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CO-MOVEMENTS BETWEEN FOREIGN AND DOMESTIC INTEREST RATES IN A FIXED EXCHANGE RATE REGIME: THE CASE OF THE ECCU AND THE US

By

Kari H. I. Grenade

And

Winston Moore

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CO-MOVEMENTS BETWEEN FOREIGN AND DOMESTIC INTEREST RATES IN A FIXED EXCHANGE RATE REGIME: THE CASE OF THE ECCU AND THE US

KARI H. I. GRENADE[1]
Eastern Caribbean Central Bank

And

WINSTON MOORE[2]
Department of Economics
University of the West Indies
Cave Hill Campus

ABSTRACT:

Economic theory posits that in a fixed exchange rate regime with unrestricted capital flows, domestic interest rates must track closely those of the country to which the currency is pegged. This paper empirically tests this theory by investigating the sensitivity of interest rates in the Eastern Caribbean Currency Union (ECCU) to changes in the US rates. The empirical results show long –run convergence between the two rates, indicating that interest rate parity holds for all countries in the ECCU. In the short–run, changes in the Fed funds rate have an almost immediate impact on lending rates and T-bill rates in the ECCU. The paper extends the empirical literature on the transmission of foreign interest rate changes and monetary policy independence in small open economies with fixed exchange rates.

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Keywords: Interest Rate Parity, Unit Roots, Interest Rate Adjustments, Fixed Exchange Rate, ECCU

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[1] Kari Grenade has been employed as an Economist in the Research Department of the ECCB since 2004. Her email address is kari.grenade@eccb-centralbank.org.
[2] Winston Moore joined the staff of the Economics Department in 2006 after serving for many years as a Senior Economist with the Central Bank of Barbados. His email address is winston.moore@uwichill.edu.bb .

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1.0 INTRODUCTION

This study investigates the sensitivity of domestic interest rates to changes in foreign interest rates by testing the interest rate parity hypothesis using data on the ECCU[3]. The countries of the ECCU share a common central bank, The Eastern Caribbean Central Bank (ECCB), and a common currency which has been pegged to the US dollar at EC$2.70=US$1 since 1976.

Interest rate parity can be applied at the microeconomic level or the macroeconomic level. At the micro level, interest rate parity holds when financial markets are efficient and there are no restrictions on the flow of capital across borders. At the macro level, interest rate parity suggests that domestic and foreign interest rates should equalise in the long run.

The logic of how domestic interest rates should respond to changes in the base country interest rate in a fixed exchange rate regime is explained by the notion of the open economy trilemma and the interest rate parity theorem. Policy makers in open economies face a macroeconomic trilemma. Typically they are confronted with three desirable objectives which, unfortunately, cannot be pursued simultaneously. Only two of the three objectives can be mutually consistent. The three objectives are: (1) to stabilise the exchange rate, (2) to enjoy unrestricted mobility of international capital and (3) to engage in independent monetary policies.

The trilemma suggests that countries with a fixed exchange rate and open capital markets must forfeit monetary autonomy and adopt the monetary policies of the country to which their currency is pegged. When capital markets are open, the interest rate parity condition posits that the domestic nominal interest rate must equal the foreign interest rate plus the expected change in the nominal exchange rate plus the risk premium on similar financial assets in the two countries.

[3] The ECCU has eight members: Antigua and Barbuda, Dominica, Grenada, St Kitts and Nevis, St Lucia and St Vincent and the Grenadines which are independent states and Anguilla and Montserrat which are British Overseas Territories.

Under the combination of no currency volatility, very small risk differentials and perfect capital mobility that typify the ECCU, the domestic interest rates cannot be set with any autonomy but rather, must track closely those prevailing in the US. In other words domestic monetary policy becomes impotent.

This study makes a concerted effort to discover the response of local interest rates to shocks in the US rates. An understanding of how the US rates impact domestic rates is particularly important in an era of high and rising interest rates in the US. The fixed exchange rate between the EC$ and the US$ makes the local economies highly susceptible to conditions in the US. High interest rates in the US have the potential to profoundly impact the economies of the ECCU by affecting investment flows, external borrowing costs and ultimately annual GDP growth. This study differs from the existing literature by attempting to investigate the response of interest rates in a monetary union to those abroad. An understanding of how foreign interest rates impact on domestic rates is particularly important for policy making in the ECCU.

The remainder of this paper is structured as follows; Section 2 provides a review of the related empirical literature. Section 3 describes the empirical methodology and data while Section 4 provides the results. Section 5 discusses the policy implications and section 6 concludes.

2.0 LITERATURE REVIEW

Monetary independence under different currency arrangements is a proverbial issue in international economics literature; empirical investigation, however, is fairly new. Edwards (1998) was the first to investigate the issue. Edwards (1998) as cited in Sahminan (2005) investigates interest rate behaviour in Argentina, Chile and Mexico, particularly examining volatility contagion from Mexico to Argentina and Chile. His headline finding is that there was a spillover from Mexico's financial market volatility into Argentina's but not into Chile's. Hausmann et al (1999) as cited in Shambaugh (2003) study the reaction of domestic interest rates to changes in foreign interest rates under both fixed and flexible exchange rate regimes.

They find that Argentina (the peg) reacts the least to changes in interest rates in the US, while Mexico (the float) reacts the most with Venezuela (the weak peg) in the middle. The study concludes that the monetary freedom associated with a floating exchange rate regime does not exist for all countries. Shambaugh (2003) cautions that the interpretation of the results is unclear given the possibility of spurious regressions due to unit roots in the data.

Borenzstein et al (2001) avoid the problems of spurious regressions by considering the changes in domestic interest rates to estimated monetary policy shocks in the base country. They investigate the impact on the exchange rate regimes of the effects of external factors on the domestic interest rates in several emerging market economies. Their finding is equivocal as to the sensitivity of domestic interest rates to external shocks in countries with a fixed exchange rate. For example, the comparison between Hong Kong and Singapore supports the hypothesis, while the hypothesis is not supported when comparison is done between Argentina and Mexico.

According to Frankel et al (2002) the aforementioned studies have been limited to a handful of countries or regions over short time periods. They test whether the transmission of international interest rate changes to local interest rates is affected by exchange rate regimes using data from both industrial and developing countries over three decades. The main finding of their study is that floating regimes appear to offer some degree of monetary independence, at least temporarily. In the long run, however, international rates have large effects on local interest rates in most countries despite their exchange rate regimes. The only exceptions are Germany and Japan, for which they find no evidence in the data of a long run relationship between the local and the international (US) rates. Frankel et al (2002) point out an important caveat of their analysis. In their study, monetary independence is based on the observed degree of co-movement of the domestic and foreign interest rate. The authors admit that their approach could understate the actual degree of monetary independence offered by non-pegged regimes if the monetary authorities choose not to make use of their monetary autonomy.

Using data of 100 countries over the period 1973 to 2000, Shambaugh (2003) provides evidence that peg countries follow base country interest rate more than non-pegs, a result that is directly opposite to Frankel et al (2002). According to Shambaugh (2003) the contrast in the two studies has to do more with differences in econometric methodologies and interpretations.

Obstfeld et al (2004) have extended Shambaugh's (2003) paper by testing whether the trilemma of open economy existed in a long period from the gold standard until Post-Bretton Wood era. The overall result is that exchange rate pegs do result in a substantially closer connection to the base country interest rate than non-pegs. In the absence of capital controls, countries with a fixed exchange rate lose considerable monetary independence, while non-pegs seem to have a fair amount of monetary independence.

Sahminan (2005), using a sample of Southeast Asian countries, shows that exchange rate regimes do not have clear-cut implications on the transmission of international financial markets into domestic interest rates and exchange rates. Irrespective of the exchange rate regime, movements in the domestic rates are mainly caused by domestic factors.

Indeed, the hypothesis that the response of domestic interest rates to changes in foreign interest rates is different under different exchange rate regime is not always supported.

3.0 EMPIRICAL RESEARCH

The empirical methodology adopted in this study involves two approaches. The first approach involves testing the interest rate parity hypothesis to determine whether or not the theorem holds between interest rates in the ECCU and the US. In the context of the ECCU and the US a test of interest rate parity is simply a test of stability and convergence of the interest rate differential series. Interest rate parity is fundamentally a long-term concept; the short run adjustment process, however, is also of interest, particularly to monetary policy makers. Therefore, the second approach involves the estimation of vector autoregressive (VAR) models. These are used to generate impulse response functions to determine the responsiveness of domestic interest rates to shocks to the foreign interest rates in the short-run.

3.1 Interest Rate Parity

The traditional interest rate parity condition states that the forward exchange rate (f) should be an unbiased forecast of the future exchange (s_{t+1}). The relation can be formulated as:

$$E(s_{t+1}) - s_t = \alpha + \beta(f_t - s_t) + \varepsilon_{t+1} \tag{1}$$

where E is the expectations operator, s_t is the logarithm of the current exchange rate and ε_{t+1} is the error term which is assumed to be stationary and normally distributed with mean zero and variance σ^2.

Covered interest rate parity implies that:

$$f_t - s_t = r_t - r_t^* \tag{2}$$

where r_t is the domestic interest rate and r_t^* is the foreign interest rate. Substituting Equation (2) into Equation (1):

$$E(s_{t+1}) - s_t = \alpha + \beta(r_t - r_t^*) + \varepsilon_{t+1} \tag{3}$$

If the coefficient β is not statistically different from 1, it implies that uncovered interest rate parity holds. Equation (3) cannot be estimated for the ECCU, however, since the countries have a fixed-exchange rate regime with a quasi-currency board arrangement. Noting that in a fixed-exchange rate system $E(s_{t+1}) - s_t = 0$, Equation (3) can be re-written as:

$$r_t - r_t^* = \frac{-\alpha + \varepsilon_{t+1}}{\beta} \tag{4}$$

where the right hand side of Equation (4) is a non-zero stationary term. Thus, one can test whether interest rate parity holds between the US and the ECCU by evaluating if the interest rate differences are stationary.

The test of interest rate parity can be done by specifying the null hypothesis as:

$$H_0 : x_{it} \equiv (r_{it} - r_{*t}) = I(1) \quad \forall i = 1,\ldots,N \tag{5}$$

where x_{it} is the difference in the interest rate of country i relative to the benchmark country, $N+1$ is the total number of countries studied, and $I(1)$ denotes a unit root non-stationary process. Unit root tests can therefore be used to evaluate the null hypothesis given in Equation (5). However, given Equation (4), then it may be more appropriate to test the null that the difference between the two interest rate series is stationary:

$$H_0 : x_{it} \equiv (r_{it} - r_{*t}) = I(0) \quad \forall i = 1,\ldots, N \tag{6}$$

where $I(0)$ denotes a stationary stochastic process. In this case, stationarity tests should be employed.

The most popular unit root test in the applied econometric literature is the Augmented Dickey-Fuller (ADF) test. The ADF test uses a regression of the following form:

$$\Delta x_t = \alpha x_{t-1} + \sum_{j=1}^{k} \beta_j \Delta x_{t-j} + \varepsilon_t \tag{7}$$

where ε_t is a stationary error and the null hypothesis of a unit root process is rejected if the coefficient α is significantly less than zero. The lagged terms of the dependent variable are included to control for serial correlation in the residuals. The test allows for a constant and the Akaike criterion to be used to select the optimal lag length. The authors also compute the relatively new GLS-based alternative of Elliot, Rothenberg and Stock (1996), denoted by ERS, which has been found to be more powerful for detecting convergence (see Harvey and Bates, 2003) and the Ng and Perron (2001) version of the ERS which both have better power and size characteristics relative to the ADF type tests.

The ERS test is based on a quasi-differencing regression. If one denote the residuals from that regression as $\hat{\omega}_t(a)$, where $a = \bar{a}$:

$$\bar{a} = \begin{cases} 1 - 7/T & if \ g_t = (1) \\ 1 - 13.5/T & if \ g_t = (1,t) \end{cases}$$

and g_t are exogenous regressors such as a constant or a trend. The ERS test statistic is given as:

$$ERS_T = \frac{SSR(\bar{a}) - (\bar{a})SSR(1)}{f_0} \tag{8}$$

where $SSR(a) = \sum \hat{n}_t^2(a)$, the sum-of-squared residuals function and f_0, is an estimator of the residual spectrum at frequency zero. The Ng and Perron (2001) also de-trends the series before calculating the test statistics. Ng and Perron first define the term $\kappa = \sum_{t=2}^{T} \left(y_{t-1}^d\right)^2 / T^2$, which is then used in the modified ERS statistic:

$$Ng - Perron\ ERS = \frac{\overline{a}^2 \kappa - \overline{a} T^{-1} \left(y_T^d\right)^2}{f_0} \tag{9}$$

where $\overline{a} = -7$.

To test for stability, the authors employ the Kwiatkowski, *et. al.* (1992) test where the null is stationarity and the alternative non-stationarity or a unit root. Kwiatkowski, et. al. (KPSS) assumes that a variable can be decomposed into a deterministic trend ($x(t)$), a random walk ($x(s)$) and a stationary error:

$$x_t = x(t) + x(s) + \varepsilon_t \tag{10}$$

where $x(s)_t = x(s)_{t-1} + u_t$. If the variable is stationary, then $\sigma_u = 0$. This hypothesis can be tested by computing the ratio of the partial sums $S = \sum_{i=n}^{N} \varepsilon_t$ of the residuals from a regression of y_t on a lagged dependent variable (a trend and a intercept may also be included) and the error variance:

$$LM = \sum_{t=1}^{N} S_t^2 \Big/ \hat{\sigma}_\varepsilon^2 . \tag{11}$$

If the computed statistic is larger than the critical value the null hypothesis of stationarity is rejected.

One can also test for convergence and stability across a group of countries using multivariate tests. Let X_{it} be the vector of contrasts between each of the $n+1$ countries and a benchmark country. The authors use three multivariate tests for convergence: the Levin, Lin and Chu (2002), the Breitung (2000) and Im, Pesaran and Shin (1997). The Levin, Lin and Chu and Breitung tests both use a multivariate version of Equation (3):

$$\Delta x_{it} = \alpha_i x_{it-1} + \sum_{j=1}^{k_i} \beta_{ij} \Delta x_{it-j} + \varepsilon_{it} \tag{12}$$

where the lag orders for the difference terms are given by k_i. The Levin, Lin and Chu as well as the Breitung tests both assume that $\alpha_i = \alpha$, or that the persistence parameter is common across all cross-sections (i.e. there is a common unit root process). The Levin, Lin and Chu derive estimates of α from values for Δx_{it} and Δx_{it-1} that are standardised and free from autocorrelation and deterministic components. The null hypothesis, of a unit root process, is then rejected if the coefficient, α, is significantly less than zero. Breitung only removes the autocorrelation components before standardisation. After standardisation, the deterministic components are removed. Besides these two differences, the two tests are conceptually quite similar. The Im, Pesaran and Shin (1997) test, in contrast, allows the persistence parameter, α_i, to vary across cross-sections. The test estimates separate ADF regressions for each cross-section, averages and standardises the t-ratios on α_i to obtain the test statistic.

To test for stability the authors employ the Hadri (2000) stationarity test. Similar to the KPSS test, it has a null hypothesis of no unit root in any of the series in the panel. The Hadri test is based on the residuals from the individual OLS regressions of x_{it} on a constant, or on a constant and a trend. The test statistic is then obtained by averaging the individual test statistics.

3.2 The Dynamics of Interest Rate Adjustment

If interest rate parity holds, it suggests that in the long run there is a one-to-one relationship between interest rates in the US and those in the ECCU. However, it is still important for monetary policy purposes to have an idea of the short run adjustment process. If all of the variables in the model are integrated of order zero, then an unrestricted Vector Autoregressive (VAR) model is appropriate for this purpose. The model is of the following form:

$$y_t = A_1 y_{t-1} + \ldots + A_p y_{t-p} + u_t \tag{13}$$

where $u = (u_{1t}, \ldots, u_{Kt})'$ is an unobservable error term that is normally independently distributed with full variance-covariance matrix Σ and A_i are $K \times K$ coefficient matrices. The process is stable if $\det(I_K - A_1 z - \ldots - A_p z^p \neq 0$ for $|z| \leq 1$ (the roots).

The authors estimate ten VAR models; one for each member of the ECCU, one for the overall ECCU weighted average lending rate and one for the ECCU average Treasury bill rate. The other endogenous variables included in the model are the US Federal Funds rate and the US Treasury Bill rate. The US prime lending rate is included as an exogenous variable. The optimal lag length for the VAR is obtained via the Hannan and Quinn criterion. In addition, the roots of the model are checked to ensure that the stability condition is satisfied. The VAR can also be used to assess the dynamics of interest rate adjustment. Impulse responses, derived from the VAR, allow one to trace out the effects of shocks in the variables of a given system. Using the Wold moving average representation of y_t gives:

$$y_t = \Phi_0 u_t + \Phi_1 u_{t-1} + \Phi_2 u_{t-2} + \ldots \tag{14}$$

where $\Phi_0 = I_K$. The coefficients of Equation (14) give the responses to impulses to the system. Given that the variables in the system are $I(0)$, this implies that $\Phi_s \to \infty$ as $s \to 0$, or that the effect of the shock should vanish over time. Impulse responses are also generated to determine the responsiveness of domestic interest rates to shocks to the foreign interest rates. Atsuyuki and Tufte (1997) provide a Monte Carlo experiment that suggests that the impulse response functions of vector error correction (VEC) models and VAR models are similar at short horizons, but different at long horizons, which suggests that the loss of efficiency from VAR estimation is not critical at the commonly used short horizon.

3.3 Data

The observations used in the study cover the period March 1980 to December 2005 and are at quarterly frequency. The weighted average lending rates are employed as the main proxy for the domestic interest rate because they reflect market forces better than deposit rates.[4]

[4] The ECCB sets the minimum deposit rate paid by commercial banks.

Experiments are also done using quarterly 90-day T-bill rates. The main proxy for the foreign interest rate is the quarterly Federal Funds Rate (FED_US), but experiments are also done using the US 90-day T-bill rates (TB_US). All interest rates are in nominal terms.

The domestic series are sourced from the ECCB's database while the foreign series are sourced from the IMF's IFS (CD-Rom) and Bloomberg. The US 90-day T-bill rates and the quarterly lending rates are obtained from the IMF IFS (CD-ROM) while the Federal fund rates are sourced from Bloomberg. Descriptive statistics over the period are shown in Table 1. The table shows that the mean interest rate for the ECCU as a whole for the period was 11.4 per cent, with some countries above the average (Saint Lucia) and others below (Anguilla, Dominica, and St Kitts-Nevis). Lending rates in the monetary union are, on average, 2.41 percentage points higher than those in the US, probably reflecting the level of development in that market and the lack of competition in the regional banking system (see Craigwell and Moore, 2003, for an empirical investigation of the impact of market power on interest rates in the Caribbean). Table 1 also shows that the variability of interest rates in the ECCU tends to be lower than that for the US.

Table 2 provides unit root test statistics for all the variables used in the empirical analysis. Three unit root tests and one stationarity test are given. The table shows that all the variables given in the table are integrated of order zero at normal levels of testing.

4.0 EMPIRICAL RESULTS

4.1 Results of Tests for Interest Rate Parity

The procedures described in Section 3.1 are employed to evaluate the interest rate parity for each of the eight OECS countries, as well as the entire monetary union. Before statistical tests are done, the nominal lending rate for the US (the benchmark country) is subtracted from that for each ECCU country, and this is used as the interest rate differential. Figure 1 also plots these interest rate differentials over time on a single chart. A visual inspection reveals that the interest rate differentials are highly correlated, as one would expect for a monetary union.

The results of the univariate test for interest rate parity are given in Table 3. The table provides the critical values and the test statistics for each of the countries, as well as for the entire monetary union. The table shows that the hypothesis of interest rate parity for the entire monetary union holds, as the difference in weighted average interest rates in the ECCU and the US is integrated of order zero.

Looking at the individual country results, all the tests accept the interest rate parity hypothesis in Grenada, Montserrat, St Kitts-Nevis, Saint Lucia and St Vincent and the Grenadines. However, for Antigua and Barbuda and Dominica the ADF test rejected interest rate parity, while in Anguilla, the ERS statistic accepted the null of a unit root. The other three statistics, in all three countries, suggested that the interest rate parity hypothesis should be accepted. The authors also plot the series to identify any outliers that would have impacted on the results. In the case of Anguilla there was a large drop in the interest rate differential between 1990 and 1992, as lending rates fell during the period. Antigua and Barbuda and Dominica experienced a similar downward spike between 1988 and 1990. Given the probable influence of these shocks on the results and the findings from the other tests, the authors also accept the interest rate parity hypothesis for Anguilla, Antigua and Barbuda and Dominica.

Rather than using pair-wise tests, the authors exploit the panel structure of the database to benefit from the superior power properties to conduct multivariate tests of the convergence and stability hypotheses. The results are displayed in Table 4. Three of the tests (the Levin, Lin and Chu, Breitung and Im, Pesaran and Shin) indicate that the interest rate parity hypothesis should be accepted. However, the Hadri test, which specifies the null as stationarity and assumes a common unit root process, rejected interest rate parity at normal levels of testing. This result could imply that while individual countries may have a stable relationship to the benchmark country (the US), these stable paths are not the same across countries. However, this conclusion can be rejected by a visual inspection of Figure 1. Instead, this finding may also reflect the tendency of Hadri's test to over-reject the null hypothesis (Caner and Kilian, 2001).

4.2 Impulse Response Function Analysis

The results in the previous section suggest that the interest rate parity hypothesis holds between the ECCU and the US. Interest rate parity, however, is a long run concept: there is a one-to-one relationship between interest rates in the ECCU and the US in the long run. However, the short run adjustment mechanism is also important for monetary policy purposes. This section therefore presents the short-run adjustment mechanism of shocks to US interest rates on the ECCU.

The impulse responses of lending rates in the ECCU to changes in the Fed Funds rate and US Treasury Bill rates are provided in Figure 2. Generalised impulse responses are employed since the VAR order does not alter the results (Pesaran and Shin, 1998). The first two figures are for the weighted average lending rate of the ECCU. They show that in the short run a shock to either the Fed Funds rate or the US Treasury Bill rate has an almost immediate impact on lending rates. The response path exhibits an inverted U-shared pattern, with the response reaching a maximum at about 3 quarters after the shock, and then slowly dissipating. In the long run, interest rates adjust and the significant effect of these shocks vanish (after about 3 to 4 years). The figure also shows that ECCU lending rate tends to have a much larger response to Fed rate shocks than to T-bill shocks.

The results for each of the other countries in the monetary union are provided in Figure 2. The pattern of adjustment in each country is quite similar to that observed above. However, response pattern varies slightly in some countries. In Grenada, Montserrat, and Saint Lucia, the impact of the shocks dissipates after about 5 quarters, while that for the other countries is somewhat slower. Shocks to the US Fed and T-bill rate tend to have a large impact on lending rates in Anguilla, Antigua and Barbuda, Saint Lucia and St Vincent and the Grenadines.

Impulse responses are plotted for the weighted average T-bill rates for the ECCU against US rates and the results are provided in Figure 3. The figure shows that shocks to the US T-bill rate also have an inverted U-shape, but with a small initial impact, reaching a maximum at about 6 to 8 quarters after the shock, and then dissipating thereafter.

The pattern of adjustment of the ECCU T-bill rate to changes in the Fed rate is somewhat different. There is an initial small decline, but then the rate rises. This pattern of adjustment could suggest that after an increase in the Fed rate, market agents expect ECCU T-bill rates to rise and therefore increase demand for these investment instruments. This causes an initial rise in price and fall in the interest rate on T-bills.

A similar undershooting is observed for the European Monetary Union (EMU) by Antzoulatos (2002). The authors note that the yield on French benchmark government bonds should be the same as those of German bonds (plus some liquidity premia), since there is no exchange rate risk in the EMU. Antzoulatos and Vallianatos report a small, but statistically significant undershooting in response to changes in German yield on French government bonds.

5.0 POLICY IMPLICATIONS

There are three important findings of the study. First, interest rate parity holds for all the countries in the ECCU. Second, the domestic rates are very sensitive to changes in the US rates with lending rates in the ECCU having an almost immediate response to shocks in the US Fed Funds rates and the treasury bill rates and third, the responsiveness of domestic rates to shocks in US rates are dissimilar across countries in the monetary union.

The finding that interest rate parity holds for all countries suggests that in the absence of exchange rate controls, attempts by the ECCB to move domestic interest rates will lead to pressures on the foreign exchange reserves given the fixity of the exchange rate. This result suggests that the brunt of domestic adjustment in the countries of the ECCU should be through fiscal policy changes rather than monetary policy adjustments. The impulse response function analysis shows that the domestic rates are sensitive to the changes in the US rates even in the short run, with lending rates in the ECCU having an immediate response to shocks in the US Fed Funds rates and Treasury bill rates. Forecast of future monetary policy changes in the US should therefore be a key component of forecasts of macroeconomic developments in the monetary union. In addition, the microeconomic impact of these exogenous interest rate changes on commercial banks in the union could be evaluated through the use of a financial stability assessment model (see Chase, et al, 2005).

The impulse response functions analysis also shows that although the pattern of response of domestic interest rates to changes to shocks in the US rates is broadly similar, there are some differences. For example, in Grenada, Montserrat, and Saint Lucia, the impact of the shocks dissipates after about 5 quarters, while that for the other countries is somewhat slower. The differences may be explained by different market structures, different holdings of treasuries across commercial banks in the ECCU and generally different internal policies at the commercial banking level across the union. Policymakers should take these differences into account.

The results of the impulse responses are particularly interesting. They provide empirical facts that would make policymakers think more creatively about how to manage economic policy trade offs in an environment of limited policy space (in this case monetary policy), multiple policy objectives and few policy instruments. Indeed, the results imply that the "trilemma" is alive and well. The ECCU cannot pursue independent monetary policy while at the same time fixing its exchange rate to the US and operating with unrestricted capital flows. While the fixed exchange rate provides price stability and financial fortitude, it makes the ECCU economies very vulnerable to macroeconomic conditions in the US. The results of the impulse response functions show unequivocally that interest rates in the ECCU economies are not insulated from interest rate shocks in the US.

6.0 CONCLUSION

This study tests the interest rate hypothesis for the case of the ECCU and the US. The authors note that since the ECCU operates in a fixed exchange rate regime, this would imply that the interest rate differential between the ECCU countries and US should be a non-zero mean stationary variable. The paper therefore exploits univariate and multivariate tests of the unit root and stationarity hypothesis of the interest rate differentials, as tests of the interest rate parity hypothesis.

All the tests accepted the interest rate parity hypothesis for Grenada, Montserrat, St Kitts-Nevis, Saint Lucia and St Vincent and the Grenadines. However, in the case of Antigua and Barbuda, Anguilla and Dominica, some of the tests rejected the interest rate parity hypothesis. This result seems to have been due to the probable influence on the test statistics of exogenous interest rate shocks in each of the three countries. Nevertheless, the other three test statistics all accepted the interest rate parity hypothesis for Antigua and Barbuda, Anguilla and Dominica.

Interest rate parity is a long run concept. However, the short run adjustment mechanism is also important for monetary policy purposes. The impulse responses of lending rates in the ECCU to changes in the Fed Funds rate and US Treasury Bill rates show that in the short run a shock to either the Fed Funds rate or the US Treasury Bill rate has an almost immediate impact on lending rates. The response path exhibits an inverted U-shared pattern, with the response reaching a maximum at about 3 quarters after the shock, and then slowly dissipating. The results also show that ECCU lending rates tend to have a much larger response to Fed rate shocks than to T-bill shocks.

The main policy implication of the findings is that the small open economies of the ECCU are susceptible to exogenous changes in US monetary policy. It is therefore critical that policy makers in the ECCU commit to making the region's legal, regulatory and fiscal framework stronger with a view to reducing the risks of capital flow reversals under a regime of fixed exchange rate and free capital mobility.

An important caveat of the study is that it does not explore the issue of market efficiency and transaction costs, which characterises many discussions of the interest rate parity theorem. This study offers much scope for further research. An assessment of the macroeconomic impact of foreign interest rate changes on capital flows, external trade, inflation and aggregate output would be an interesting issue for future research.

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Appendices

Table 1: Descriptive Statistics

	Mean	Maximum	Minimum	Standard Deviation	Jarque-Bera	P-Value	Observations
LR_ANG	10.670	13.140	4.240	2.225	56.725	0.000	72
LR_ANT	12.532	15.000	10.000	0.917	0.156	0.925	95
LR_DOM	10.817	12.180	7.950	0.818	23.922	0.000	95
LR_GRE	11.104	12.390	9.500	0.742	5.518	0.063	95
LR_MON	11.055	12.390	9.500	0.755	5.537	0.063	95
LR_SKN	10.926	13.080	9.000	0.959	5.295	0.071	100
LR_SLU	12.277	16.210	9.730	1.359	0.064	0.969	98
LR_SVG	11.429	14.000	8.800	0.879	4.732	0.094	101
LR_ECCU	11.395	14.000	8.800	0.933	6.445	0.040	101
LR_US	8.990	20.320	4.000	3.434	35.405	0.000	104
FED_US	6.490	17.780	1.000	3.738	20.452	0.000	104
TB_US	5.912	15.090	0.920	3.208	13.675	0.001	104

Table 2: Unit Root and Stationary Tests

	ADF - Intercept	ERS	Ng-Perron (ERS)	KPSS
Critical Values –				
1%	-3.503	1.948	1.780	0.739
5%	-2.893	3.112	3.170	0.463
10%	-2.584	4.176	4.450	0.347
LR_ANG	-3.312	0.308	0.363	0.122
LR_ANT	-3.456	8.269	6.596	0.413
LR_DOM	-3.422	11.366	12.791	0.563
LR_GRE	-3.958	5.142	3.514	0.182
LR_MON	-3.688	4.639	3.372	0.123
LR_SKN	-2.827	8.926	6.257	0.232
LR_SLU	-3.189	1.917	2.069	0.109
LR_SVG	-2.389	6.373	5.442	0.199
LR_ECCU	-2.223	5.832	6.748	0.224
LR_US	-2.347	22.891	15.823	0.859
FED_US	-1.952	26.484	18.255	0.966
TB_US	-2.634	59.231	35.156	0.974

Table 3: Univariate Tests of Interest Rate Parity

	ADF - Intercept	ERS	Ng-Perron (ERS)	KPSS
Critical Values –				
1%	-4.062	1.929	1.780	0.216
5%	-3.460	3.074	3.170	0.146
10%	-3.156	4.102	4.450	0.119
AGU-US	-3.324*	1.837	1.867*	0.053*
ANT-US	-3.072	40.481*	37.820*	0.085*
DOM-US	-2.509	65.287*	44.589*	0.140*
GRE-US	-4.615*	34.428*	182.992*	0.092*
MON-US	-4.716*	30.872*	160.660*	0.091*
SKN-US	-3.199*	71.196*	34.347*	0.160*
SLU-US	-3.784*	21.106*	13.705*	0.050*
SVG-US	-3.578*	33.204*	15.930*	0.159*
ECCU-US	-4.084*	29.885*	14.089*	0.160*

Note: * indicates evidence of interest rate parity.

Table 4: Multivariate Tests of Interest Rate Parity

	Statistic	P-value	Cross-Sections	Observations
Tests for Convergence				
Levin, Lin and Chu	-4.821*	0.000	9	819
Breitung	-1.428*	0.077	9	810
Im, Pesaran and Shin	-4.951*	0.000	9	819
Test for Stability				
Hadri	12.200	0.000	9	852

Note: * indicates evidence of interest rate parity.

Figure 1: Interest Rate Differentials

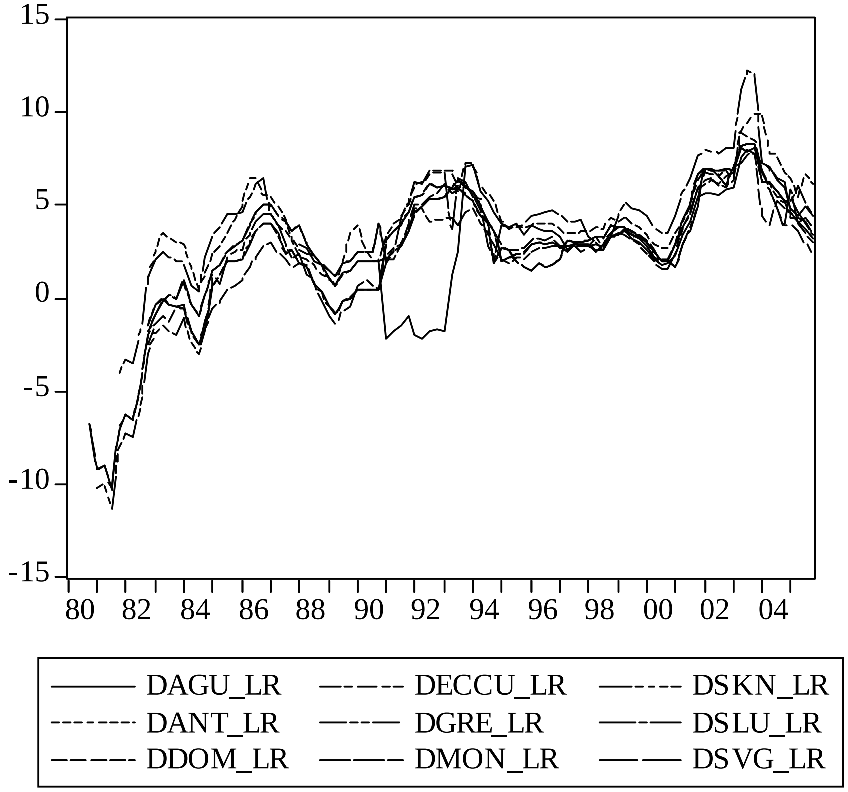

Figure 2: Generalised Impulse Responses, Lending Rates

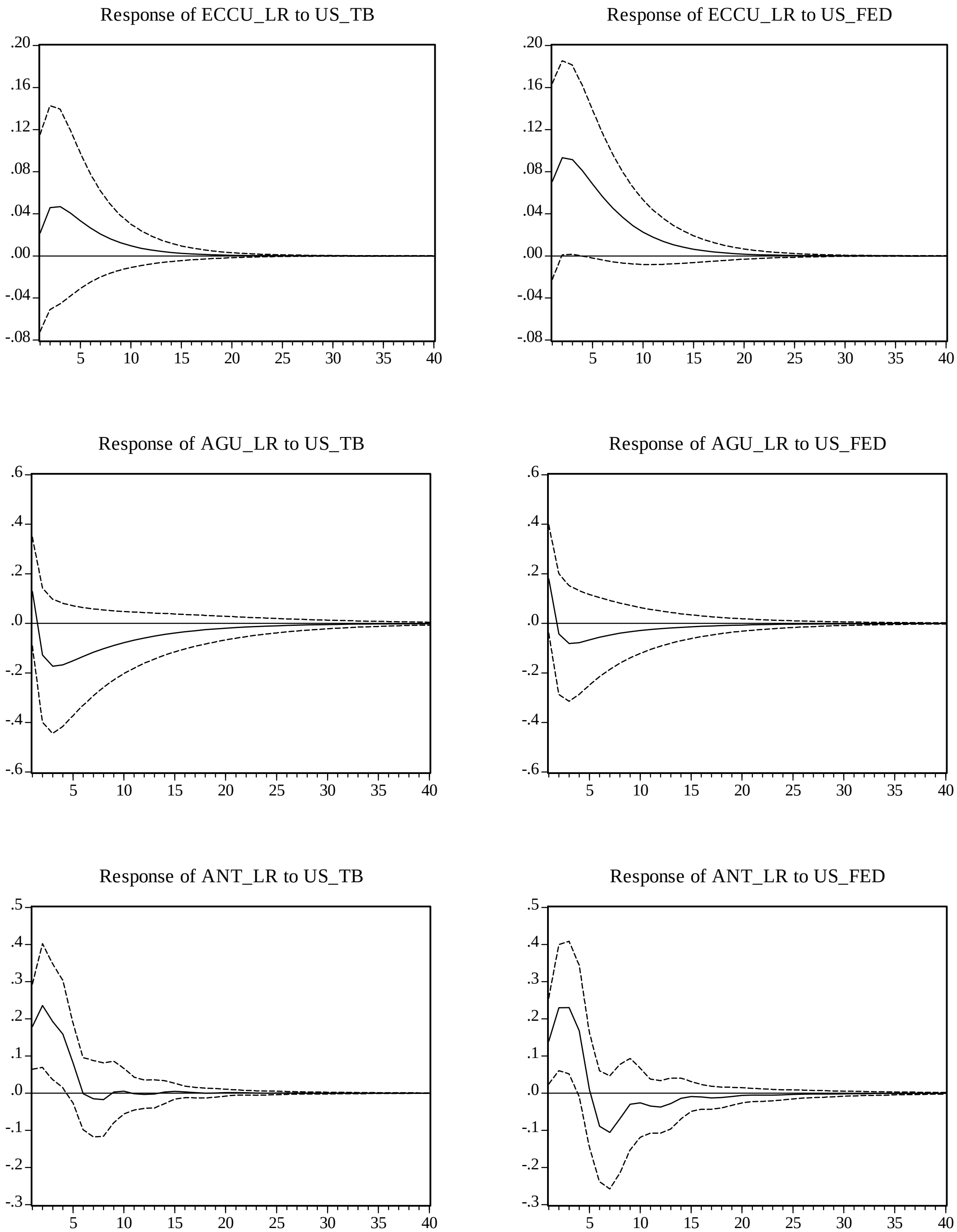

Figure 2 (cont'd): Generalised Impulse Responses, Lending Rates

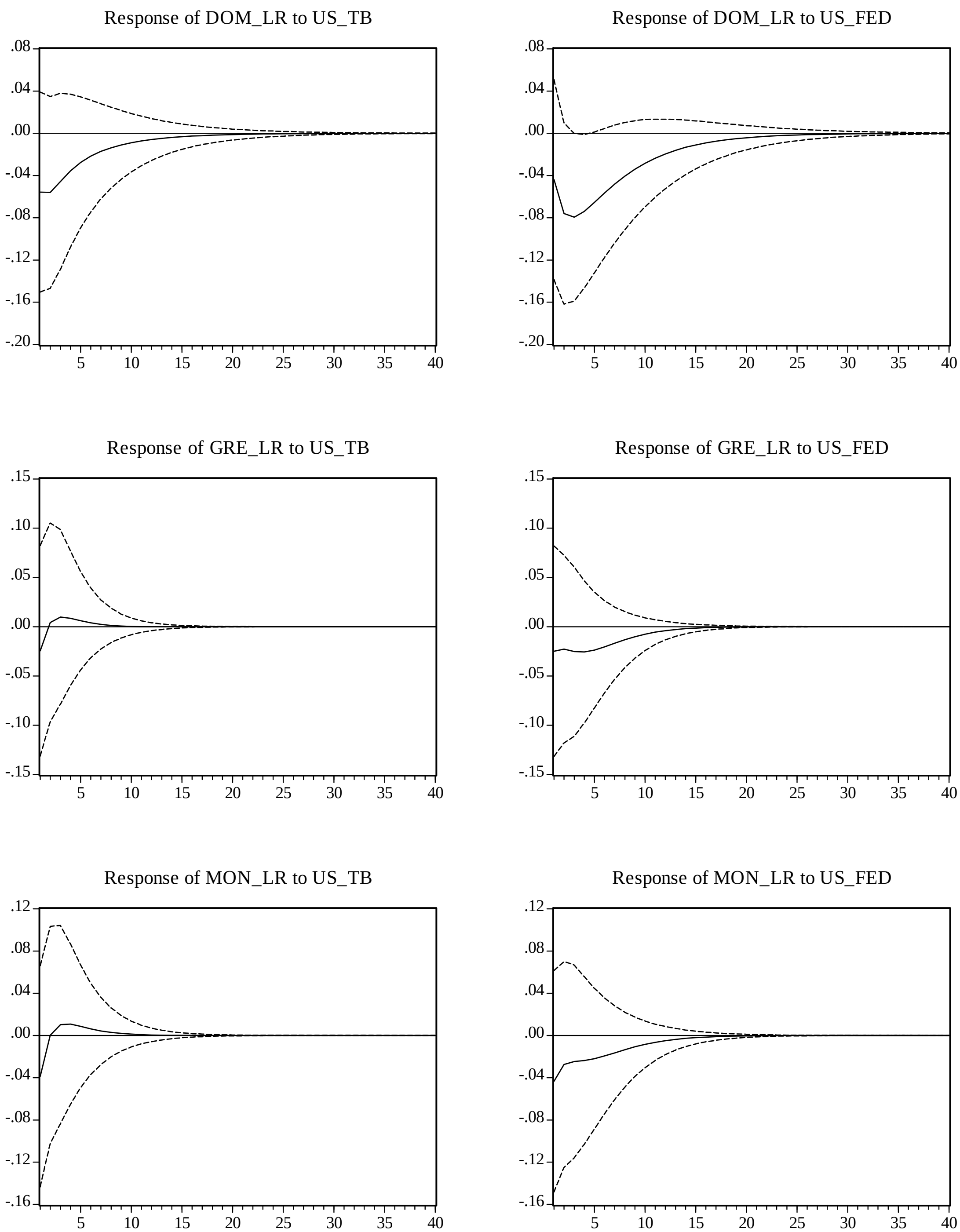

Figure 2 (cont'd): Generalised Impulse Responses, Lending Rates

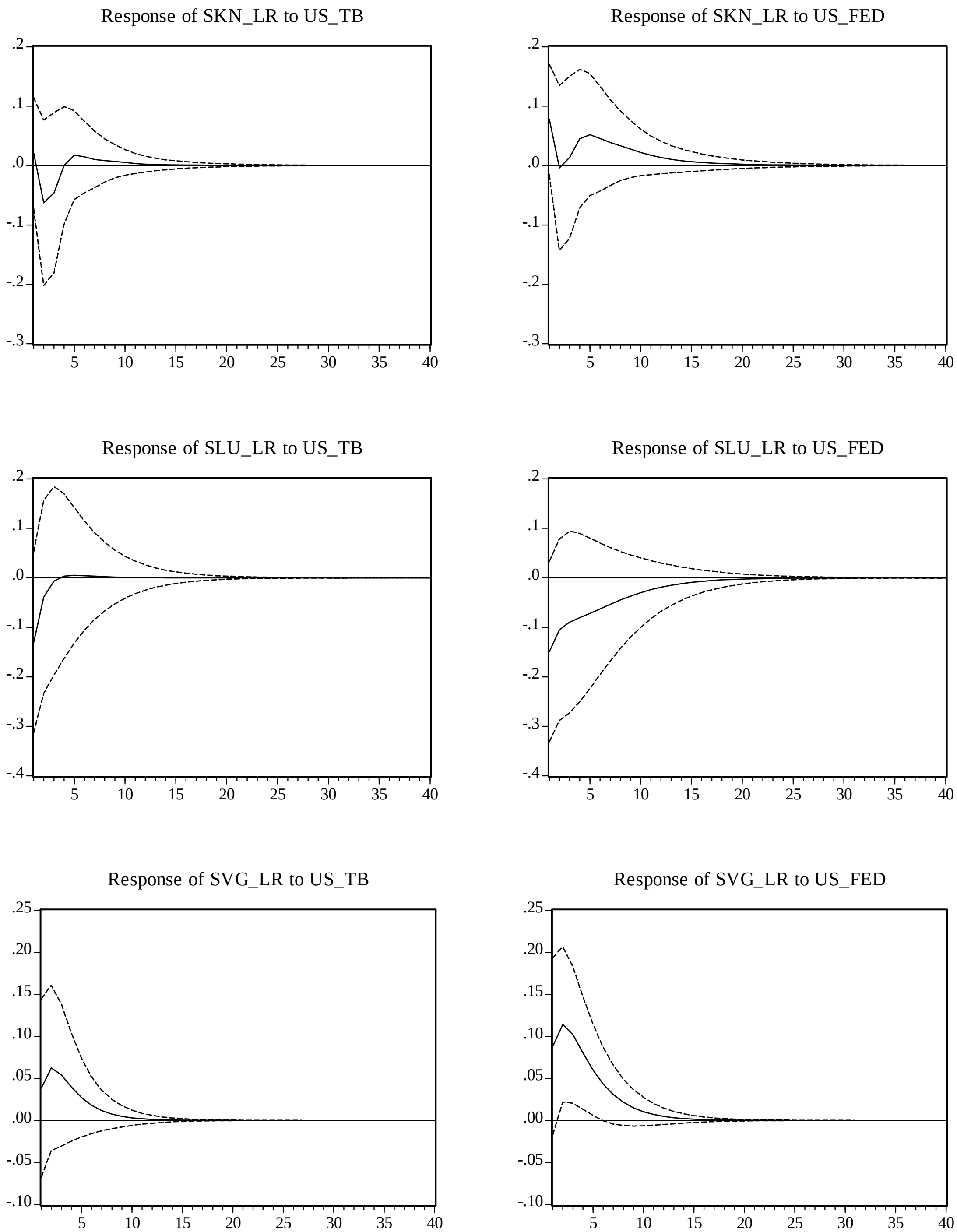

Figure 3: Generalised Impulse Responses, Treasury Bill Rates