rate regime and full capital controls.  $\beta_3$  represents an interaction effect in that it estimates the extent to which moving to a floating exchange rate regime changes the

responsiveness of the domestic interest rate to changes in the base country interest rate.  $\beta_5$  is also an interaction term and captures the extent to which a more open capital account changes the responsiveness of the domestic interest rate to movements in the base country interest rate.  $\varepsilon$  is an error term assumed to satisfy the classical properties of least squares estimation.

Since the theory suggests that non-pegged countries should have more monetary autonomy than pegged economies, *ceteris paribus*, it is expected that the size of  $\beta_1$  for pegged countries should be significantly larger than for non-pegged economies. In the extreme case where the peg is rigid (no bands) and perfectly credible, capital markets are open and arbitrage costless, risk premiums constant, and investors are optimizing,  $\beta_1$  should be 1. For non-pegs, the theory suggests a much lower  $\beta_1$  driven by the correlation of shocks although, in the case of the fear of floating argument it is likely that the magnitude of  $\beta_1$  could approximate that of the pegged rate economies.

These hypotheses regarding the size of  $\beta_1$  are conditioned by the behaviour of the control variables that measure the effect of capital mobility, external debt and inflation. It is expected that the sign on the capital mobility variable will be positive while those on external debt and inflation are ambiguous (see Shambaugh, 2004).

#### **4. A Brief Review of the Empirical Literature**

This section reviews some of the empirical studies concerned about the level of monetary independence exercised by economies characterised by different exchange rate regimes – fixed, floating or somewhere in between. Shambaugh (2004) conducted such a study on over 100 developing and industrial countries from 1973 to 2000 using panel data analysis and the time series co-integration technique developed by Pesaran, Shin and Smith (2001). The author also tested the theory of the open economy trilemma by adding capital controls as one of the explanatory variables in the regression. The empirical findings of the paper showed that pegged economies lack monetary freedom as local rates follow closely changes in the base country's interest rates while in non-pegged economies local rates revealed a less high association to movements in the interest rates of the base economy. When capital mobility is incorporated into the analysis, Shambaugh (2004) found that non-pegs without capital controls display a fear of



floating or have a significant amount of common shocks as evidenced by the significant proportion of the changes in domestic interest rate that are explained by the international rate. The response of an economy with a fixed exchange rate and open capital market to changes in the foreign interest rate is large, resulting in a faster speed of adjustment to shocks than non-pegged economies. Pegs with capital controls show a much stronger relationship with the base interest rates than the non-pegs.

Forssback and Oxelheim (2005) examined the relationship between monetary policy autonomy and different exchange-rate regimes in the small open European economies during the periods of the 1980s and 1990s. The authors used Generalised Least Squares on a model determination procedure based on the Granger concept of causality. They found that the exchange rate regime of any country is not a good predictor of policy autonomy. Results further indicated that an economy is considered to have a monetary policy constraint when its independent nominal target does not deviate too much from the targets of the country with which it is financially integrated. The paper states that this outturn is equivalent to an economy that has an explicit exchange rate peg. Moreover, the authors empirical findings showed that the level of monetary policy autonomy enjoyed by the European economies have little variances regardless of the exchange rate regime of the country, fixed or flexible. However, in the short term a flexible exchange rate provides an economy with a greater margin of monetary freedom, which proves to be advantageous under asymmetric shocks to the real economy. .

In investigating the conventional proposition that an economy with a floating exchange rate allows the central bank to maintain monetary independence, Borensztein, Zettelmeyer and Philippon (2001) focused on two types of shocks: (a) changes in the US dollar interest rates and (b) movements in the risk premia attached to emerging market international bonds. The empirical analysis, which was conducted, using vector autoregressions and impulse response functions mainly, concentrated on Latin American and Asian economies in the early 1990s. The authors found that the conventional proposition about exchange rate regimes with regard to the two types of shocks hold for both Hong Kong and Singapore. Conversely, the impact of shocks to emerging market risk premia is about the same size of changes in the interest rates and

exchange rates in Argentina and more so, in Mexico. However, these economies preserved monetary autonomy following an adjustment in the monetary stance of the US.

Frankel, Schmukler and Serven (2002) utilised simple linear regression to examine whether the choice of exchange rate regime affects the sensitivity of domestic interest rates to international interest rates using a large sample of developing and industrialised economies during the period 1970 to 1990. The study also focused on the ability of a country with a floating exchange rate to isolate its domestic interest rate from negative international shocks. The main results of the paper are summarized as follows. First, all exchange rate regimes exhibit a high level of correlation between domestic interest rates and international interest rates, which are eventually fully transmitted in the long run. Second, floating exchange rate regimes have a higher level of monetary independence or there have a certain degree of temporary monetary independence, in the sense that the speed of adjustment of domestic interest rates to international interest rates are lower under floating regimes than under any other type of regime. Finally, the results show that only two industrialised countries, Germany and Japan, benefit from independent monetary policy in the 1990s, given that no evidence was found of a long-run relation between local and international interest rates.

In a related paper, Bailliu, Lafrance and Perrault (2002) employed the Generalised Methods of Moments estimator to investigate the influence of exchange rate regimes on economic growth using a panel of sixty industrialised and developing countries over the period 1973 to 1988. The evidence showed that any exchange rate regime characterised by a strong monetary policy framework have a positive influence on growth. However intermediate or flexible exchange rate regimes without a monetary policy anchor are harmful to growth. The study concludes that it is the presence of a strong monetary framework, rather than the type of exchange rate regime, that is important for economic growth.

## **5. Data, Methodology and Empirical Results**

### ***5.1 Data***

The domestic country interest rate is the nominal rate on the respective Caribbean countries three-month treasury bills, while the base country interest rate is the nominal rate on the US

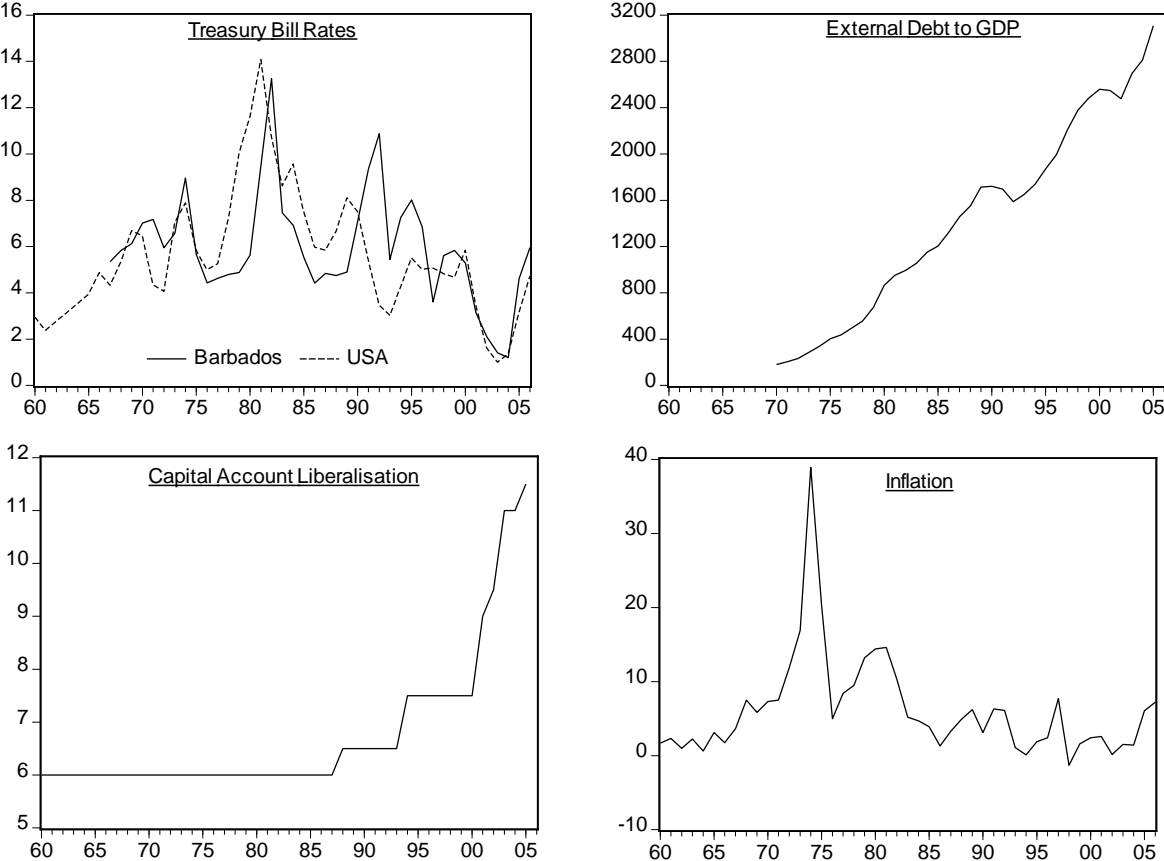
three-month treasury bills. For external debt, the stock of both private and public external debt to gross domestic product at market prices is employed. The inflation rate, defined as  $\ln(1+\Delta CPI)$ , represents changes in the consumer price index (CPI). CapLib is taken from Greenidge (2006). The index is based on information taken from the International Monetary Fund (IMF)'s annual publication on Exchange Arrangements and Exchange Restrictions (AREAER). This publication contains detailed reports on each member country's exchange arrangement, administration of controls, prescription of currency, regulations on import and import payments etc. Greenidge (2006) also utilises additional information from the respective central banks. He argues that the IMF's AREAER is updated annually and in many cases such information is only sent in summary, but there is usually more details and explanations housed within each of the Central Banks. Therefore, he believes that the index is likely to provide a better reflection of the practices throughout the Caribbean region. All data, with the exception of Caplib are taken from the World Development Database 2007 and spans the period 1960 to 2005. The data is expressed in natural logarithm and all computations are done in the PCGIVE econometric software programme.

## **5.2 Methodology**

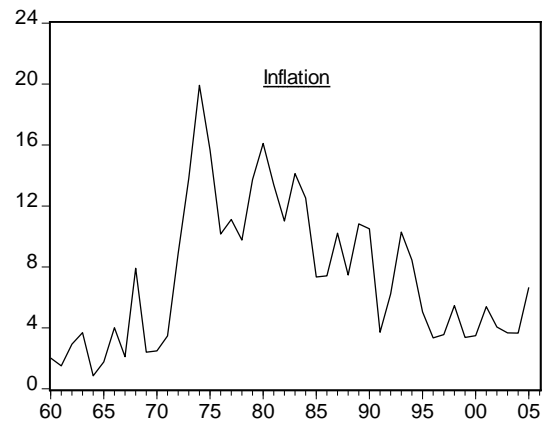
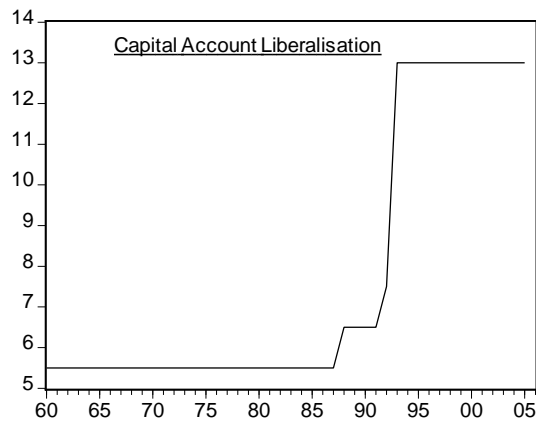
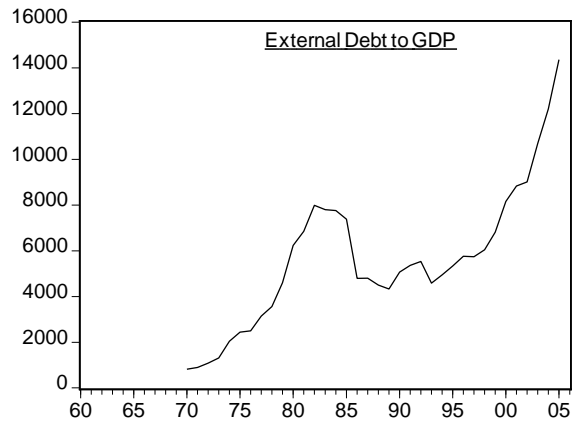
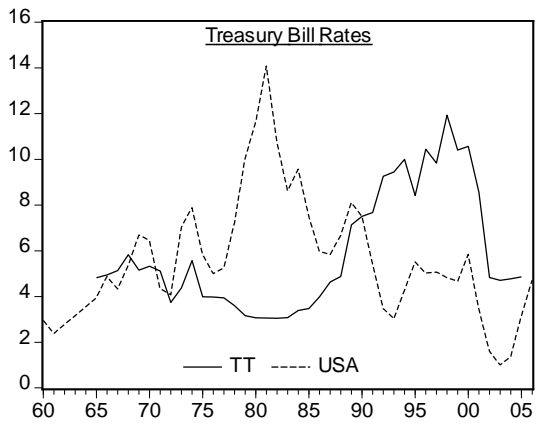
Plots of the data for the 3 Caribbean countries (see Figures 1 to 3), and confirmed by the unit root tests described below, suggest that the variables are a mixture of  $I(0)$  and  $I(1)$  processes. Hence, the Unrestricted Error Correcting Model (UECM) first introduced by Sargan (1964), and later popularised by Engle and Granger (1987), is used to estimate Equation (3) since it is still an open debate on how to appropriately handle combinations of stationary and non-stationary variables in standard co-integration frameworks like that of Johansen (1988). For a discussion of this debate see, for example, Greenidge (2006). In addition, Monte Carlo studies have shown that the ECM procedure is as good as, if not more appropriate than, other co-integration techniques in dealing with small data samples, even in the presence of  $I(1)$  variables (see Krolzig, 2000). With the ECM approach one can minimise the possibility of estimating spurious relations while retaining long-run information and at the same time derive a model that is suitable for economic interpretation. The final parsimonious ECM is computed with the help of the general-to-specific approach of Campos *et al* (2005) where an unrestricted model with 2 lags (2 lags are considered appropriate when dealing with annual data) is progressively reduce by

eliminating statistically insignificant coefficients and ensuring that no significant information is lost in the process as indicated by the diagnostic statistics at each stage.

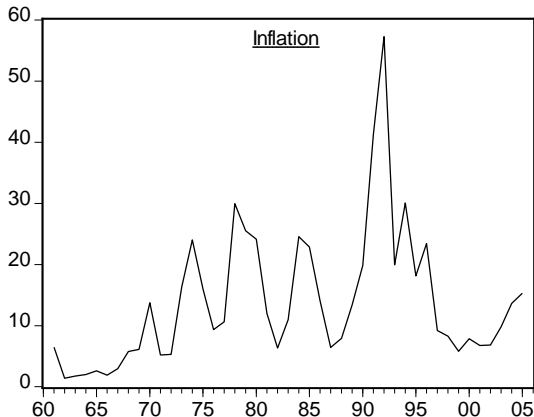
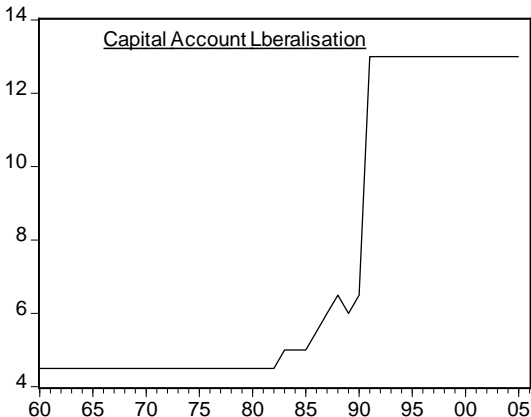
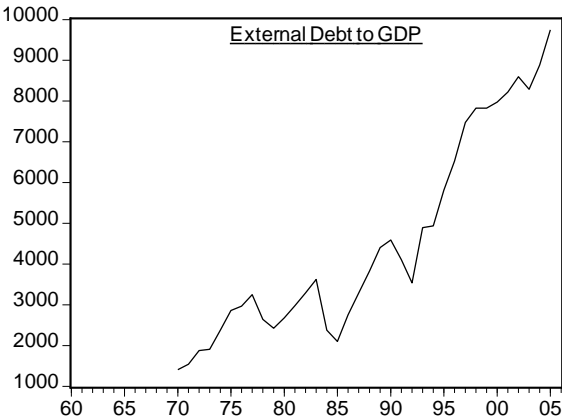
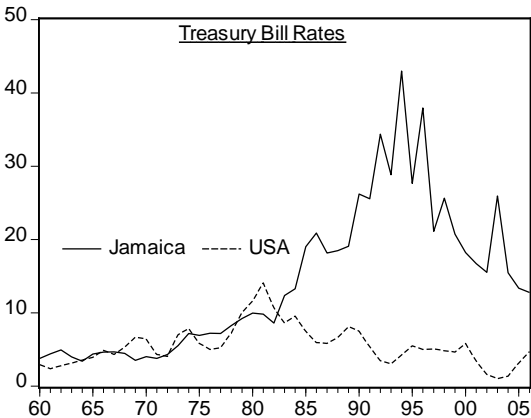
**Figure1: Barbados Data**



**Figure 2: Trinidad and Tobago**



**Figure 3: Jamaica Data**



### 5.3 Results

Three tests for unit roots are undertaken in this paper: the Augmented Dickey - Fuller (ADF), Philips and Perron (PP) and the Kwiatkowski, Phillips, Schmidt and Shin (KPSS). Except for the domestic interest rate of Barbados, these statistics are in agreement with each other and indicate that the interest rates are  $I(0)$  while external debt and prices are  $I(1)$ . With respect to the Barbados' local interest rate, there is an inconsistency in the findings of the ADF and PP tests verses that from the statistic of KPSS. The former two tests indicate that  $R$  is  $I(1)$  while the latter statistic suggests it is  $I(0)$ . Figure 1 shows that this inconsistency could be explain by the break in the series in 2004. To deal with this, the procedure in Saikkonen and Lütkepohl (2002) and Lanne et al. (2002) is utilised which involves adding a shift function to the ADF regression, then estimating the deterministic term by generalised least squares under the unit root null hypothesis, subtracting the resultant fit from the original series, and applying an ADF type test to the adjusted series that also includes terms to correct for estimation errors in the parameters of the deterministic part. The critical values for the new ADF statistic are given in Lanne et al. (2002). For more details on the specification of the various shift functions see Saikkonen and Lütkepohl, (2000; 2002). The included shift function is significant with a t-statistic of 9.378, while the test statistic for the null hypothesis of a unit root with this function incorporated is -3.308, which is significant at the 1 percent level. Thus, it is assumed that  $R$  is  $I(0)$  for Barbados.

Given that the variables are a mixture of  $I(0)$  and  $I(1)$  variables an UECM is estimated with two lags for the 3 countries. A few issues relating to Jamaica and Trinidad and Tobago need to be discussed before the results are presented. The samples of both countries cover periods where the exchange rate was fixed and when it was un-pegged. This difference is shown clearly in Figures 2 and 3 where it is observed that the local rates diverge significantly from the foreign rate in the early 1980s for both countries. To compound the situation the capital mobility variable of Greenidge (2006) used in this paper has an element of this exchange rate switch built into it. As a result the model tries to account for these effects by attempting to disentangle the exchange rate regime impact on  $\beta_1$  from that related to capital liberalisation. This is done through the interaction terms  $\beta_3$  and  $\beta_5$  mentioned above. The final parsimonious representations of the models are presented in Tables 2 to 4 below along with some standard diagnostic statistics and long-run elasticities.

The models appear to be fairly well specified satisfying all the standard diagnostic checks. The estimated long-run parameter of  $\beta_1$  support the theory discussed above, that is,  $\beta_1$  is much higher for the fixed exchange rate economy of Barbados than the non-pegged economies of Trinidad and Tobago and Jamaica. This finding imply that the lost of monetary autonomy in Barbados is higher than in Jamaica and Trinidad and Tobago. Using the same reasoning one would expect that  $\beta_1$  to be larger for the manage float economy of Trinidad and Tobago than for the flexible rate regime of Jamaica. This is borne out by the data where it is seen that the long run parameter coefficient for Jamaica could range between 0.07 and 0.48 relative to Trinidad and Tobago value of 0.59. The short-run results are also in agreement with these long run findings, with the base rate impact in Barbados being 0.88, Trinidad and Tobago, 0.24, and Jamaica influence is not significant and dropped out in the general to specific reduction process.

Turning now to the impact of capital mobility, it appears that in the long run, capital liberalisation only affects the local rate in Trinidad and Tobago and the result suggest that a change in capital liberalisation causes local rates to move in the same direction. The insignificant finding for Barbados is as expected since that country during the sample period used here still had controls on private capital flows. On the other hand Jamaica result is a bit surprising, especially since it has a significant positive short run effect but it may be explained by Jamaica's history of implementing and then reversing the capital liberalisation measures as well as Jamaica's bad timing of introducing capital liberalisation policies in an unfavourable macroeconomic environment (see Greenidge and Belford, 2000). If anything, these sequences of decisions created greater uncertainty in the macroeconomy. In fact, the statistically significant effect of the shock variables related to external debt and prices in the Jamaica equation may give credence to this view. Note the external debt variable is also found to be statistically significant in Barbados and Trinidad and Tobago but with a negative sign.

As far as the speed of adjustment is concerned Jamaica rate is the highest with 59% adjustment undertaken within in one year, compared to Barbados and Trinidad and Tobago whose adjustment rate is about 50% and 20%, respectively. The result for Jamaica is surprising since one would expect the interest rate in a non-pegged country to react less quickly to changes in



base rate than those of pegged economies. This result may reflect the greater uncertainty that existed in the Jamaican economy over the review period.

**Table 1: Results of Test for Stationarity**

		Barbados	Trinidad	Jamaica	USA
R	Level	-2.586 [-2.702*] {0.319}	-1.267 [-1.511] {0.336} <sup>+</sup>	-1.264 [-1.454] {0.734} <sup>++</sup>	-1.619 [-1.975] {0.257}
	$\Delta$	-5.485*** [-6.085]*** {0.128}	-5.873*** [-5.917]*** {0.135}	-9.721*** [-9.603]*** {0.238}	-6.591*** [-3.806]*** {0.192}
ED	Level	-2.868* [-4.773]** {0.667} <sup>++</sup>	-2.235 [-2.107] {0.597} <sup>++</sup>	-1.055 [-0.981] {0.696} <sup>++</sup>	
	$\Delta$	-2.653* [-2.607] {0.545} <sup>++</sup>	-3.676** [-3.760]*** {0.219}	-4.949*** [-5.168]*** {0.110}	

Notes: the first row for each country gives the ADF test statistic, the second row contains the PP test statistic in square brackets, and the third row shows the KPSS test statistic in curly brackets. \*, \*\* and \*\*\* are the MacKinnon critical values for rejection of the null hypothesis of a unit root at the 10%, 5%, and 1% levels respectively, for both the ADF and PP tests, while <sup>+</sup>, <sup>++</sup>, <sup>+++</sup> are the critical values for the LM test statistic of the KPSS test and denote rejection of the null hypothesis of stationarity at the 10%, 5%, and 1%, respectively (based upon the asymptotic results presented in KPSS (1992) Table 1, pp. 166).  $\Delta$  denotes the first difference of the original series.

**Table 2: Results for Barbados**

$\Delta R_{B,t} =$	0.281	- 0.496*	$R_{B,t-1}$	+ 0.8763*	$\Delta R_{US,t}$	+ 0.435*	$R_{US,t-1}$	- 2.227*	$\Delta ED_{B,t}$
	(0.182 <sup>++</sup> )	(0.14 <sup>+++</sup> )		(0.187 <sup>+++</sup> )		(0.126 <sup>+++</sup> )		(0.879 <sup>++</sup> )	
$R^2 = 0.67$ ; $JOINT - F(4,29) = 9.921 [0.000]$ ; $DW = 1.87$ ; $AR - F(2,27) = 0.024 [0.976]$ ; $ARCH - F(1,27) = 0.413 [0.526]$ ; $Norm. - \chi^2(2) = 0.776 [0.679]$ ; $HET - F(8,20) = 1.148 [0.148]$ ; $RESET - F(1,28) = 1.7454 [0.198]$ ;									
<b><u>Long-run elasticities (Long-run response of the domestic rate with respect to):</u></b>									
Base Interest Rate	0.876								
External Debt/GDP	none								
Capital Account Liberalisation	none								

Notes: Heteroscedasticity and autocorrelation consistent standard errors are in parentheses. <sup>+</sup>, <sup>++</sup> and <sup>+++</sup> denotes significance at the 10%, 5% and 1% level respectively. The F-statistic for the respective diagnostics tests are shown and the associated p-value in square brackets.  $R^2$  is the fraction of the variance of the dependent variable explained by the model and *JOINT* is a test of the joint significance of the explanatory variables, *DW* is the Durbin Watson statistic, *AR* is the Lagrange multiplier test for *p*-th order residual autocorrelation correlation, *RESET* = Ramsey test for functional form mis-specification (square terms only); *Norm* is the test for normality of the residuals based on the Jarque-Bera test statistic ( $\chi^2(2)$ ). *ARCH* is the autoregressive conditional heteroscedasticity for up to *p*-th order (see Engle, 1982a). *HET* is the unconditional heteroscedasticity test based on the regression of squared residuals on the squared fitted values. Finally, *Chow* (*n*) is Chow's (1960) test for parameter constancy based on breakpoints in the sample (two breakpoints are tested - the sample mid-point and 90th percentile).

**Table 3: Results for Trinidad and Tobago**

$\Delta R_{TT,t} = -2.272 - 0.204 * R_{TT,t-1} + 0.12 * R_{US,t-1} + 0.238 * \Delta R_{US,t-1} + 0.138 * CL_{TT,t-1} - 0.438 * \Delta ED_{TT,t-1} - 1.002 * dumfloat_{t-1}$					
(0.174 <sup>+++</sup> )	(0.918 <sup>+++</sup> )	(0.115 <sup>++</sup> )	(0.067 <sup>++</sup> )	(0.087 <sup>++</sup> )	(0.055 <sup>+++</sup> )
					(0.385 <sup>+++</sup> )
$R^2 = 0.65$ ; $JOINT - F(6,26) = 7.148 [0.000]$ ; $DW = 2.20$ ; $AR - F(2,25) = 0.462 [0.635]$ ; $ARCH - F(1,25) = 0.471 [0.499]$ ; $Norm. - \chi^2(2) = 0.175 [0.916]$ ; $HET - F(11,15) = 0.893 [0.567]$ ; $RESET - F(1,26) = 2.268 [0.144]$ ;					
<b><u>Long-run elasticities (Long-run response of the domestic rate with respect to):</u></b>					
Base Interest Rate	0.590				
External Debt/GDP	non3				
Inflation	none				
Capital Account Liberalisation	0.675				

Notes: Heteroscedasticity and autocorrelation consistent standard errors are in parentheses. <sup>+</sup>, <sup>++</sup> and <sup>+++</sup> denotes significance at the 10%, 5% and 1% level respectively. The F-statistic for the respective diagnostics tests are shown and the associated p-value in square brackets.  $R^2$  is the fraction of the variance of the dependent variable explained by the model and *JOINT* is a test of the joint significance of the explanatory variables, *DW* is the Durbin Watson statistic, *AR* is the Lagrange multiplier test for *p*-th order residual autocorrelation correlation, *RESET* = Ramsey test for functional form mis-specification (square terms only); *Norm* is the test for normality of the residuals based on the Jarque-Bera test statistic ( $\chi^2(2)$ ). *ARCH* is the autoregressive conditional heteroscedasticity for up to *p*-th order (see Engle, 1982a). *HET* is the unconditional heteroscedasticity test based on the regression of squared residuals on the squared fitted values. Finally, *Chow (n)* is Chow's (1960) test for parameter constancy based on breakpoints in the sample (two breakpoints are tested - the sample mid-point and 90th percentile).

**Table 4: Results for Jamaica**

$\Delta R_{J,t} = 1.515 - 0.588 * R_{J,t-1} + 0.042 * R_{US,t-1} + 0.243 * (R_{US,t-1} * \text{float}_{J,t-1}) + 0.679 * \Delta ED_{J,t} + 0.282 * ED_{J,t-1}$	
(0.568 <sup>+++</sup> )	(0.092 <sup>+++</sup> )
(0.035 <sup>+</sup> )	(0.039 <sup>+++</sup> )
(0.082 <sup>+++</sup> )	(0.186 <sup>+++</sup> )
$+ 0.310 * \Delta CL_{J,t-1} + 0.234 * \pi_{J,t-1} + 0.196 * \Delta \pi_{J,t} - 0.123 * \Delta \pi_{J,t-1} + 0.744 * \text{dum2003}$	
(0.197 <sup>+++</sup> )	(0.031 <sup>+++</sup> )
(0.026 <sup>+++</sup> )	(0.020 <sup>+++</sup> )
(0.109 <sup>+++</sup> )	
$R^2 = 0.82$ ; $JOINT - F(10,23) = 18.91$ [0.000]; $DW = 2.61$ ; $AR - F(2,21) = 1.747$ [0.199]	
$ARCH - F(1,21) = 0.146$ [0.706]; $Norm. - \chi^2(2) = 0.848$ [0.655]; $HET - F(16,6) = 0.447$ [0.907]; $RESET - F(1,22) = 1.084$ [0.309];	
<p><b>Long-run elasticities (Long-run response of the domestic rate with respect to):</b></p>	
Base Interest Rate	$\frac{0.042}{0.588} + \frac{0.243 * \text{float}_J}{0.588} = 0.071 + 0.413 * \text{float}$
External Debt/GDP	0.481
Inflation	0.413
Capital Account Liberalisation	none

Notes: Heteroscedasticity and autocorrelation consistent standard errors are in parentheses. <sup>+</sup>, <sup>++</sup> and <sup>+++</sup> denotes significance at the 10%, 5% and 1% level respectively. The F-statistic for the respective diagnostics tests are shown and the associated p-value in square brackets.  $R^2$  is the fraction of the variance of the dependent variable explained by the model and *JOINT* is a test of the joint significance of the explanatory variables, *DW* is the Durbin Watson statistic, *AR* is the Lagrange multiplier test for *p*-th order residual autocorrelation correlation, *RESET* = Ramsey test for functional form mis-specification (square terms only); *Norm* is the test for normality of the residuals based on the Jarque-Bera test statistic ( $\chi^2(2)$ ). *ARCH* is the autoregressive conditional heteroscedasticity for up to *p*-th order (see Engle, 1982a). *HET* is the unconditional heteroscedasticity test based on the regression of squared residuals on the squared fitted values. Finally, *Chow* (*n*) is Chow's (1960) test for parameter constancy based on breakpoints in the sample (two breakpoints are tested - the sample mid-point and 90th percentile).

## **Conclusion**

This paper takes up the issue of how an exchange rate regime affects monetary policy, empirically evaluating it in the context of Caribbean countries. In particular, the fixed exchange rate economy of Barbados is contrasted with the managed float of Trinidad and Tobago and the flexible rate of Jamaica in the context of an uncovered interest rate parity equation extended to include the impact of capital controls and shocks related to external debt and inflation. The main result is that monetary policy in the fixed rate country follows more closely that of the base country than in the “floaters”, suggesting that the open-economy trilemma framework is an adequate characterisation of policy analysis in these countries; fixed rates involve a loss of monetary policy autonomy.

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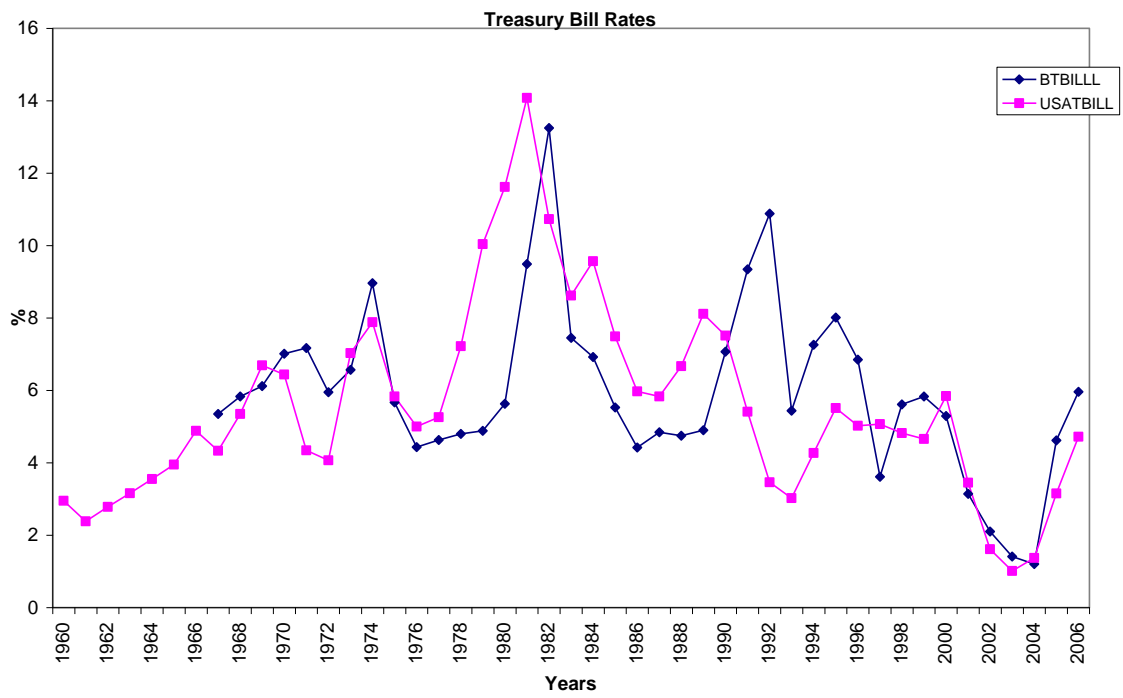
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Treasury Bill Rates

