An Assessment of Reserve Adequacy in Caribbean Economies

Prof. Roland Craigwell
Darrin Downes
Skeeta Carasco

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Background

- Caribbean economies face a binding foreign exchange constraint that requires prudent management of foreign reserves
- Foreign reserves act as a buffer against adverse balance of payments shocks, particularly important in fixed exchange or ‘managed’ exchange rate regimes
- Given Caribbean economies’ high vulnerability to external shocks, and in the context of the considerable pressure on reserve levels being exerted by the current uncertain and challenging global and regional economic environment, underscores an assessment of reserve adequacy in these economies
- Another implication for reserves management is whether countries are accumulating foreign reserves well beyond adequate levels or holding excessive reserves

Objective

To assess the adequacy of foreign reserves levels in Caribbean economies over the past thirty years using four methods:

- Informal ratio analysis
- Combined factors analysis
- Estimation and forecasting of foreign reserve demand
- Rational optimisation models

Literature Review

Literature has evolved in response to:

- Change in the global monetary systems (after collapse of Bretton Woods System in the early 1970s) from fixed to flexible or floating exchange rate regimes

- Periods of financial crises (especially after the Asian financial crisis in late 1990s)

- Acceleration of foreign reserves accumulation in emerging market economies, particularly South and East Asian economies

Literature Review

- **Informal Ratios**
  - Reserves to Imports of Goods – Triffin (1947)
  - Reserves to Broad Money – Malchup (1966)
  - Reserves to Short-term External Debt (STED) Guidotti-Greenspan rule; Greenspan (1999)

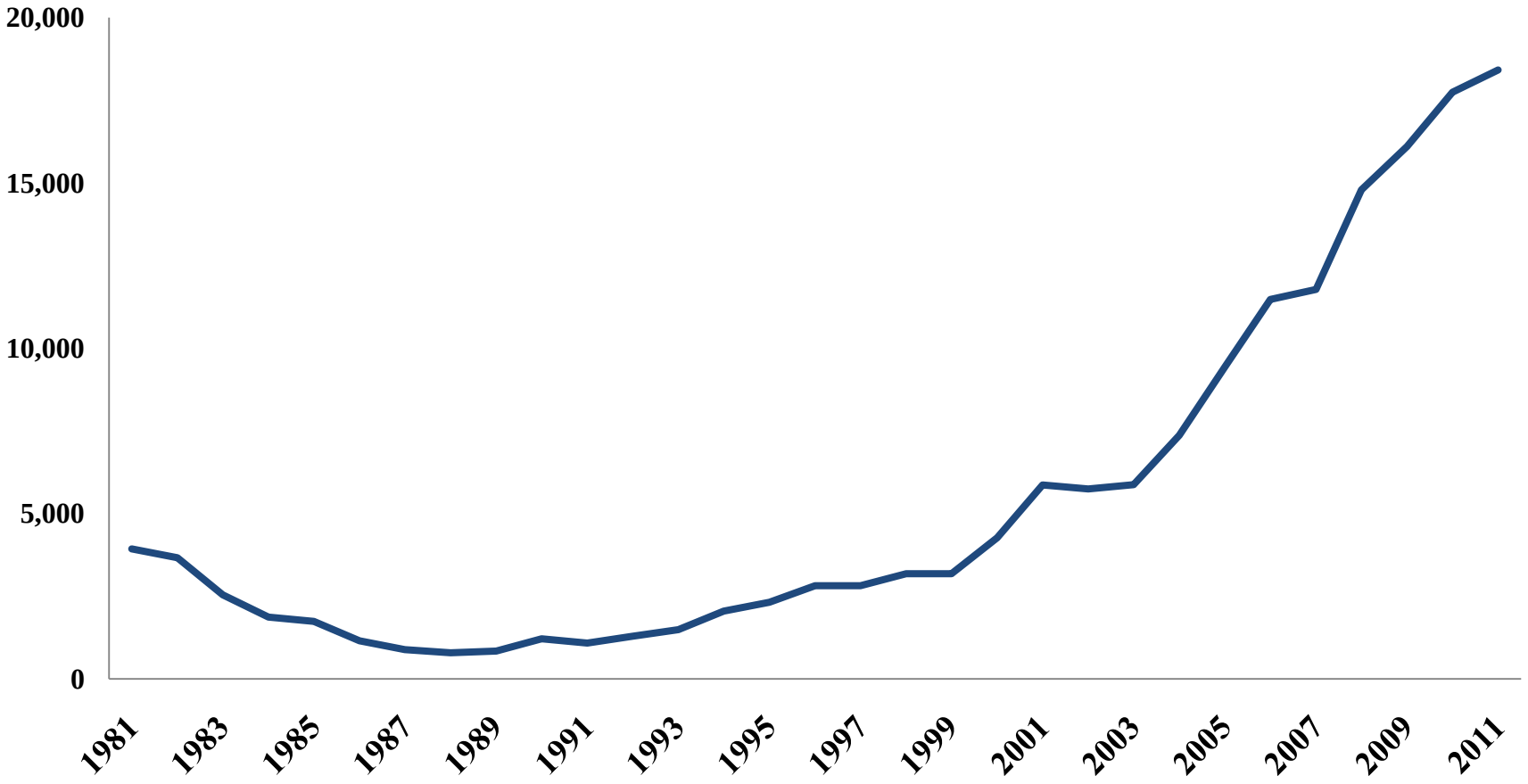
- **Combined Factors Measures**
  - Full STED + Risk-weighted % of M2 - Wijnholds and Kapteyn (2001)
  - % of exports, % of STED, % of M2 and other port. liab. - IMF (2001)
  - Mwase (2012), extended IMF(2011)
  - Imports, total foreign debt, return on profits from FDI Zeng (2012)

Literature Review

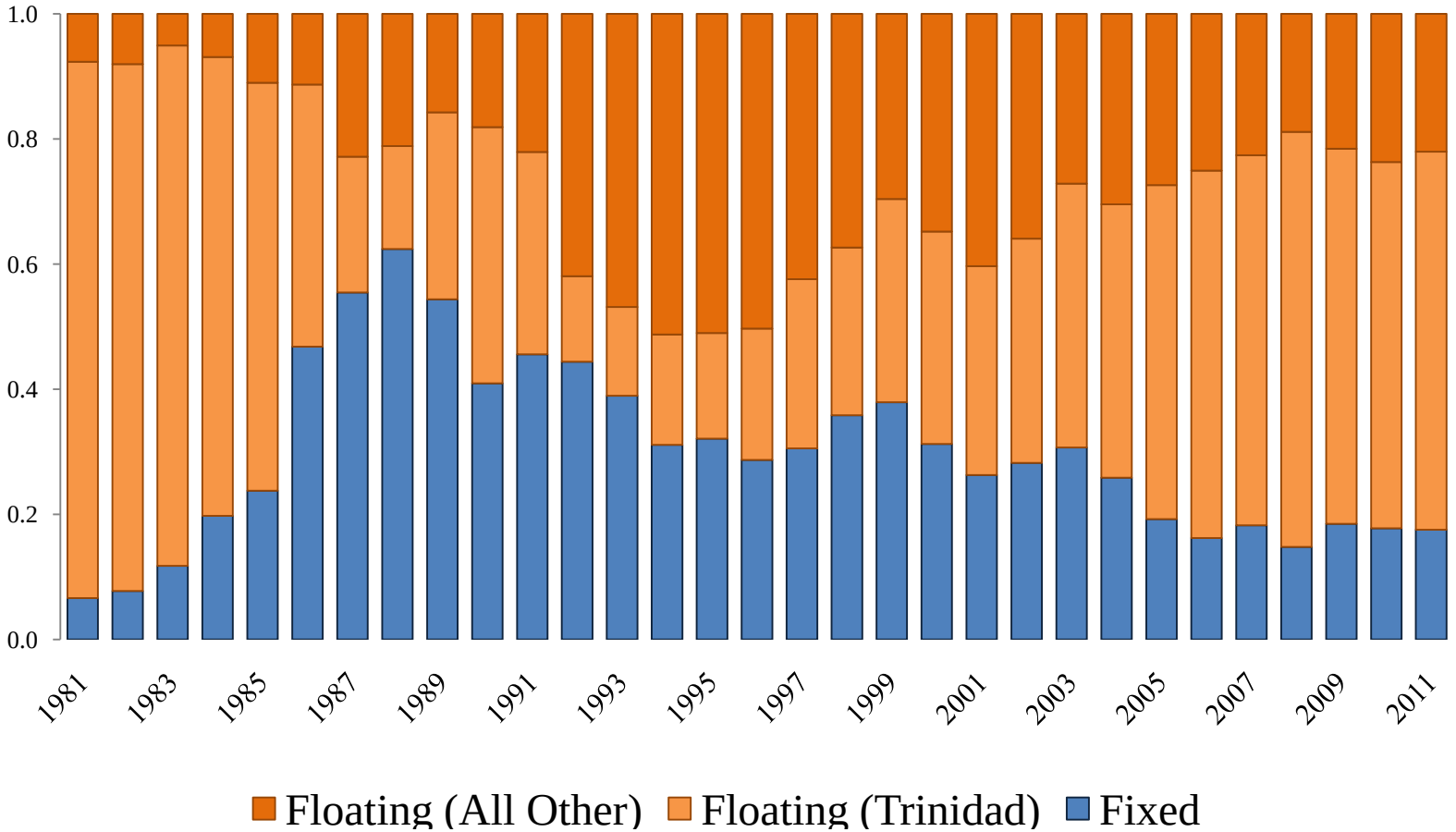
- **Regression Analysis (Estimation and Forecasting of Reserve Demand)**
  - Estimation of reserve demand using variables, which capture economic size, current account vulnerability, capital account vulnerability, exchange rate flexibility and opportunity cost;
  - Comparison of reserves forecasts with actual reserves levels, Edison (2003); Park and Estrada (2011); Gosselin and Parent (2005)

- **Rational Optimising Behavioural Models**
  - Jeanne and Rancier (2006)
  - Jeanne (2007); Dehesa, Pineda and Samuel (2009)
  - Barnichon (2009)

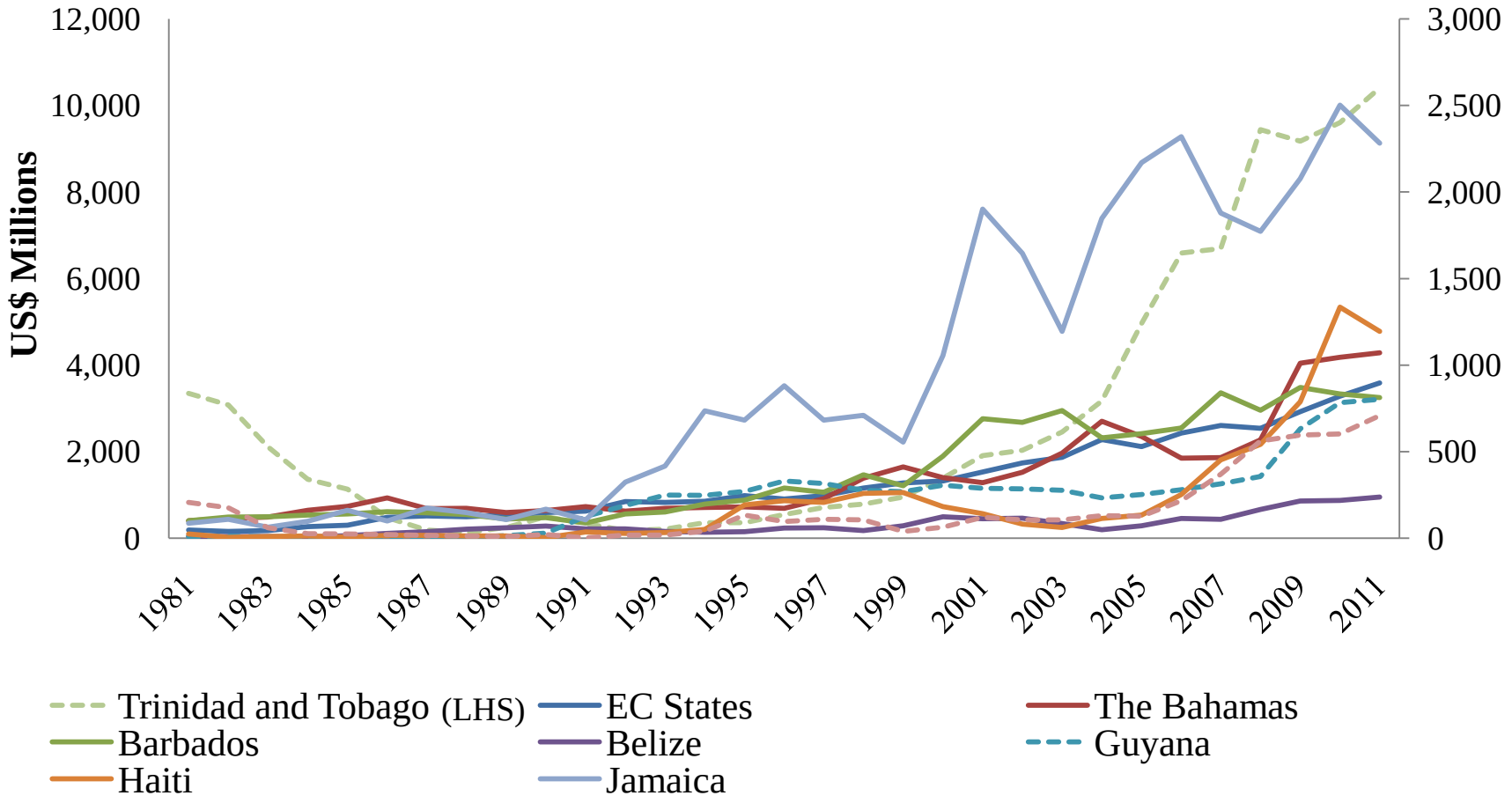
Total Foreign Exchange Reserves (US$M)



Country Shares of Total Foreign Reserves



Individual Country Reserves Growth



Data Sources and Definitions

- Foreign exchange reserves - reserve assets excluding gold and SDRs (IFS)
- Imports/Exports – imports/exports of goods and services (IFS)
- Broad money – M2 (currency outside banks, demand deposits, time, savings and foreign currency deposits of residents (WDI)
- STED – debt with original maturity of one year or less (WDI)

Methodology

- **Informal ratio analysis**
  - FXR/IMP (3 months' worth of imports of G&S)
  - FXR/M2 (5% and 20% of M2)
  - FXR/STED (unity or above)

- **Combined factors analysis - Mwase (2012) metric**
  - ECCU (20% exports G&S + 20% M2+ 80% STED)
  - floating exchange rate (10% exports G&S +30% M2+ 40% STED)
  - fixed exchange rate (35% exports G&S + 10% M2+ 95% STED)
  - FXR/Mwase metric is adequate if between 75% and 100%

Methodology

Estimation of long-run reserve demand using dynamic OLS regression

$$lres = \beta' X_t + \sum_{j=-k}^{k} \lambda_j' \Delta X_{t-j}^{I} + \varepsilon_t$$

lres is the log of FXR;

X_t is the set of variables capturing

- economic size (GDP per capita)
- current account vulnerability (imports of G&S to GDP)
- capital account vulnerability (M2 to GDP)
- β the vector of long run coefficients
- X^I the sub-set of I(1) variables of X
- estimation sample for each country:1981 to 2006
- out-of-sample forecast: 2007–2011

Methodology

- **Jeanne and Rancier (2006) model**

$$\rho = \lambda + \gamma - \frac{p^{\frac{1}{\sigma}} - 1}{1 + \left(p^{\frac{1}{\sigma}} - 1\right)(1 - \delta - \pi)} \left(1 - \frac{r - g}{1 + g}\lambda - (\delta + \pi)(\lambda + \gamma)\right) \quad (3)$$

- **Jeanne (2007) Model**

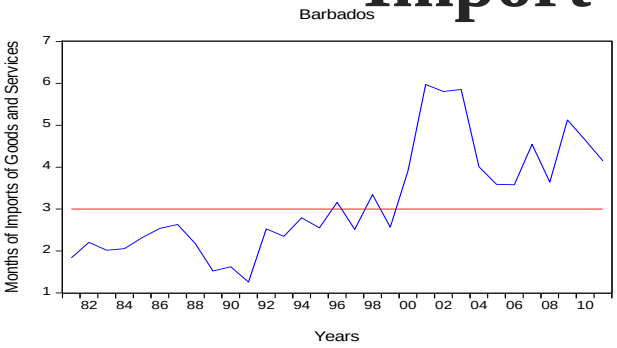
$$R = L + \Delta Y - \left[1 - \left(1 + \frac{\partial}{\pi}\right)^{\frac{-1}{\sigma}}\right] \quad (4)$$

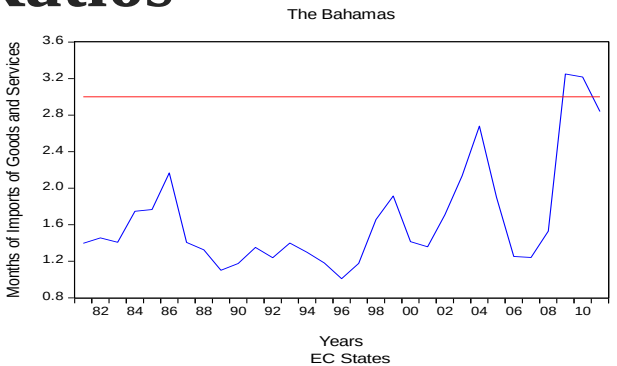
Methodology

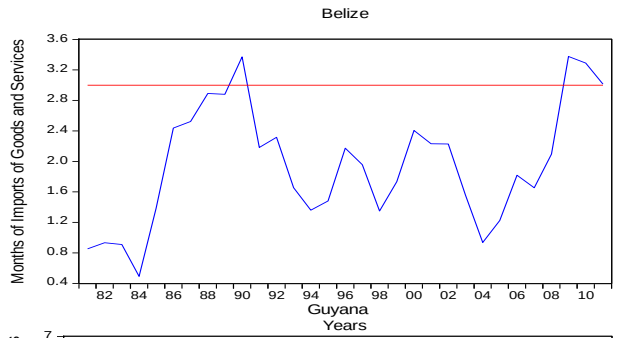
- Barnichon (2009) Model

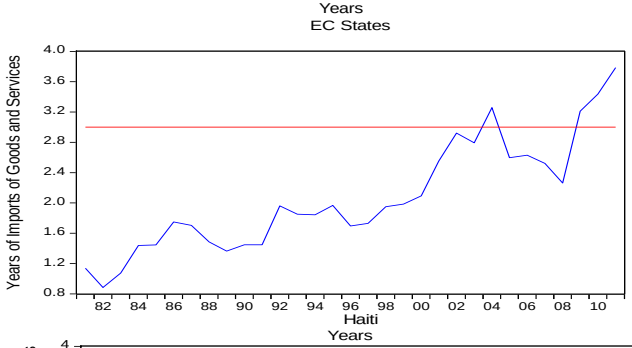
$$\frac{R^*}{C_F} \approx \varepsilon\delta\left[\frac{\pi^{nd}}{\left(\frac{1+g}{\beta}-(1-\pi^{nd})\right)+(1-\pi^{nd})\frac{\delta}{1-\delta}\frac{r\theta}{1-\theta}}-\eta_\varepsilon\eta_X\eta_Y\right]\times\frac{1}{\varepsilon\delta+Tr} \quad (5)$$

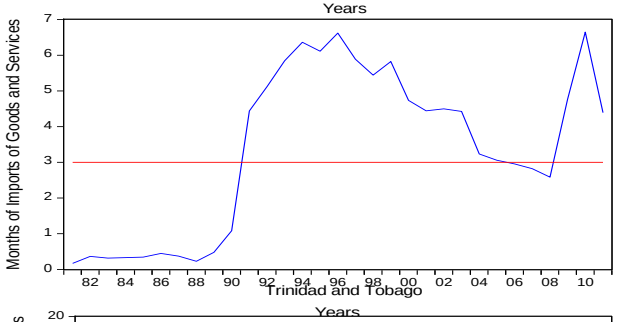
Import Cover Ratios

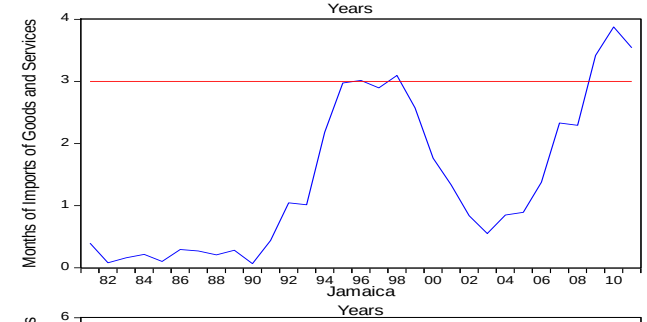


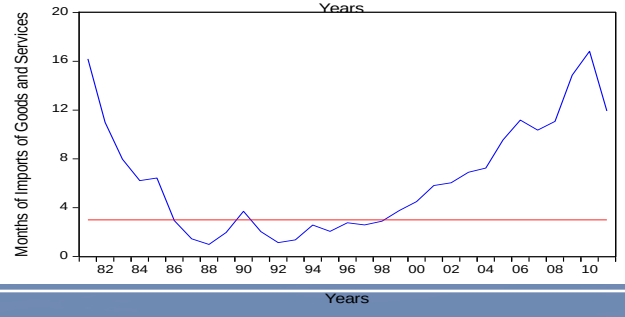


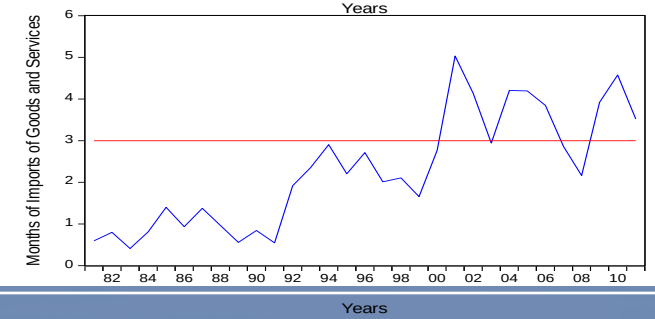




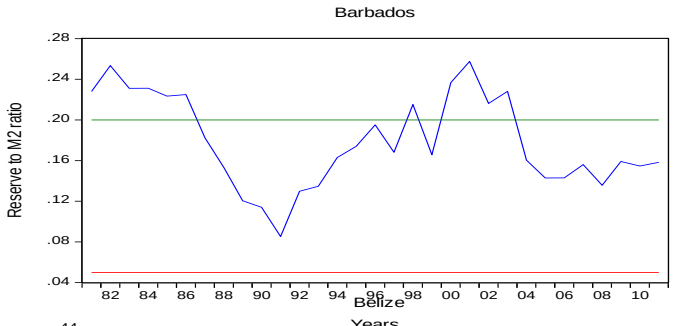


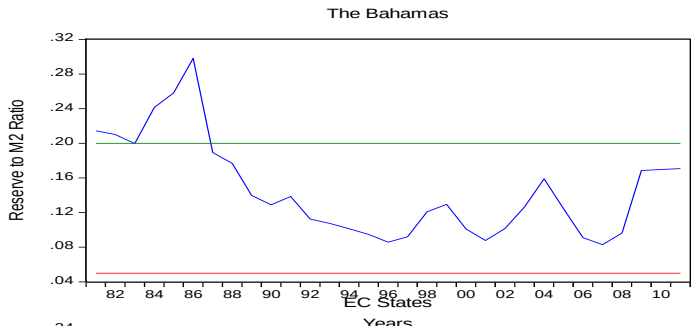


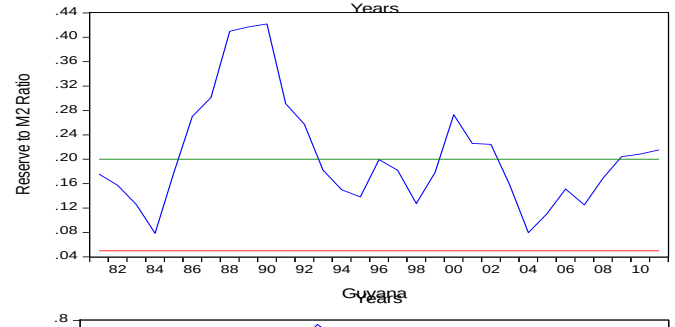


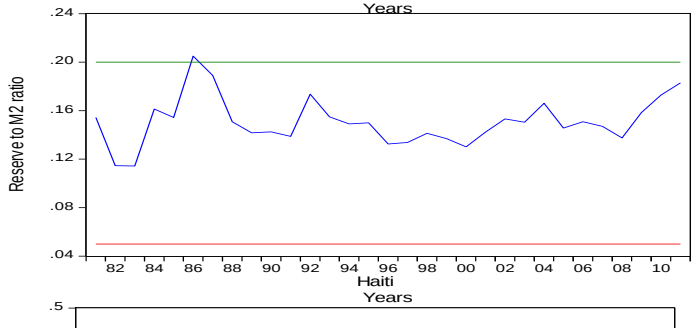


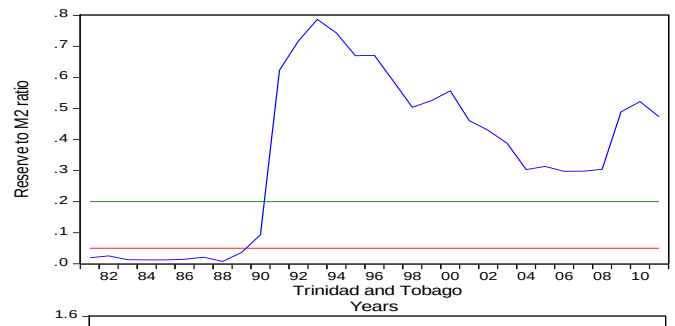
Reserves to M2 Ratios

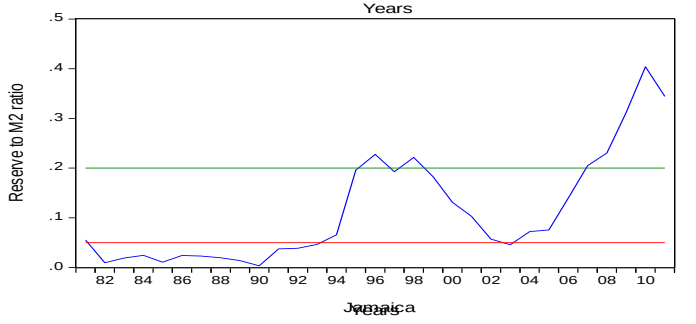


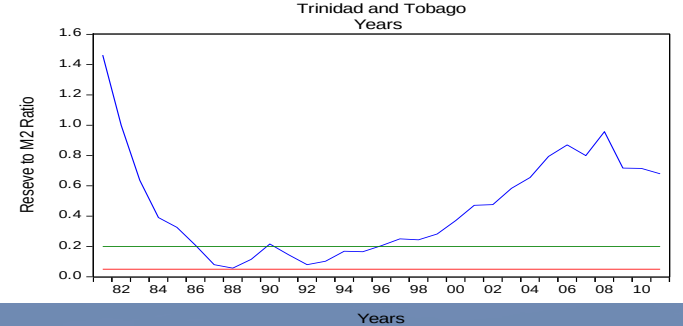


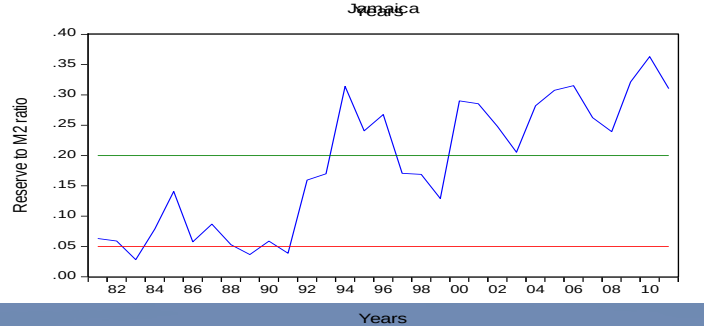




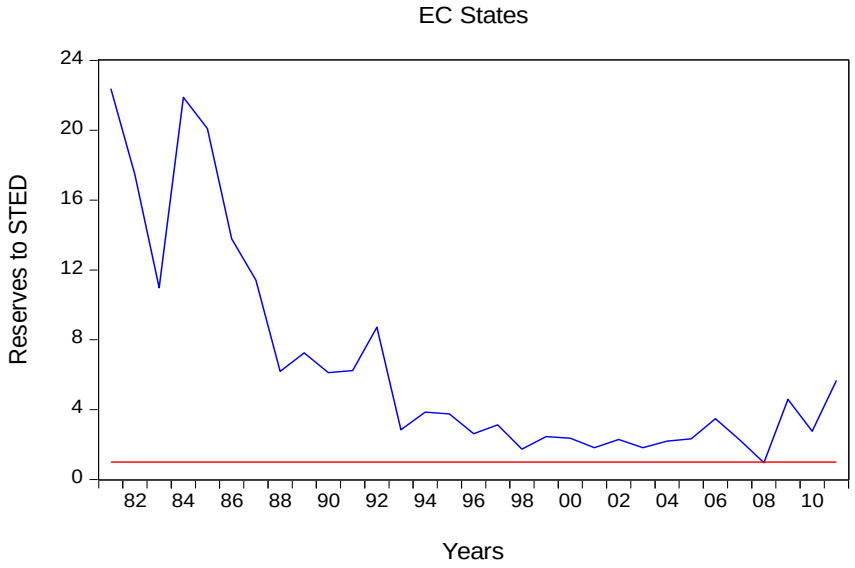


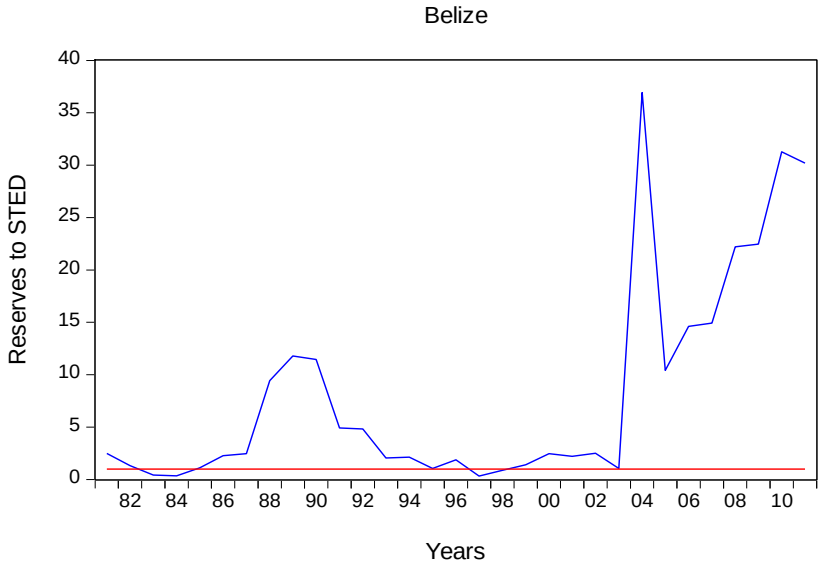


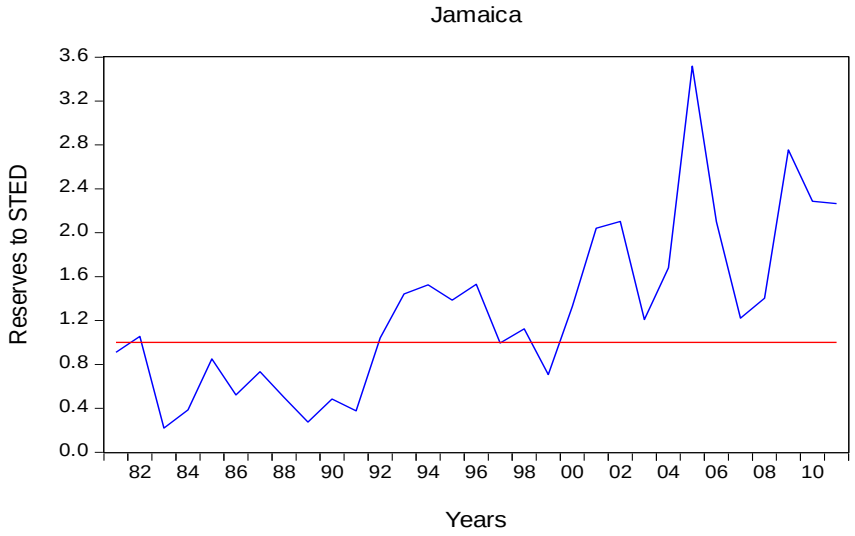


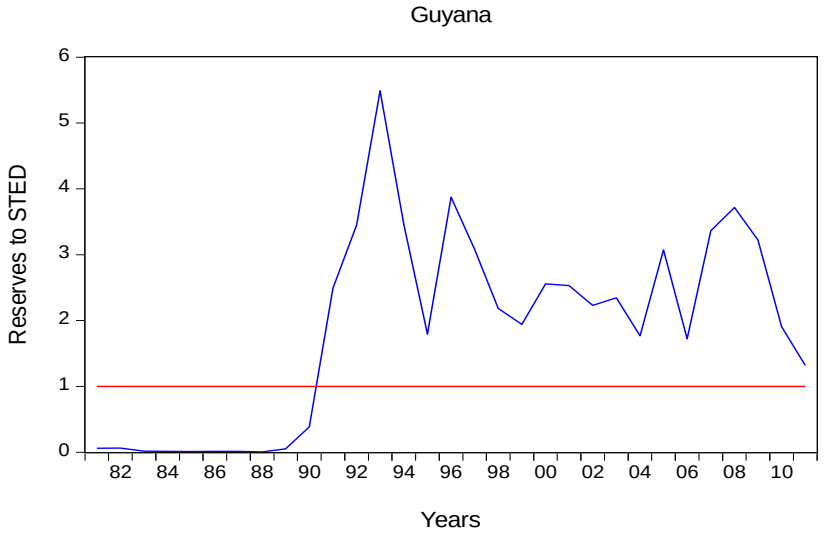


Reserves to STED

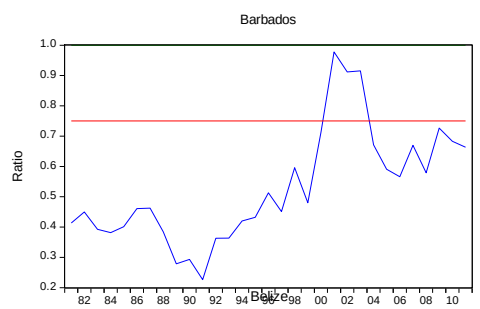


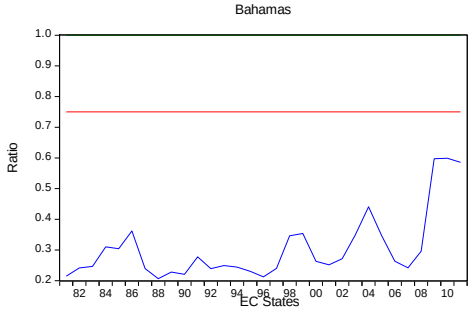


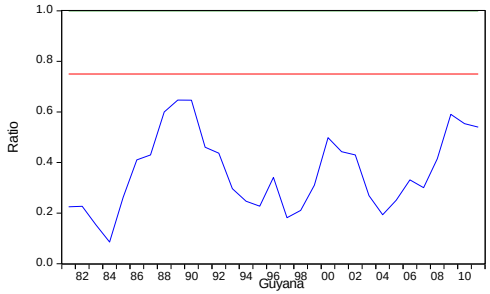


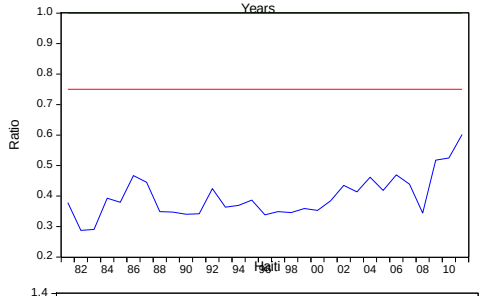


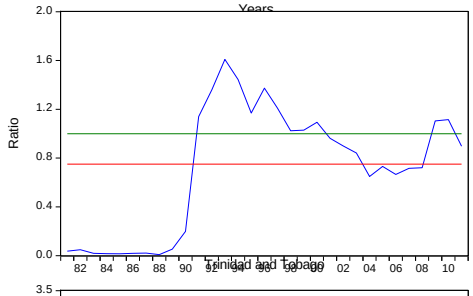
Combined Factors Analysis

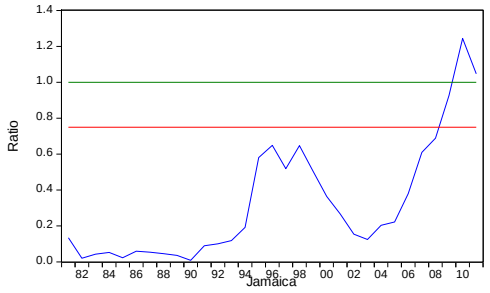


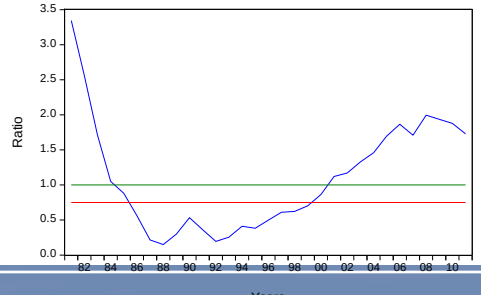


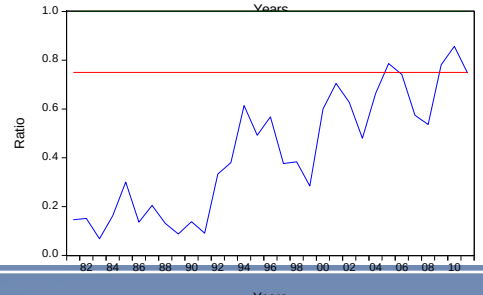












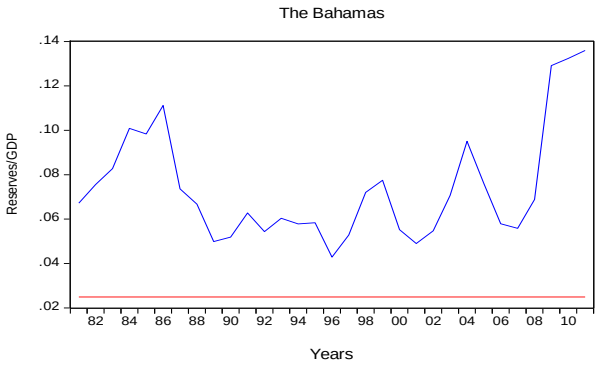
DOLS Forecasts of Reserves

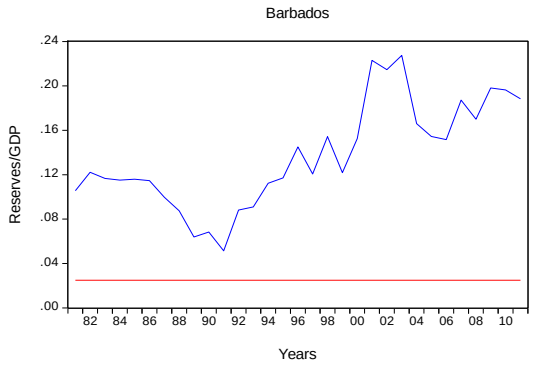
	2007		2008		2009		2010	
Country	Actual	Forecast	Actual	Forecast	Actual	Forecast	Actual	Forecast
Barbados	839.43	895.21	738.53	667.20	871.15	707.67	833.54	679.13
Bahamas	464.48	349.63	567.91	204.97	1,009.82	246.80	1,044.15	325.69
Belize	108.51	141.69	166.16	100.40	213.68	122.53	218.00	93.20
ECCU	651.43	656.68	635.39	692.26	731.43	595.51	819.67	645.87
Guyana	313.01	555.98	355.91	757.65	631.41	418.94	782.06	371.52
Jamaica	1,878.51	2,725.32	1,772.71	1,961.46	2,075.84	3,263.64	2,501.09	3,767.53
Trinidad	6,693.73	12,985.05	9,442.61	24,257.09	9,177.94	7,074.77	9,605.54	7,134.59

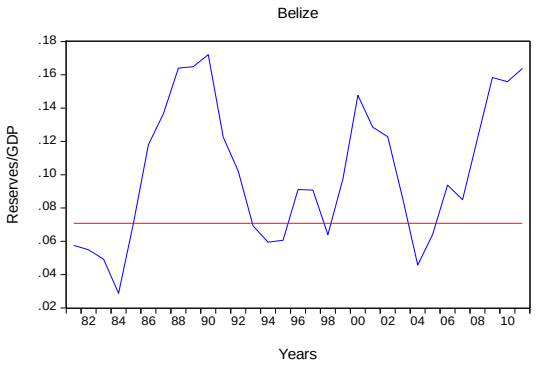
Optimal Reserves to GDP Ratios (Jeanne and Ranciere (2006) Approach)

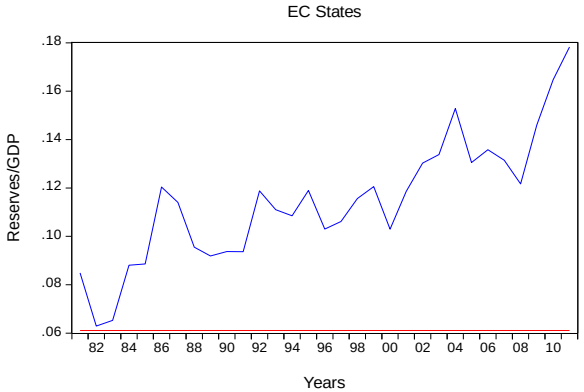
Country	Optimal Reserve to GDP Ratio
Barbados	0.025
ECCU	**0.061**
The Bahamas	0.025
Belize	**0.071**
Guyana	**0.441**
Haiti	0.054
Jamaica	**0.104**
Trinidad and Tobago	0.025

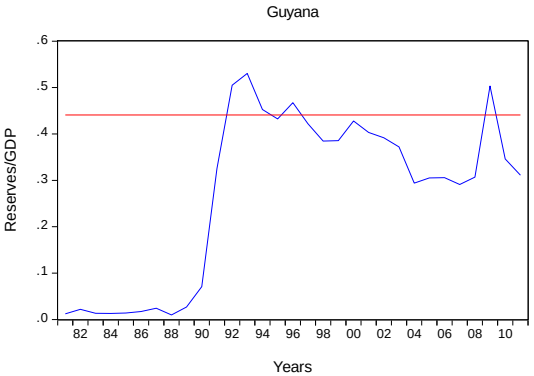
Jeanne and Ranciere (2006) model

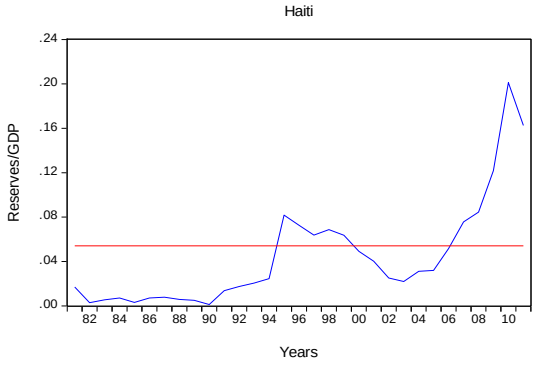


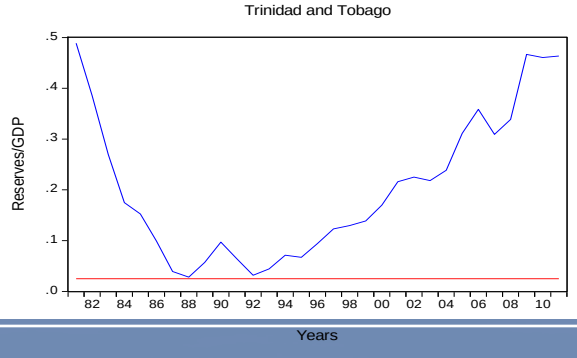


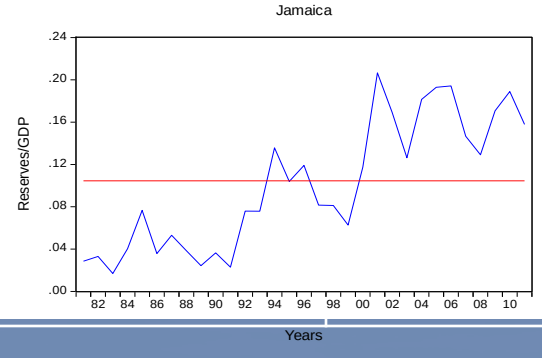






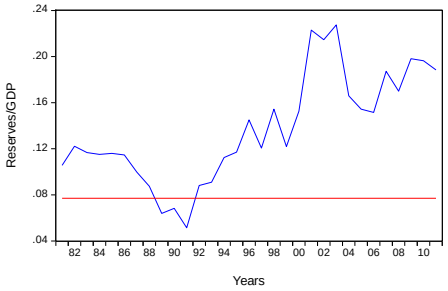




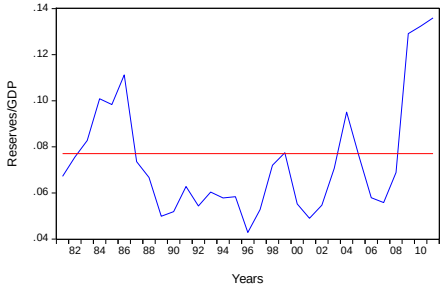


Jeanne (2007) model

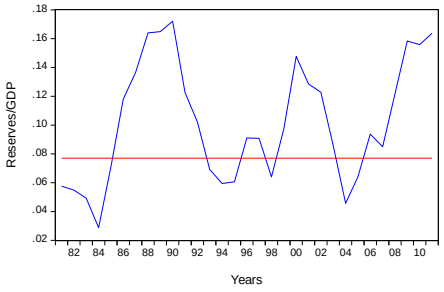
Barbados



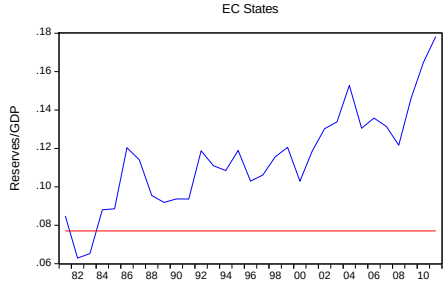
The Bahamas



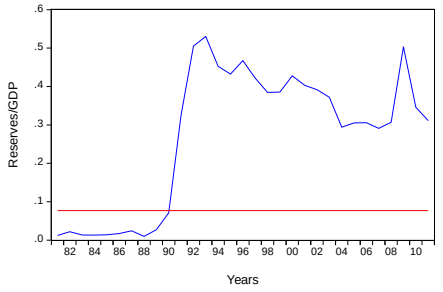
Belize



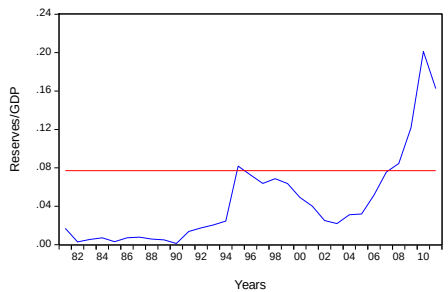
EC States



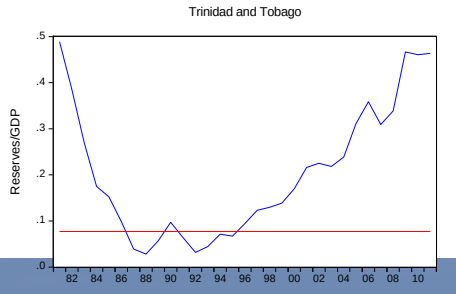
Guyana



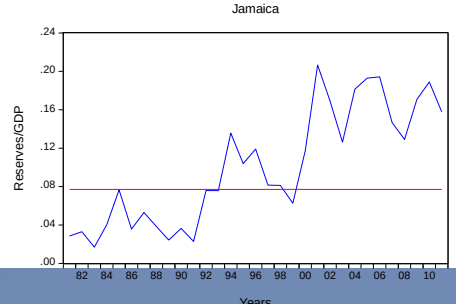
Haiti



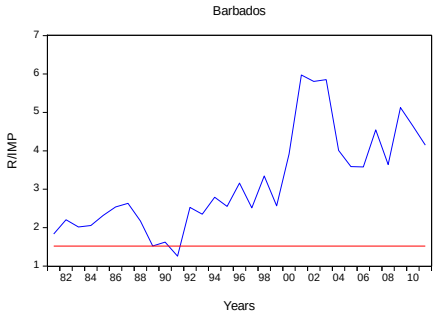
Trinidad and Tobago

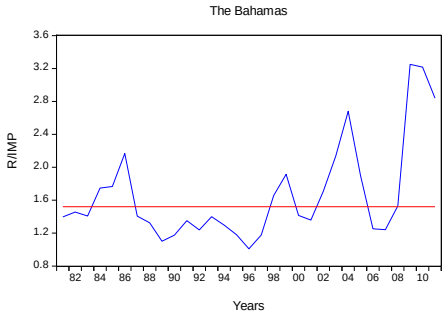


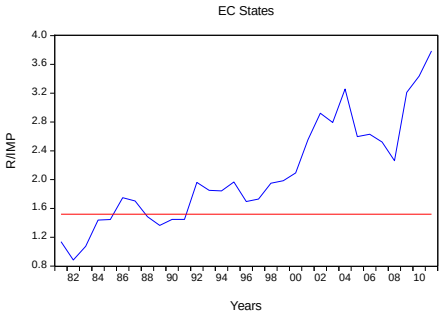
Jamaica

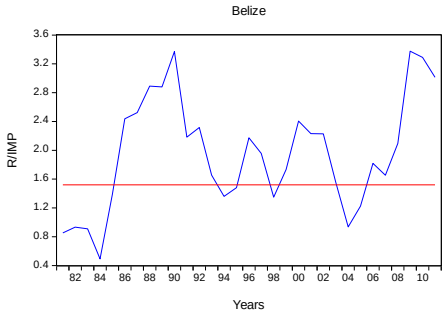


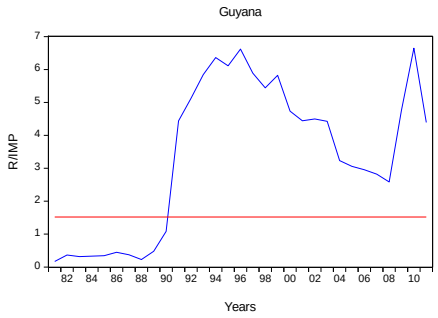
Barnichon (2009) model

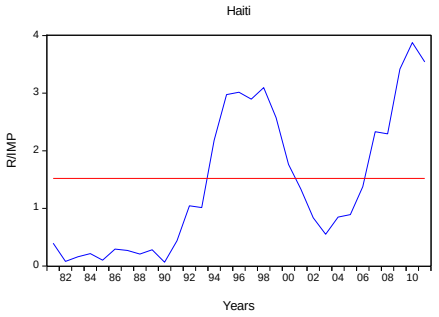


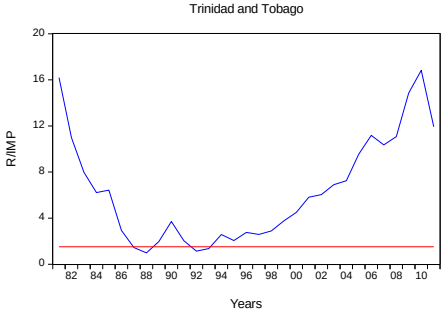


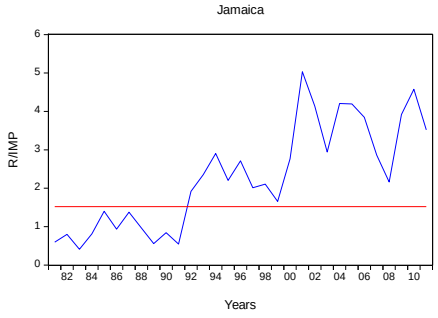












Conclusions

- The results varied across measures, but there was sufficient consistency to asses reserve adequacy for each country
- Trinidad and Tobago holds a substantial portion of total reserve holdings for Caribbean economies
- Trinidad and Tobago by all measures held adequate reserves, except for the 1980s period and barring any major shocks to the energy sector is likely to continue to hold adequate reserves in the future
- Jamaica, as indicated by most of the measures, did not hold adequate reserves in the early years of the sample period, but reserves levels, though fluctuating, were adequate from 2000 onwards (except Mwase (2012) metric)
- Guyana's foreign reserve holdings were inadequate by all measures during the 1980s. This situation improved during the latter half of the sample period (except as suggested by the reserve demand method)

Conclusions

- Barbados was consistent in holding adequate reserves according to most measures, except during the balance of payments crisis in the early 1990s which significantly depleted reserves
- ECCU generally held adequate reserves for the majority of measures, although the import cover ratio indicated a shortfall during the early period of the sample.
- Haiti did not hold adequate reserves as indicated by most of the measures, but improved between 2009-11

Conclusions

There were obvious limitations of the individual methods:

- Informal ratios analysis narrowly focus on either current or capital account vulnerabilities, despite Caribbean countries face vulnerabilities related to both types of transactions;

- Mwase (2012) metric addresses both current and capital account issues, but according to the results, this benchmark may possibly be too strict to be meaningful in a Caribbean context;

Conclusions and Future Work

- The estimation and forecasting of reserve demand specifications suffered from the challenges of limited data availability, and the limitations of the approach of using econometric estimates of reserve demand based on past experience to predict optimal reserves;

- The results from the optimisation models are very sensitive to the parameters used. Some models predicted optimal ratios that were inconsistent with historical experience.

- However, with better data, alternative or more country-specific parameters could have been estimated and applied in favor of the majority of the parameters adopted from the literature. This, as well as scenario analysis, will be undertaken in future work

Thank You