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A NEW FORCASTING MODEL FOR BARBADOS

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A NEW FORECASTING MODEL OF THE BARBADIAN ECONOMY

by

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I. <u>INTRODUCTION</u>

Hitherto, forecasting and policy analysis of the Barbadian economy was undertaken solely on a judgmental basis. The proposed 'New Forecasting Model' (NFM) attempts to provide a formal econometric and statistical base for forecasting and policy analysis. Its broad objective is to identify and analyse causal relationships of macro-economic variables necessary for the understanding of the workings of the Barbadian economy. That is, it examines the causes of changes in output, balance of payment imbalances, fiscal deficits, inflation etc., focuses on those factors which are susceptible to domestic decisions, mainly government policy, projects domestic factors, assesses the impact of alternative policies and explores the implications of structural change. Thus it is envisaged that it will answer such short-term government policy questions as "what size of fiscal deficit may be allowed, if a certain foreign exchange target is to be achieved?"

The NFM is a culmination of fifteen years of modelling research in Barbados (see Craigwell and Walker (1993) for a useful survey). The first experimenters were McClean (1979, 1985); Worrell and Holder (1979, 1984); Boamah (1982); Boamah et al (1984). The main features of these models were their small size and the distinction they made between tradable and non-tradable sectors. Criticism can be lodged against the

tourism uses a two- step procedure. First, the demand for the Barbados tourism is estimated and projected. The determinant is real output in the visitors' home countries. Secondly, supply effects, non-price strategies and market specifics are introduced to modify the projection which is derived from step one. Specific account is taken of expansion in hotel capacity in Barbados, and the upgrade of hotels and facilities, increases or decreases in airline seat capacity, intensification of marketing expenditures, changes in productivity and improved service quality. Exhibit 1 shows the details of the estimates for Barbados. The total effects are applied to the baseline forecast for tourism.

The projections for manufacturing are also based on a two-step procedure. The forecast begins with a projection based on recent trends. This baseline projection is modified to take account of trade reform, the latter being largely judgmentally determined.

Barbados exports sugar under quota to the European Community; a restructuring programme is currently underway to increase the supply so as to fulfil the quota and the domestic market. The projections are based on data supplied by the sugar management company. For non-sugar agriculture and fishing, the forecasts are based on recent trends, adjusted by forecasts made by the officials of the various industries.

$$W = W(P_T, RQ, Q/N)$$

Estimates for import costs, sugar and export manufacturing and tourism are taken from the World Economic Outlook document of the World Bank.

Balance of Payments

From the output projections we may derive projections for the balance of payments, using the relationships that we have estimated. Export growth reflects recent trends. Imports are estimated from nominal GDP and adjustments for elasticity changes, e_p. That is,

$$m = m (Q, e_p)$$

where m is imports. Travel credits are based on tourism value added and inflation, while travel debits are on a historical ratio to domestic exports and travel credits. Investment income is based on trend as well as debt projections. Other services and transportation are forecasted on trend while all other services is projected using a 10-year relationship based on freight and insurance.

Fiscal Sector

Government revenues are projected according to economic growth and inflation, adjusted for the impact of tax reform and divestment. Current expenditures are

services from the forecast of the output of tradeables. Imports are forecast and we derive the required net capital inflows which would satisfy the foreign exchange reserve target.

We then forecast liabilities to the private sector and credit to the private sector, deriving the change in bank liquidity and its impact on the monetary base. The difference between the change in the monetary base and the central bank's net foreign assets (which are identical to the foreign exchange reserve target) give us the change in the net domestic assets of the monetary authority. We will allow that change to be in the form of credit to the government. It sets the limit of credit to government which may be allowed without causing the economy to fall short of the authorities' target for foreign exchange accumulation.

The maximum allowable fiscal deficit is the total of this non-inflationary credit from the central bank and prudent levels of foreign borrowing - determined by the government's external debt service profile. The projection of fiscal revenues is based on inflation and real GDP, adjusted for the impact of any tax reform. The maximum allowable government expenditure is the total of the deficit and revenue.

The system offers a forecast of real output and employment based on sectoral plans, problems and strategies. It provides a guide for monetary and fiscal policies that will serve to attain balance of payments targets, conditional on the prospects for growth.

The details are being worked out via institutions for private/public collaboration such as ministries of tourism, tourism associations and trade unions. Some aspects of the strategy are in place, others are still matters of contention. Some plans are well-devised and have been consistently implemented, others are of questionable efficacy. It is the forecaster's job to make the best judgement about the implementation, effectiveness and probable impact of each item.

The country has also taken measures to reduce gradually the extent of export concentration in the tourism sector, though acknowledging that tourism will remain the principal foreign exchange earner. More vigorous promotion and additional incentives are being targeted to other traded services. Niche markets are being sought in fisheries, agriculture and manufacturing and these sectors are to be developed further as complements to tourism, to provide inputs and to produce goods and services that may be sold to tourists. There is substantial international financial services activity. A fledgling information services industry has grown up in Barbados in the decade of the 1980s. There has been considerable development of artistic services in association with the tourism industry, especially music and festival arts. A few firms in manufacturing have developed niches in pharmaceuticals, electronic assembly and a number of other areas. In all of these activities demand is infinitely large on the international market.

Beyond a certain level of the money supply imports absorb so much of the foreign exchange receipts that the foreign exchange target cannot be achieved. Therefore, by superimposing the balance of payments constraint on the fiscal constraint the allowable level of credit to the central bank and therefore of increase in money supply is uniquely determined.

V. <u>ECONOMIC PROSPECTS FOR BARBADOS</u>

The point of departure is the forecast of tourism growth. Based on output in the visitors' home countries, the projected growth rate for tourism in the next six years is between 5% and 6%. If the exchange rates are kept fixed and inflation is contained as well as it has been in the recent past, cost competitiveness should improve by about 4% per year relative to other Caribbean destinations. It is unlikely that Jamaica and the Dominican Republic - the competitors suffering from high inflation - will be able to reduce inflation to rates comparable to those for Barbados for the time being.

Manufacturing accounts for 9% of GDP in Barbados. Growth is expected in food processing and the other manufacturing based on recent trends. However, Barbados is undertaking a major trade reform which is likely to slow the growth of manufacturing. The growth rate for manufacturing is projected at 1%. Output in fisheries and non-sugar agriculture are both projected to grow at the same rate of about 5%. Efforts to expand production of non-sugar agriculture have had little success.

policies and the expected impact of competitive strategies. Because so much of what goes into the forecast of tradeables is judgmental we cannot determine margins of error ex ante. Nevertheless, the forecasts are useful if they are carefully compared with performance as it evolves as a guide to the modification of strategies and policies.

ECASTING TOURISM	1993	1904	1995	1996	1997	1996	1900	5000					
* 'pe Artivals	1,000												
Tourist Arrivels	112.8	1162	121,1	126.2	131 4	138.6	142.3	147.9					
TOP - USA	4779.3 1649	4,870 1 169.9	5,001 B	5,136.6 1845	5,275.3 192.2	5,417.8 200.0	5,564.0 206.0	5,714.3 216.3					
☐ ilmate "nemarii lactor	0.66	£7.69	D 58	0 88 119 \$	0.68 129.1	0.68 135.5	0.68 145.2	0.69 15 1.1					
- UK	100.1 422.2	1042	442.0	455 2	488,9	483 0	497.4 143.0	512.4 151.8					
_{hard} mate ्रेड्डिकालकार्ड Sector	96.6 1.02	102.7	110.3	1.02	126.2 1.02	1345	1,02	1.02					
Carada EXIP — CANADA	49.2 562.0	49 0 580.6	48 7 801.5	46 4 623.)	48 2 645.5	47.9 668.8	47.0 592.9	717.8					
Satmata	64.2 0.77	63.9 0.77	63.6 0.77	63.3 0.77	62.9 0.77	62.5 0.77	62.1 0.77	61.7 0.77					
.' idgement lector u⇒lcom	52.2 19.0	53 0 19.2	53.9 19.4	54.8 19.5	55.7 10.8	56.5 20.0	56.5 20.0	55.5 20.0					
rage = TRINIDAD	73.5	74.7	75.9 0.71	77.2 0.71	78.4 0.71	79.6 0.71	79.5 0.71	79.6 0.71					
਼±xigement factor ਹੋੜੇਆ	0.71 81.4	0.71 6-4 i	85.7	69.3	91.9	24.5	\$4.5	94.5 60.1					
isimate -bidgement factor	1.18	71.2 1.18	73.4 1.1 B	75.7 1.18	77 D 1.18	80.1 1.16	80.1 1.18	1.16					
: w tourist Arrivals	305.7	408.5	422.4	438,6	455.2	472.2	495.1	500.4					
: main of Stay	8.8 0.54	6.8 0.54	6.6 0.53	6,8 0,52	6.9 0,52	6.9 0.51	a.9 0.51	6.9 0.50					
Short Blay Ratio "stimated Langth of Stay	8.19	8.20	8.22	5.24 9.63	8.26 0.63	8.26 0.83	8.29 0.63	8.31 0.63					
_'udgement factor	0.83	0.83	0.83	0.63	063	4.83	0.03	0.00					
										F-4			
				djustmest	Estimated Tourist	Quarterly		(engith	Adjustment	Estimated fength	Quarterly	O - d - la lan	Contain
1004 Jan		weights 0.068	antiva¥t 38.0	Factor 1.000	87 ivals 37.973	Arrivals	atriglew BOO.1	ol stay 7.0	Factor 1,000	of stay 7.000	Length of Stay	265 6	Beangitta
feb		0.068 0.097	38 5 36.2	1.000	36.538 39.248	115.750	1.026	7.5 6.7	1.000 1.000	7.500 6.700	7.1	269.0 263.0	272.0
Kur Apr		0.099	37.6	1,000	37.577 32.310	***************************************	0.928	7.6 7.1	1,000	7.600 7.100		265.6 229.4	
May Jun		0.058 0.058	32.3 27.6	1.000	27-812	97.600	0.968	7.1	1.000	7.100 7.130	7.3	197.5 3340	237.5
Jul Dug		p.097 0.068	46.8 35.8	1.000	45.799 35.795		1.048	7.1 7.5	1.000	7.328		262.3	~~~
Seb Oct		0.052 0.074	25.2 30.1	1.000	25.168 33.369	107.783	1,038	7.1 6.9	1.000 1.045	7.055 7.169	7,2	177.7 239.2	258.0
Nov		0.067	35.3 39.1	1.106 1.108	39.154 43.330	115,852	0.973 1.017	0.6 0.9	1,045 1,045	6.923 7.235	7.5	271 D 313.5	2744
Dec							1,003	6.6	1.045	7.158		291.4	
1905 Jan Feb		0.067 0.068	36.6 37.0	1.108	40,719 41,051		1.029	7.0	1.045	7,330	7.0	301.3	288.5
Mar Acr		0.066 0.069	37.1 37.6	1.108	41.005 41.612	122,635	0,031 0,971	6.4 6.6	1.045 1.045	6.641 6.924	7.0	268.1	
titey Jun	,	0.074	31-2 26.0	1.106	34,520 30,990	107,122	0.977 0.971	6.7 6.6	1.045 1.045	6.969 6.925	8.9		247.8
Ju Aug		0.000 0.007	42.0 30 6	1.108	46.510 40,519		1,006	7.1 7.2	1.045 1.045	7.380 7.540		343.7 305.0	
5ep		0.001	25.6	1.106	28,550 35,001	115,570	1,025	7.0 6.5	1.045 1.045	7.307 7.145	7,4	206.6 250.1	286.1
Oe1 Nov		0.075 0.068	31.6 37.4	1.103	41,386		0.963	5.6	1.045	6.670	7.1	2843 339.3	291.2
Dec		0.093	41.6	1.106	46,051	122,447	1.033	7.0	1.045 1.045	7.366	7.1		2012
1900 Jen Fab		0.067 0.067	38.1 38.3	1.108	42,244 42,446		0.994 1.022	6.8 7.0	1,045 1,045	7.107 7.305		300.2 310.1	
Mer		0.095 0.088	37.9 38.4	1,108	41.974 42.579	120,063	0.928	6.3 6.7	1.045 1.045	6.935 6.954	7.0	278.5 298.1	290.3
Apr Mey		0.074	32.6	1.106	36,095 31,020	110,504	0.071	6.6 5.7	1.045	6.945 5.995	7.0	250.7 223.4	258.7
Jun Jul		0.065	28.8 44.4	1.108	49.216	110,504	1.030	7.0	1.045	7.465 7.560		302.5 319.0	
Aug Sep		0.067 0.061	36.0 26.9	1.106	42,060 29,502	121 098	1,000	7.3 7.1	1.045 1.045	7.304	7.4	220.4	3,000
Oct Nov		0.076 0.092	33.3 38.9	1.106	30,650 43,068		1.010 0.964	6.9 6.6	1,045 1,045	7.220 6.680		295.1 295.7	
Dec		0.095	43.1	1.108	47,700 0,000	127.619	1.035	7.1	1.045 1.045	7.401 0.000	7.2	353.g D.g	
1997 Jan Feb		0.067 p.067	39.5 39.6	1.106	43,843 44,052		0.988 1.025	6.8 7.0	1.045 1.045	7.067 7.347		309.8 323.8	
Mar		0.095	39.3	1.108	43,562 44,191	131,458	0,930	5.4 5.7	1.045 1.045	6.665 7.028	7,0	290.3 310.6	307.9
Apr May		0.068 0.074	33.8 33.8	1.108	37,481		0.973	6.7	1.045	6.976 7.060	7.0	201.3	268,6
Jun Jul		0.065 0.101	29,9 48,1	1.108	33.128 51,079	11 4760	0.965 1.027	6.B 7.0	1.045 1.045	7.358	1.0	375.0	
Aug Sep		0.067	39.4 27.0	1.106	43 673 30,930	125.682	1.057 1.037	7.2 7.1	1.045 1.045	7.574 7.434	7,5		312.2
Oct Nov		0.076	34,5 40,3	1.108	38.245 44.039		0,999 0,964	6.6	1.045 1.045	7.162 8.909		273.9 306.8	
· Dec		0.006	44.7	1.108	49,506	132.449	1,036	7.1	1.045 1.045	7.421	7.2		316,7
1998 Jan		0.064	49.6	1.106 1.108	45.253		0.067	8.0	1.045	7.089		320,6 336,0	
Føb Mar		0.067 0.067	41,3 40,9	901.1 901.1	45.760 45.345	136,357	1.022 0.931	7.0 5.4	1.045 1.045	7.943 6.688	7.0	303.3	320.0
Apr May	,	0.064	41.8 35.1	1.106	48.065 38,931		0.983 0.975	6.6 6.7	1.045 1.045	7.062 7.000		325.5° 272,5	
ماران فاران		0.005	30.7 48.2	1.108	34,025 53,373	119,041	0.1936 1,016	5.8 7.0	1.045 1.045	7.090 7.315	7.0	240,9 360,4	279,6
Aug.		0.065	40.3 26.6	1.105	44.031 31,713	129,718	1.055	7.2 7.1	1.045 1.045	7.575 7.405	7.4	338,1	321.1
eê Oct		0.061 0.076	35.B	1,100	30,700	120.110	1.006	6.9	1.045	7.224	,,,	280.8	
Nov Dec		0.099 0.099	42.0 46,6	1,108 1,108	48,509 51,658	138,067	0.972 1.035	6.7 7,1	1.045 1.045	6.961 7,432	7.2	324 <i>1</i> 385.4	332.3
1990 Jan		B.067	42.2	1,106	46,773		0.990	5.8	1.045 1.045	7.120		333.0	
Feb Mar		0.065 0.067	42.6 42.5	1.108	47,182 47,066	141.021	1,029 0.931	7.1 0.4	1.045 1.045	7.404 6.700	7.1	849.3 315.3	332,6
Apr May		0.068 0.074	42.6 36.0	1,108	47.200 30.923		0.994 0.978	6.6 6.7	1,045 1,045	7.150 7.034		337,5 290,8	
մտ		0.005	31.7	901.1	35.141	122.265	0.963	8.6	1.045	7.003	7.1	248.4 404.6	
Jul Aug		0.102 0.065	49.7 41.5	1,108	\$5.043 45.969		1.022	7.0 7.2	1,045 1,045	7.350 7.550	_	347.7	
Sep Oct		0.000 0.076	29.3 36.8	1.106 1.106	32.518 40.787	133.550	1.023	7.0 6.9	1,045 1,045	7,355 7,220	7.4	239.2 294.5	330.5
Nov Dec		0.000	43.2 47.9	1,109	47.841 53.101	141,729	0.966	8.7 7.1	1.045 1.045	5,949 7,406	7.2	332.5	340.1
				1.106					1,045			3440	
2000 Jan Feb		0.097 0.097	43.5 43.6	1,108	48.144 48.500	_	0.992 1.025	6.9 7.1	1.045 1.045	7.140 7.387	_	358.3	
Mar Apr		0.067 0.068	43.5 44.0	1.106 1.106	48.182 48.772	144832	0.930 0.960	6.6 6.6	1.045 1.045	6,702 7.061	7.1	322.0 344.4	
May Jun		0.074 0.066	37.1 32.6	1,106	41.119 36.354	126,245	0.975 0.961	5.7 6.8	1,045 1,045	7.023 7.064	7.0	268.8 256.8	296.7
Jư		0.105	50.7	1,108	56.121		1.027	7.1 7.3	1,045 1,045	7.395 7.606		415.0 363.1	
tep €ep		0.065 0.061	43 1 30.5	1.106	47.728 33.779	137.628	1.056	7.1	1.045	7,410	7.5	250.6	342.9
Oct Nov		0.076 0.099	37.8 44,4	1.106 1,106	41.016 49,164		1.004	6.9 6.7	1,045 1,045	7.233 0.957		303.2 342.0	
Dec		0.096	49.3	1,108	54.602	145,684	1,034	7.1	1.045	7.446	7.2	406.5	350.0

350.0

GDP ESTIMATES

Estimates of Real GDP (1974 Prices) (% changes)

•	1995 	1996	1997	1998	1999	2000
TRADED SECTOR	0.6	5.7	3.8	4.8	2.5	2.5
Sugar Non – Sugar Agriculture &	(30.6)	46.7	11.7	12.5	0.0	0.0
Fishing	0.3	6.6	6.4	5.5	4.2	3.4
Manufacturing	(8.0)	(0.7)	(0.9)	2.7	0.0	0.7
Tourism	6.7	4.3	4.4	4.3	3.7	3.6
NON-TRADED SECTOR	3.0	2.6	2.6	2.7	2.3	1.8
Mining & Quarrying	0.6	3.6	7.0	2.7	2.8	2.3
Electricity, Gas & Water	3.3	(1.3)	3.0	4.2	3.5	2.9
Construction	1.8	2.6	4.5	2.2	2.7	3.0
Wholesale & Retail	4.5	2.9	0.3	2.6	3.0	3.6
Government	0.0	5.3	4.5	2.7	2.5	2.6
Transportation, Storage &						
Communications	4.2	0.3	2.9	3.3	3.1	3.1
Business & Other Service	3.5	2.2	2.5	3.1	2.8	3.1
Total	2.2	3.5	3.0	3.3	2.4	2.0