Intervention in the Foreign Exchange Market, Market Turnover and the Impact on Exchange and Interest Rate Dynamics in the Caribbean

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FORMAT OF PRESENTATION

1. Introduction
2. Literature Review
3. Empirical Methodology
3. Results
4. Conclusions

INTRODUCTION - RATIONALE

- The Importance of Exchange Rate "Management" – Intervention, Policy Interest Rates
- The importance of the Policy Environment – Volume, Volatility and Market Structure
- The Need for Empirical Facts to Inform Intervention Policy
- The Observed Relation and Feedback Effects between Intervention and Monetary Variables
- The Increasing Frequency of Shocks and the Need to Manage Liquidity at a Daily Frequency
- The Need for a Joint Empirical framework to look at a number of issues Simultaneously
- The Rationale for Multivariate GARCH

LITERATURE REVIEW – The Channel of Intervention

- **Portfolio – Rebalancing of Agents' Portfolios (Galati and Melick 2002)**
- **Market Microstructure – Emits information which modify expectations and change order flows (Lyons 2001)**
- **Signalling – Signaling to agents the future stance of monetary Policy (Mussa 1981; Canales-Kriljenko et. Al. 2003)**

LITERATURE REVIEW – EMPIRICAL METHODS

- **Good Reviews are Provided by Edison (1993) and Sarno and Taylor (2001)**
- **OLS Regression of means, risk premiums and order flow - Dominquez and Frankel (1993); Evans and Lyons (2002)**
- **Event Studies – Fatum (2000)**
- **GARCH – Dominquez (1998); Seerattan (2004)**
- **Markov Switching – Beine et.al. (2003); Seerattan and Spagnolo (2007)**
- **Multivariate GARCH – Beine (2004), Kim and Sheen (2006)**

THE RATIONALE FOR THE MULTIVARIATE GARCH

- Can Explore the Full Range of Relations and Feedback Effects
- Can Investigate the Impact of Policy on both the 1st and 2nd Moments
- Daily Data Used Since CBs Now Need to Respond on Daily Basis
- It Allows the Derivation of Conditional Covariance and Correlation of Important Variable Over Time –The Cost of Policy Conflicts Due to Unsynchronized Implementation of Related Policy Instruments
- The BEKK Parametization chosen – Reduces no. parameters to be estimated & covariance matrix will be positive semi-definite without additional restrictions being imposed

MULTIVARIATE GARCH - BEKK

$$H_{t+1} = C'C + A'\varepsilon_t\varepsilon_t'A + B'H_tB$$

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} \quad B = \begin{bmatrix} b_{11} & b_{12} & b_{13} & b_{14} \\ b_{21} & b_{22} & b_{23} & b_{24} \\ b_{31} & b_{32} & b_{33} & b_{34} \\ b_{41} & b_{42} & b_{43} & b_{44} \end{bmatrix} \quad C = \begin{bmatrix} c_{11} & 0 & 0 & 0 \\ c_{21} & c_{22} & 0 & 0 \\ c_{31} & c_{32} & c_{33} & 0 \\ c_{41} & c_{42} & c_{43} & c_{44} \end{bmatrix}$$

$$\begin{aligned} h_{11,t+1} = {} & a_{11}^2\varepsilon_{1,t}^2 + 2a_{11}a_{12}\varepsilon_{1,t}\varepsilon_{2,t} + 2a_{11}a_{31}\varepsilon_{1,t}\varepsilon_{3,t}\varepsilon_{3,t}^2 + 2a_{11}a_{41}\varepsilon_{1,t}\varepsilon_{4,t}\varepsilon_{4,t}^2 \\ & + a_{21}^2\varepsilon_{2,t}^2 + 2a_{21}a_{31}\varepsilon_{2,t}\varepsilon_{3,t} + a_{31}^2\varepsilon_{3,t}^2 + a_{31}^2\varepsilon_{3,t}^2 + 2a_{31}a_{41}\varepsilon_{3,t}\varepsilon_{4,t} + a_{41}^2\varepsilon_{4,t}^2 \\ & + b_{11}^2 h_{11,t} + 2b_{11}b_{12}h_{12,t} + 2b_{11}b_{31}h_{13,t} + 2b_{11}b_{41}h_{14,t} \\ & + b_{21}^2 h_{22,t} + 2b_{21}b_{31}h_{23,t} + 2b_{31}b_{41}h_{34,t} \\ & + b_{31}^2 h_{33,t} + 2b_{31}b_{41}h_{34,t} + b_{41}^2 h_{44,t} \end{aligned}$$

$$L(\theta) = -\frac{TN}{2}\ln(2\pi) - \frac{1}{2}\sum_{t=1}^{T}(\ln|H_t| + \varepsilon_t' H_t^{-1}\varepsilon_t)$$

MULTIVARIATE GARCH – MEAN EQUATIONS

$$ER_{1,t} = \delta_1 + \delta_{11} ER_{t-1} + \delta_{12} I_{t-1} + \delta_{13} RR_{t-1} + \delta_{14} MV_{t-1} + \varepsilon_{1,t}$$

$$I_{2,t} = \delta_2 + \delta_{21} ER_{t-1} + \delta_{22} I_{t-1} + \delta_{23} RR_{t-1} + \delta_{24} MV_{t-1} + \varepsilon_{2,t}$$

$$RR_{3,t} = \delta_3 + \delta_{31} ER_{t-1} + \delta_{32} I_{t-1} + \delta_{33} RR_{t-1} + \delta_{34} MV_{t-1} + \varepsilon_{3,t}$$

$$MV_{4,t} = \delta_4 + \delta_{41} ER_{t-1} + \delta_{42} I_{t-1} + \delta_{43} RR_{t-1} + \delta_{44} MV_{t-1} + \varepsilon_{4,t}$$

EMPIRICS - DATA

- **Daily data**
- **Jamaica had 1162 Observations from Feb 7, 2002 To Sep 28, 2006 while T&T had 2393 Observations from Jan 3, 2000 To Sep 30, 2009**
- **Exchange rates Measured as the Intervention Currency per Domestic Currency – Variable used defined as 100*log(xrate/xrate{1})**
- **Intervention measured as Daily Purchases and Sales of the Intervention Currency**
- **Interest rates used are the repo rate in Jamaica and the interbank rate in T&T- Variable used defined as 100*log(day180/day180{1})**
- **Volume data is the daily sales and purchases of FC by the public**
- **All variables are I(0)**

Table 1: Estimated coefficients for the multivariate GARCH model for Jamaica

	Exchange Rate (i=1)		*Intervention (i=2)*		*Interest Rate (i=3)*		*Volume (i=4)*	
δ_{1i}	-0.19	-0.43	0.019	2.70	-0.003	-2.15	-0.001	-5.19
δ_{2i}	-0.13	-2.90	0.46	16.13	-0.003	-1.22	-0.004	-6.84
δ_{3i}	1.47	2.79	-0.17	-1.42	-0.25	-4.42	-0.001	-0.59
δ_{4i}	11.57	3.20	8.82	6.48	0.13	1.01	-0.39	-13.0
a_{1i}	0.77	24.4	0.15	1.92	-0.56	-0.53	-10.3	-3.1
a_{2i}	0.08	7.64	0.004	0.03	0.29	1.70	0.75	0.31
a_{3i}	0.002	1.03	-0.004	-1.81	-0.93	-34.6	-0.31	-1.37
a_{4i}	0.0004	2.77	0.007	12.54	0.005	1.4	0.80	117.9
b_{1i}	0.65	9.34	-0.15	-1.99	-1.5	-2.44	8.78	2.92
b_{2i}	-0.03	-2.9	-0.09	-2.67	0.38	1.97	-1.64	-0.84
b_{3i}	-0.001	-1.0	0.002	0.97	0.42	3.71	0.62	3.2
b_{4i}	-0.001	-4.39	-0.006	-3.9	-0.006	-0.2	-0.05	-0.91
$LBQ(10)$	53.8	(0.00)	29.4	(0.00)	13.1	(0.21)	126.2	(0.00)
$LBQs(10)$	0.72	(0.99)	29.0	(0.00)	1.62	(0.99)	26.6	(0.00)
LLR	-7860							

Notes: $LBQ(10)$ and $LBQs(10)$ are the Ljung-Box Q-statistics for standardized and squared standardized residuals at lag 10 respectively and LLR is log likelihood ratio. Values underlined are t-values and those in brackets are the probabilities for the Ljung-Box Q-statistics.

Table 2: Estimated coefficients for the multivariate GARCH model for Trinidad and Tobago

	Exchange Rate (i=1)		*Intervention (i=2)*		*Interest Rate (i=3)*		*Volume (i=4)*	
δ_{1i}	-0.38	-19.5	0.001	2.53	0.002	0.82	-0.0005	-0.57
δ_{2i}	0.06	0.11	0.01	0.65	-0.05	-1.33	-0.003	-1.46
δ_{3i}	-0.11	-0.53	0.01	2.25	-0.12	-3.56	0.001	1.02
δ_{4i}	3.25	0.84	0.09	1.05	0.33	0.84	-0.41	-21.9
a_{1i}	-1.09	-109.1	-0.59	-1.67	-0.47	-0.75	-98.7	-10.9
a_{2i}	0.001	5.7	-0.98	-238.1	0.02	1.36	1.18	5.9
a_{3i}	-0.003	-0.81	-0.06	-1.53	0.99	160.5	-0.05	-0.09
a_{4i}	0.002	13.4	0.006	1.38	0.002	0.81	0.71	6.53
b_{1i}	0.11	6.25	-1.85	-2.62	-0.27	-0.77	-34.9	-3.1
b_{2i}	0.001	1.59	0.18	4.48	-0.007	-1.04	0.14	0.43
b_{3i}	-0.001	-0.76	0.01	0.88	0.13	4.23	-0.59	-0.61
b_{4i}	0.0002	2.96	0.003	1.7	0.002	0.80	0.37	11.5
LBQ(10)	219.5	0.00	78.5	0.00	36.2	0.00	274.4	0.00
LBQs(10)	18.3	0.05	13.7	0.19	4.4	0.93	38.0	0.00
LLR	-24862							

Notes: Same as Table 2.

PRELIMINARY CONCLUSIONS

- **Central bank intervention tended to move the exchange rate in the desired direction in both Jamaica and T&T**
- **The BOJ tended to lean against the wind while the CBTT did not, implying CBTT not targeting the trend rate**
- **The relationship between intervention and interest rates is best characterized by the signaling framework in Jamaica**
- **The implementation of DI caused increased xrate volatility in the short term in Jamaica buy not T&T**
- **Less volatility in Jamaica when policy interest rate used compared to DI**
- **Spillovers from xrate to trading volume in Jamaica suggest the microstructure and MDH a factor in the market – not a factor in T&T**
- **Differences generated by the market structure where the Jamaican market is more constrained by opportunity cost on the interest rate side because of the structure of SS and DD**

END

THANK YOU

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