

OIL THE DUTCH DISEASE AND THE TRINIDAD AND TOBAGO MACROECONOMY.

The Implications of oil prices and oil price volatility

Introduction

This research investigates the dynamic relationships between oil price shocks and the major macroeconomic variables in a small open oil-producing country Trinidad and Tobago.

The study extends the work of Lorde et.al. (2009) to include the unemployment rate, the historic maximum oil price reached in July 2008 followed by the global meltdown, the 2009 oil shock and the partial recovery of 2010.

Lorde et.al (2009) Results

Impulse response functions :

With positive oil price shock :

For the first two years output falls then grows positively throughout.

Positive response of gross investment, government consumption, and revenue, and price level.

Net exports exhibit signs of Dutch disease : sharp increase but by fourth year in deficit.

With positive oil price volatility shock :

Random swings to macroeconomy.

Smaller macroeconomic impacts on macroeconomy than shocks to oil prices.

Lorde et.al(2009) Results

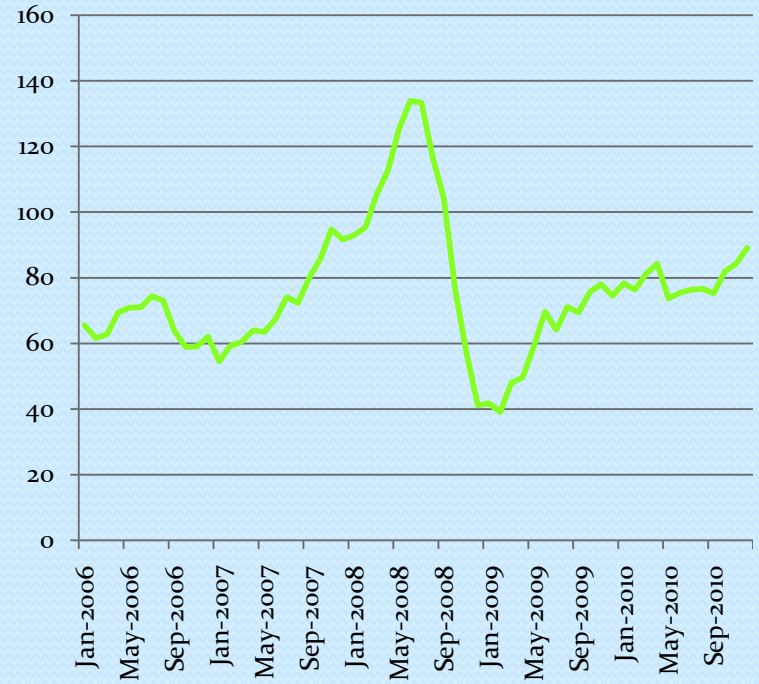
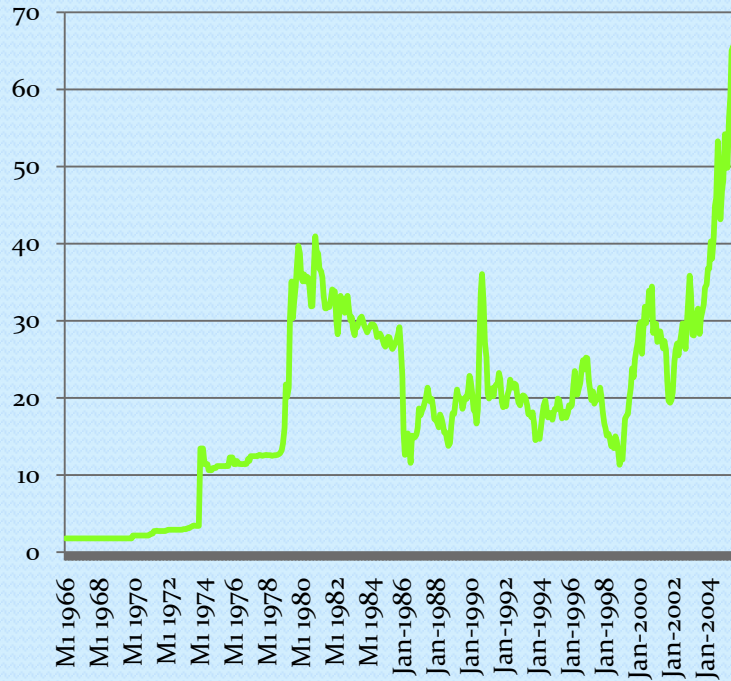
Variance decompositions imply that the oil price is a major component of of the chosen variables barring net exports and output.

Similar results but on a significantly smaller magnitude, concerning shocks to oil price volatility.

Causality from oil prices to output and oil prices to government revenue.

Government revenue granger causes net exports, government consumption and average prices.

Oil price behavior Lorde et al (2009) and post Lorde et al (2009)



Behavior of oil prices after Lorde et.al (2009)

	Lorde et.al (2009) : 1966-2005	1966 -2010	2006-2010
mean	13.07	15.80	70.67
Std.dev	2.74	2.97	1.21
kurtosis	2.838	2.93	2.87
skewness	-1.07	-0.836	1.24

Behavior of oil prices after Lorde et.al (2009)

Egarch estimates	Lorde et.al (2009) 1966-2005	1966-2010
γ	-0.1240	0.8437
β	0.4461	-0.4103
α	0.2345	0.1915
Dummy variable	-0.2813	-0.2121

Statistical comparison of the time series variables of Lorde et.al.(2009) :1966 to 2005 vs. current study 1966 to 2010

	Skewness	Kurtosis	Jarque Bera	Mean	Probability
Oilp Lorde	-1.07	2.83	7.71	13.07	0.021
Oilp	-0.84	2.93	5.26	15.80	0.07
Oilvol Lorde	1.31	8.43	59.15	1.17	0.0
Oilvol	1.9	9.15	95.97	1.14	0.0
Nx Lorde	3.39	17.46	425.02	1924.06	0.0
Nx	2.92	10.56	171.09	5534.03	0.0
Ginv Lorde	-0.58	2.3	3.06	2697.3	0.22
Ginv	-0.62	2.35	3.65	3294.5	0.16
Cons Lorde	-0.73	2.15	4.81	1978.31	0.09
Cons	-0.66	2.31	4.20	2489.91	0.12
Rev Lorde	-0.86	2.53	5.28	3568.85	0.07
Rev	-0.65	2.63	3.48	4628.55	0.17
Prices Lorde	-0.68	2.12	4.42	27.11	0.011
Prices	-0.67	2.26	4.34	32.14	0.11
Output Lorde	0.28	2.86	0.55	40134.84	0.76
Output	0.61	2.52	0.44	2373793.82	0.80

Correlation analysis of impact of oil prices (oilp) and oil price volatility (oilvol) on macro economy

	Lorde et.al.(2009) 1966 to 2005	1966 to 2010		Lorde et.al.(2009) 1966 to 2005	1966 to 2010	2006 to 2010	2006 to 2010
	oilvol	oilvol		oilp	oilp	oilp	oilvol
nx	0.09	-0.02	nx	0.41	0.53	0.66	0.86
prices	-0.19	-0.19	prices	0.87	0.89	-0.07	-0.52
output	-0.12	-0.16	output	0.84	0.87	0.46	-0.16
rev	-0.17	-0.16	rev	0.94	0.95	0.82	0.54
cons	-0.22	-0.21	cons	0.88	0.91	0.02	-0.61
ginv	-0.20	-0.19	ginv	0.88	0.90	0.02	-0.48
ur	n/a	0.20	ur	n/a	-0.23	-0.71	-0.05

Objectives of the study

- To highlight the vulnerability and dependence of the macroeconomy of T&T on oil prices and oil price volatility.
- To bring to the forefront the presence of the Dutch disease symptoms and the imperative of economic diversification within and away from the energy sector.

Econometric Methodology

- Nelson (1990) EGARCH

$$\gamma_t = \omega + \alpha_1 + \alpha_1 \gamma_{t-1} + \varepsilon_t, \varepsilon_t \sim N(0, \sigma_t^2)$$

$$\text{Log}(\sigma_t^2) = \omega + \beta_1 \log(\sigma_{t-1}^2) + \alpha_1 \left| \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \right| + \gamma_1 \frac{\varepsilon_{t-1}}{\sigma_{t-1}}$$

- where γ_t is the log difference of oil prices. The estimated standard deviation of ε_t is used to proxy oil price volatility. EGARCH (1,1) model is asymmetric since as there isn't the need to impose restrictions on the α, γ and β ; as opposed to the ARCH/GARCH the coefficient can be either positive or negative; the standard GARCH model assumes that negative shocks have the same impact as positive shocks of the same magnitude and allows for asymmetry.
- Innovation Accounting.
- Granger Causality Tests.

Unit Roots Results

Variable	ADF		KPSS		Decision
	Level	1 st .difference	Level	1 st .difference	
OILP	-1.9253	-4.4859***	0.1282***	0.0948	I (1)
OUTPUT	-1.9253	-4.4859*	0.2996***	n/a	I (1)
GINV	-2.1577	-4.1567***	0.1203*	0.0744	I (1)
REV	-1.8732	-3.2593**	0.1391**	0.0722	I (1)
CONS	-1.549	-3.2437*	0.1715**	0.0938	I (1)
PRICES	-1.7859	-3.9386**	0.191**	0.0882	I (1)
OILVOL	4.7395***	n/a	0.085***	n/a	I (0)
UR	-1.8632	-5.5248***	0.20536***	0.03546	I (1)

Note,***,** and* indicate significance at the 1%, 5% and 10% levels of significance respectively

Johansen co integration test

Null hypothesis	Alternative hypothesis	Test statistic	Test statistic Lorde et. al.	p-value	p-value Lorde et. al.
Trace test					
r = 0	r ≤ 1	163.0534***	168.160***	0.008	0.00
r = 1	r ≤ 2	113.8394	104.483**	0.0857	0.011
r = 2	r ≤ 3	81.9576	61.927	0.1409	0.181
Max eigen value test					
r = 0	r = 1	49.2139	63.677***	0.0692	0.000
r = 1	r = 2	n/a	42.555**	n/a	0.026
r = 2	r = 3	n/a	25.182		0.373

Impulse Response Analysis

A positive and significant response of output, gross investment, government revenue and consumption, the price level and the unemployment rate to a unitary shock in oil prices.

Dep var	period	output	ginv	rev	nx	cons	prices	ur
oilp	1	0.0089	0.0193	0.1326	1952.9	0.0324	0.0611	0.9314
	5	0.0268	0.1368	0.2423	1402.8	0.1347	0.0979	0.6360
	10	0.0297	0.1421	0.2422	1261.8	0.1437	0.0954	0.6468

Impulse Response Analysis

The impulse response functions suggest that an unanticipated rise in oil volatility brings about random swings in the macroeconomy. With regard to the magnitude of the responses, shocks to oil volatility tend to yield smaller macroeconomic impacts in comparison to shocks to oil prices.

Dep var	period	output	ginv	rev	nx	cons	prices	ur
oilvol	1	- 0.0008	0.0184	0.1252	1387.3	0.0372	0.0621	1.1245
	5	- 0.0005	- 0.0033	0.0006	96.053	- 0.0025	-0.0004	0.0092
	10	0.000005	0.000047	0.000004	-1.0818	0.000036	0.000006 7	0.000059

Variance decomposition with oil price in VECM

Depvar	Period	S.E.	OUTPUT	OILP	GINV	REV	NX	CONS	PRICES	UR
output	1	0.039	100	0	0	0	0	0	0	0
	5	0.17	68.054	1.038	2.4	0.107	0.47	23.973	3.328	0.63
	10	0.315	61.16	2.152	2.315	0.071	0.147	27.818	5.512	0.825
ginv	1	0.039	9.4984	0.102	90.4	0	0	0	0	0
	5	0.17	12.838	12.21	67.66	0.458	1.414	1.7015	3.465	0.254
	10	0.315	16.803	14.87	54.97	0.38	1.857	4.5522	6.104	0.466
rev	1	0.039	10.914	54.81	0.506	33.77	0	0	0	0
	5	0.17	23.019	55.82	0.13	3.221	0.906	1.0616	15.55	0.289
	10	0.315	25.741	51.22	0.079	1.336	0.442	3.003	17.84	0.338
nx	1	0.039	7.8789	3.564	1.793	13.72	73.04	0	0	0
	5	0.17	18.846	1.739	4.255	5.071	68.23	0.1291	1.61	0.117
	10	0.315	18.507	1.022	4.715	4.362	69.97	0.1054	1.256	0.065
cons	1	0.039	3.9787	10.28	6.583	0.159	0.199	78.803	0	0
	5	0.17	9.4708	46.35	12.37	0.324	0.53	16.79	14.05	0.114
	10	0.315	18.734	44.09	9.498	0.129	0.694	6.0867	20.37	0.394
prices	1	0.039	0.4548	62	0.052	1.089	4.037	7.5178	24.85	0
	5	0.17	1.09	50.9	1.342	2.265	6.232	2.3824	34.87	0.913
	10	0.315	1.4509	48.99	1.599	2.184	6.716	1.32	36.55	1.19
ur	1	0.039	1.6144	12.59	0.276	32.74	0.004	0.1496	0.372	52.26
	5	0.17	3.3692	6.726	0.535	51.64	1.589	6.0536	0.707	29.38
	10	0.315	4.6588	6.56	0.453	55.94	1.944	3.6176	0.559	26.27

Variance decomposition with oil price volatility (OILVOL) in VAR

depvar	Period	S.E.	OUTPUT	OILVOL	GINV	REV	NX	CONS	PRICES	UR
output	1	0.049	100	0	0	0	0	0	0	0
	5	0.059	86.412	0.622	4.4735	0.128	2.281	4.637	0.21	1.236
	10	0.059	86.41	0.622	4.4749	0.128	2.281	4.637	0.21	1.236
ginv	1	0.049	12.617	1.567	85.816	0	0	0	0	0
	5	0.059	13.466	9.02	69.346	2.086	2.297	0.666	1.93	1.19
	10	0.059	13.528	9.011	69.288	2.085	2.3	0.67	1.93	1.189
rev	1	0.049	7.4043	38.42	0.0424	54.13	0	0	0	0
	5	0.059	18.034	29.08	0.9907	33.24	3.279	0.676	13.24	1.457
	10	0.059	18.07	29.04	1.0159	33.21	3.283	0.697	13.23	1.456
nx	1	0.049	0.9977	2.448	1.6855	16.91	77.96	0	0	0
	5	0.059	6.8434	2.336	2.5062	17.84	65.1	0.516	4.313	0.545
	10	0.059	6.8427	2.336	2.5086	17.84	65.1	0.521	4.314	0.545
cons	1	0.049	2.1736	7.871	3.1066	0.117	1.061	85.67	0	0
	5	0.059	18.048	11.61	3.656	3.469	1.548	58.99	1.888	0.792
	10	0.059	18.106	11.6	3.6632	3.466	1.551	58.93	1.888	0.792
prices	1	0.049	0.997	57.64	0.2478	4.884	4.9	4.918	26.41	0
	5	0.059	4.097	45.89	3.5084	5.61	4.978	3.807	29.37	2.741
	10	0.059	4.2004	45.8	3.5323	5.6	4.982	3.822	29.32	2.738
ur	1	0.049	0.0892	16.42	0.0011	5.463	1.041	2.44	1.267	73.27
	5	0.059	4.585	16.82	0.3134	4.586	0.952	19.06	1.285	52.4
	10	0.059	4.5861	16.81	0.3152	4.585	0.952	19.07	1.284	52.4

Null hypothesis	F statistic
Oil prices do not Granger- Cause	
Output	9.3505 ***
Gross investment	0.0894
Government revenue	6.4512 ***
Net exports	1.5764
Government consumption	0.7345
Average prices	4.0118 ***
Unemployment rate	0.1064
Null hypothesis	F statistic
Government revenue do not Granger- Cause	
Output	11.3088 ***
Gross investment	0.1514
Net exports	4.5666 **
Government consumption	2.807 *
Average prices	11.1924 ***
Unemployment rate	0.1080

Note,***,** and* indicate significance at the 1%, 5% and 10% levels of significance respectively

Implications of the Analysis and Concluding Comment

Economic diversification must be the goal of whatever wise and prudent fiscal strategies and monetary policies are adopted by the policymakers of Trinidad and Tobago. Diversification of the economy not only brings about the benefits of insulating the macroeconomy from economic vulnerability but also the positive externalities of learning by doing, technological progress and innovation are fostered through a virtuous cycle of growth and development Velculescu and Rizavi (2005). The crowding out of the non booming (NB) export sectors by the booming export sector and non-traded goods sector can be prevented by the investment of oil windfalls towards economic diversification, which can mitigate the negative effects oil price volatility Weinthal and Luong (2006)

Implications of the Analysis and Concluding Comment

Policy makers in Trinidad and Tobago should bear in mind three points when formulating fiscal policy. Firstly, the non oil balance should feature prominently in the fiscal policy in the budget. Secondly, since aggregate demand can destabilize, exacerbate uncertainty and induce macroeconomic volatility.

Therefore, there should not be large swings in the fiscal policy as measured by the non-oil balance. Finally, oil wealth should be transferred to financial wealth. This implies viewing oil revenue more like financing rather than like income.

OIL, THE DUTCH DISEASE AND THE TRINIDAD AND TOBAGO MACROECONOMY

THANK YOU !