Interest rate volatility, Asymmetric Interest rate pass through and the monetary transmission mechanism in the Caribbean

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Motivation

- Most countries reduced interest rates to stimulate their economies and soften the negative effects of the recent global economic Turmoil.

- These policies are only effective if the mediums through which they enter the real economy are operating efficiently.

- More specifically, the central bank can influence the economy via interest rates, only if the government policy rate is successfully transferred to the retail lending and deposit rates.

Pass-through

- Complete pass- through (rare even in developing countries)
- Incomplete pass-through
- Over- pass through

Motivation

- Cottarelli and Kourelis (1994) believes that profit maximizing institutions such as commercial banks will only change the lending rate or borrowing rate if the cost of doing so is less than the adjustment cost associated with the change.

- If it is cheaper to keep the current interest rates fixed even when the money market rate has changed then this is the action that will be taken.

Asymmetric interest rate Pass through

- If the adjustment towards the long run equilibrium is the same between increases and decreases in the interest rate then the pass through is symmetric.

- However, if there are different adjustment patterns for increases and decreases towards the long run equilibrium; the adjustment process is asymmetric.

- Research has highlighted that for many countries the interest rate adjustment process is rigid on the downside for lending rates and rigid on the up side for deposit rates. Lowe and Rolling (1992) provide four main theoretical explanations for interest rate stickiness.

Interest rate stickiness

- Lowe and Rolling (1992) provide four main theoretical explanations
  - Adverse selection via agency costs
  - Switching costs
  - Risk sharing
  - Consumer irrationality

Interest rate stickiness

- Berger (1991) found that deposit rates generally demonstrate upward rigidity and the more compact financial markets with smaller firms have more deposit rate rigidity (asymmetric adjustments).

- According to Wang and Lee (2009), the linear model used by most researchers to test for interest rate pass through is biased towards rejecting the existence of interest rate pass through given that it does not account for asymmetries in the adjustment process and other asymmetries.

- Mojan (2000) and Ehrmann et al. (2003) argue that competition in the financial market between banks and/or financial institutions and the increase in interest rate volatility have great impact on the speed and the level of interest rate pass through.

Objective

- Considering this, we wish to investigate asymmetric interest rate pass through, the impact of interest rate volatility on the retail deposit and lending interest rates and the overall monetary transmission mechanism in the Caribbean region.

Methodology

- Threshold Autoregressive (TAR) and Momentum-Threshold Autoregressive (MTAR) asymmetric cointegration model proposed by Enders and Siklos (2001),

- Error Correction exponential GARCH in the mean EC-EGARCH (1,1)-M model proposed by Wang and lee (2009).

- Dynamic least Squares (DOLS) to estimate the long run parameters in the presence of unit root

Literature

- Boamah and Jackman (2008)

- Interest rate pass through in the Caribbean. They analyse the impact of the central banks minimum deposit rate on the commercial banks lending rate in Barbados from 1980 to 2007 using a partial adjustment error correction model.

- The results show that the lending rate movements are sticky in the short run however there is complete pass through in the long run.

Literature

- Cottareli and Kourelis (1994)
- Toolsema, Sturm and Haan (2002)
- Sander and Kleimeier (2002, 2004)
- Angeloni and Ehrmann (2003)
- Egert, Crespo-Cuaresma and Reininger (2007)
- Wang and Lee (2009)
- Karagiannis, Panagopoulos and Vlamis (2010)
- Burgsteller (2003)
- Atesoglou (2003)
- Chionis and Leon (2006)

DATA

- Monthly data from 1995:01 to 2010:04.

- Data is collected from the IMF International Financial Statistics on the treasury bill rate, the commercial banks' retail lending rate and retail deposit rate for six countries from the CSME;

- Barbados, Guyana, Haiti, Jamaica, Trinidad and Tobago and St. Lucia.
- St. Lucia is the only country included from the OECS, IFS data base show the same interest rates for all the countries in the union.
- Therefore we use St. Lucia is the representative for the OECS.

- Our data set begins 1995 because most Caribbean countries changed their financial markets from fixed to flexible exchange rate regime between 1991 and 1993, this would allow the market sufficient time to adjust without any structural break in the data.

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Methodology

- Consider the following equation

- $$RR_t = \hat{\beta}_0 + \hat{\beta}_1 PR_t + u_t \quad (1)$$

- $$\Delta u_t = \rho u_{t-1} + \varepsilon_t \quad (2)$$

Where RR_t is the retail deposit or lending rate

And PR_t is the policy rate

In the presence of asymmetry, The regular Engel and Granger (1987) cointegration test outlined in equation (2) is mis-specified.

Threshold Auto Regression (TAR)

- $$\Delta u_t = I_t \rho_1 u_{t-1} + (1 - I_t)\rho_2 u_{t-1} + \varepsilon_t \qquad (3)$$
- $$\Delta u_t = I_t \rho u_{t-1} + (1 - I_t)\rho_2 u_{t-1} + \sum_{j=1}^{p} \gamma_j \, \Delta u_{t-j} + \varepsilon_t \qquad (4)$$
- Where I_t is the Heaviside indicator function and is specified as follows

$$I_t = \begin{cases} 1 \;\; if \;\; u_{t-1} \geq \tau \\ 0 \;\; if \;\; u_{t-1} < \tau \end{cases}$$

- Here τ is the threshold value

Momentum Threshold Auto Regression (MTAR)

- The true nature of the asymmetry is unknown so we propose the MTAR as well:
- $$\Delta u_t = M_t \rho_1 u_{t-1} + (1 - M_t)\rho_2 u_{t-1} + \varepsilon_t \qquad (5)$$
- $$\Delta u_t = M_t \rho_1 u_{t-1} + (1 - M_t)\rho_2 u_{t-1} + \sum_{j=1}^{p} \gamma_j \, \Delta u_{t-j} + \varepsilon_t \qquad (6)$$
- Where M_t ; the new indicator variable is given as

$$M_t = \begin{cases} 1 \ if \ \ \Delta u_{t-1} \ \geq \ \tau \\ 0 \ if \ \ \Delta u_{t-1} \ < \ \tau \end{cases}$$

Finding the Threshold Value

- τ generally unknown, and therefore has to be estimated. The procedure proposed by Chan (1993) is commonly used in the literature to estimate the threshold value

- Let RR_t represent the series of retail interest rate in our model, the procedure is as follows;

1. Sort the series in ascending order ranging from the smallest to the largest value irrespective of time.

2. To treat the problems arising from outliers, delete the smallest and the largest 15% of the observation, keeping just the median 70%.

3. Use OLS to estimate the model repeatedly with all the possible values of τ, and choose the model that provides the minimum error sum of squares which is the model with the correct threshold value.

The asymmetric EC-EGARCH (1, 1)-M model

- The mean equation

$$\Delta RR_t = \theta_0 + \sum_{i=1}^{p} \theta_i \Delta RR_{t-i} + \sum_{j=1}^{q} \varphi_i \Delta v_{t-j} + r\Delta PR_t + s\sqrt{\sigma_t^2} + \gamma_1 M_t \hat{u}_{t-1} + \gamma_2 (1 - M_t)\hat{u}_{t-1} + v_t$$

$$\log(\sigma_t^2) = \omega + \alpha \left| \frac{v_{t-1}}{\sigma_{t-1}} \right| + k \frac{v_{t-1}}{\sigma_{t-1}} + b \log(\sigma_{t-1}^2)$$

Table 1: DOLS

	$\hat{\beta}_0$	$\hat{\beta}_1$	$h_o: \hat{\beta}_1 = 1$
Barbados			
Deposit	2.05(0.000)	0.437(0.000)	762.180(0.000)
Lending	8.22(0.000)	0.299(0.000)	1259.890(0.000)
Haiti			
Deposit	-2.371(0.000)	0.700(0.000)	68.780(0.000)
Lending	19.954(0.000)	0.116(0.1.37)	135.800(0.000)
Guyana			
Deposit	-0.468(0.001)	0.891(0.000)	31.320(0.000)
Lending	13.563(0.000)	0.339(0.000)	3851.000(0.000)
Jamaica			
Deposit	-3.658(0.000)	0.749(0.000)	79.370(0.000)
Lending	0.766(0.443)	1.149(0.000)	9.580(0.002)
St. Lucia			
Deposit	-3.568(0.000)	1.359(0.000)	6.280(0.013)
Lending	4.256(0.002)	1.381(0.000)	2.500(0.116)
Trinidad and Tobago			
Deposit	0.029(0.919)	0.760(0.000)	73.900(0.000)
Lending	5.989(0.000)	0.969(0.000)	1.150(0.286)

Dynamic Least Square (DOLS) Estimates of the pass through coefficient for each country

Table 2

TAR				MTAR			
lags	Φ	F-statistic	τ	lags	MΦ	F-statistic	τ
Barbados							
1	9.350	21.720*	-0.013	2	10.040	21.740*	-0.019
2	9.250	17.210*	-0.021	3	9.940	17.570	-0.006
Haiti							
3	9.270	11.840*	-0.062	2	10.040	14.240*	-0.031
2	9.250	12.660*	-0.171	4	9.850	10.170	-0.040
Guyana							
1	9.350	90.680*	-0.0802	4	9.850	13.650*	-0.051
2	9.250	27.710*	-0.045	2	10.040	27.790*	-0.014
Jamaica							
2	9.250	25.860*	-0.141	3	9.940	21.31*	-0.192
3	9.270	23.360*	-0.151	4	9.850	13.610*	-0.014
St. Lucia							
2	9.250	42.090*	-0.235	2	10.040	41.090*	-0.138
2	9.250	39.930*	-0.029	2	10.040	43.170*	-0.030
Trinidad and Tobago							
2	9.250	23.700*	-0.090	3	9.940	18.400*	-0.057
2	9.250	23.580*	-0.024	4	9.850	12.880*	-0.054

Table 3: TAR and MTAR estimates and Test for symmetry

	TAR			MTAR		
Barbados	ρ_1	ρ_2	$\rho_1 = \rho_2$	ρ_1	ρ_2	$\rho_1 = \rho_2$
deposit	-0.881	-0.682	2.25(0.144)	-0.647	-0.824	1.780(0.184)
Lending	-0.734	-0.653	0.19(0.665)	-0.663	-0.779	0.790(3.75)
Haiti						
deposit	-0.591	-0.575	0.010(0.933)	-0.660	-0.390	2.670(0.104)
Lending	-0.558	-0.553	0.000(0.981)	-0.642	-0.376	2.630(0.107)
Guyana						
deposit	-1.117	-0.697	13.300(0.000)*	-0.961	-0.465	6.600(0.011)*
Lending	-1.063	-0.670	12.010(0.000)*	-0.908	-0.337	24.970(0.000)*
Jamaica						
deposit	-0.927	-0.525	8.130(0.004)*	-0.769	-0.669	0.290(0.594)
Lending	-1.05	-0.494	8.370(0.004)*	-0.867	-0.415	6.110(0.014)*
St. Lucia						
deposit	-1.653	-1.148	14.180(0.000)*	-1.661	-1.662	13.920(0.000)*
Lending	-1.688	-1.354	9.910(0.000)*	-1.696	-1.288	15.750(0.000)*
Trinidad and Tobago						
deposit	-0.583	-0.664	0.260(0.605)	-0.658	-0.627	0.040(0.838)
Lending	-0.600	-0.656	0.070(0.796)	-0.642	-0.427	2.600(0.109)

	Mark up/ mark down	Full Pass through	Pass through mechanism	Impact of interest rate volatility	Asymmetry of the conditional variance	Adjustment rigidity	hypothesis
Barbados							
deposit	Mark up	no	symmetric	negative			
Lending	Mark up	no	symmetric		positive		
Guyana							
deposit		no	asymmetric	negative	negative	downward	
Lending	Mark up	no	asymmetric	negative	positive	downward	CPA
Haiti							
deposit		no	symmetric	negative	positive		
Lending	Mark up	no	symmetric		negative		
Jamaica							
deposit		no	asymmetric		negative	Upward	CPA
Lending	Mark up	no	asymmetric	positive	positive	Upward	
Trinidad and Tobago							
deposit		no	symmetric	negative	Negative		
Lending	Mark up	yes	symmetric		Negative		
St. Lucia					positive		
deposit		no	asymmetric		positive	downward	
Lending	Mark up	yes	asymmetric			downward	CPA

	Mark up/ mark down	Full Pass through	Pass through mechanism	Impact of interest rate volatility	Asymmetry of the conditional variance	Adjustment rigidity	hypothesis
Hong Kong							
deposit		no	asymmetric		positive	upward	
Lending	Mark up	no	asymmetric	positive	positive	downward	CPA
Indonesia							
deposit	Mark up	no					
Lending	Mark up	no					
Japan							
deposit		no			positive		
Lending	Mark up	no		positive			
Korea							
deposit	Mark up	no		negative	positive		
Lending	Mark up	no			negative		
Malaysia							
deposit	Mark up	no	asymmetric	negative		upward	
Lending	Mark up	no		positive			

	Mark up/ mark down	Full Pass through	Pass through mechanism	Impact of interest rate volatility	Asymmetry of the conditional variance	Adjustment rigidity	hypothesis
Philippines							
deposit	Mark up	no	asymmetric	positive		upward	
Lending	Mark up	no	asymmetric	negative		downward	CPA
Singapore							
deposit	Mark up	no	asymmetric		positive	upward	
Lending	Mark up	no	symmetric		positive		
Thailand							
deposit	Mark up	no		negative	positive		
Lending	Mark up	no		negative	negative		
Taiwan							
deposit	Mark up	no	asymmetric	negative	positive	upward	
Lending	Mark up	no	asymmetric		positive	downward	CPA
Us							
deposit		yes	symmetric	positive	positive		
Lending	Mark up	no					

Conclusion

- The results from the EC-EGARCH(1, 1)-M models show that for the countries where there is asymmetric cointegration the deposit rate has upward adjustment rigidity and the lending rate has downward adjustment rigidity. Compared to our results, there is asymmetric cointegration for Guyana, Jamaica and St. Lucia lending and deposit rates. Unlike the countries from Asia, see Wang and Lee (2009), both rates for Jamaica display upward adjustment rigidity and both rates for Guyana and St. Lucia display downward adjustment

- The findings are useful to policymaker, central banks and potential investors who want to compare the risk and return on their investment in Caribbean the US and Asia.