Coordination of Monetary and Fiscal Policies in Trinidad and Tobago

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Abstract

The purpose of this paper is to investigate the extent of coordination between monetary and fiscal policies in Trinidad and Tobago over the period 1967 – 2016. To achieve this objective, the paper first adopts the Granger causality and cointegration tests to determine whether these policies are implemented independently. Testing for independence is necessary since only independent institutions are in a position to engage in economic policy coordination. If independence is observed, the extent of coordination is then estimated using: (i) the Set-Theoretic Approach (STA); and (ii) the vector autoregressive (VAR) modelling framework. Our analysis reveals that policy coordination has been weak throughout most of the review period. Coordination improved following the 2008/09 global financial crisis as both the fiscal and monetary authorities came together to revive the economy. The results point to the need for the policy-making authorities to improve coordination to enable sustainable long-term growth with low inflation in the country.

1. Introduction

The 2008/09 global financial crisis underscores the importance of policy coordination in countries and regions. The crisis, which began in the United States (US) 'subprime' mortgage market, was quickly transmitted to the rest of the world. The crisis left policymakers in many countries struggling to foster economic growth and maintain price stability. In response, central banks and governments relied heavily on coordinating their monetary and fiscal policies in order to revive their economies (Gomes da Silva and Vieira (2014). Across the globe, many economies adopted highly accommodative monetary policies (including unconventional monetary policies in the case of advanced economies) to stabilize financial markets while fiscal policies became expansionary with the aim of stimulating aggregate demand.

Policy coordination has also become a timely and relevant topic from the perspective of the challenges facing Trinidad and Tobago in recent years. It is being observed that the substantial decline in international energy prices since mid-2014 and lower local energy production have resulted in severe shortfalls in energy revenue and foreign exchange inflows for the country. In many countries, governments carry out the important resource allocation role through two key policy-making authorities. One, is the fiscal authority (or ministry of finance), which collects public revenues through taxation and allocate the same through spending in various sectors of the economy. National budgets prepared by the fiscal authority reflect the macroeconomic policies of the government. The other, is the monetary authority (usually the central bank), which controls the country's critical financial resources (such as foreign exchange reserves and credit) and can influence allocation by operating on the monetary aggregates and interest rates. These institutions usually have separate mandates or policy objectives. It is crucial, therefore, that the policies implemented are not counterproductive especially where the policies of one authority do

not compromise the ability of the other to achieve its own policy objectives. This situation can potentially hinder the efficient allocation of already limited resources in the country.

The theoretical literature has produced a number of studies on the benefits of monetary and fiscal policy coordination. High levels of policy coordination implies a reduction in the potential for policy conflicts that could result in the economy operating lower than optimal, a greater ability to respond to adverse external shocks, a sustainable growth path alongside low inflation, and an overall improvement in the economic well-being of citizens of the country. In practice, however, there are challenges to achieving high levels of policy coordination. Blinder (1982) noted that a lack of coordination may be due to three main reasons: (i) different objectives of monetary and fiscal authorities on the economy; (ii) different opinions on the implications of policy actions on the economy; and (iii) different forecasts on the state of the economy used by the two authorities.

The available studies on the issue of monetary and fiscal coordination in relation to Trinidad and Tobago are few. Measuring policy coordination and understanding the interaction is a key step in addressing potential problems of weak policy coordination in the economy. This paper attempts to quantify the extent of the coordination. The rest of the paper is organized as follows: Section 2 provides a review of related theoretical and empirical literature. Section 3 describes some of the stylized facts on TT. Section 4 describes the methodology used to assess the extent of the relation between the fiscal and monetary policies. Section 5 is a presentation of the results along with an analysis of the findings. Finally, Section 6 will conclude with some brief policy recommendations.

2. Literature Review

Coordination may be defined as the necessary arrangements which ensure that monetary and fiscal policy actions are taken in a consistent manner (Arby and Hanif, 2010). Monetary policy is the responsibility of a central bank and involves managing monetary conditions in the economy with the main objective of ensuring low inflation. Fiscal policy is the responsibility of the national government (i.e. the ministry of finance) and involves tailoring of taxation, expenditure, and borrowing measures to achieve high growth with low unemployment. Although these policies are carried out by separate policy-making authorities they have one main ultimate objective, which is, to improved well-being of the citizens of a country.

Due to the separate institutional arrangements, fiscal and monetary policies could at times work against each other and do not bring the intended benefits to the economy and its citizens. It is therefore important that both institutions coordinate their policies to ensure they are carried out as effectively as possible to enable the economy to operate optimally. Coordination does not mean that the central bank surrenders its autonomy for carrying out monetary policy. In fact, a more independent central bank is a critical prerequisite in ensuring coordination between both types of policies (Sehovic, 2013). Many central banks have shifted towards greater independence

within the last two decades, making the issue of policy coordination even more crucial for countries.

The issue of policy coordination has been studied quite extensively over the years. The interactions and potential conflicts associated with these two types of policies can be found in the traditional Mundell-Fleming model which requires both internal and external balance to be met (Fleming, 1962, Mundell, 1963). Later, Sargent and Wallace (1981) described the interaction of these policies as a game of chicken which requires coordination in order to achieve Pareto efficiency in an economy. According to Sargent and Wallace (1981), the fiscal authority being the agent for fiscal policy, dominates the policy environment and makes the first move which effectively dictates the actions of the monetary authority - like a game of chicken. The authors noted that when fiscal policy operates in a dominant way the ability to effectively carry out monetary policy is compromised and inflation objectives are unable to be met. The potential for policy dominance was also noted in Togo (2007) who pointed out the need to have these two policies to be coordinated and carried out independently so as to avoid an inappropriate mix of policies.

Other studies viewed the interaction between monetary and fiscal policies as a game between the monetary and fiscal authorities. For example, Tabellini (1985) found that coordination of policies in response to shocks increases the economy's speed of convergence to the steady state and planned target outcomes. Further, Nordhaus (1994) explained that non-cooperative policies played by monetary and fiscal authorities will result in Nash equilibrium with higher interest rates and lower economic growth, but a strategy that involves coordination between authorities can yield a Pareto outcome with low inflation and higher economic growth. Dahan (1998), studying the budgetary implications of central bank actions and monetary implications of fiscal actions, also stressed the need for coordination of both polices (See also Checherita (2010)). Recently, Bianchi and Milose (2017) studied the effects of the lack of policy coordination with particular emphasis on the zero-bound period. They found that the lack of coordination can lead to an explosive dynamics of inflation and large output losses.

Policy coordination has also been a topical issue in the context of a monetary union. In a monetary union where the monetary policy is carried out by a single central bank but fiscal policy is the work of individual member countries, fiscal policies (e.g. government deficits) in one country can have adverse spillover effects on other member countries and lead to inefficient outcomes for the monetary union (Cabral and Diaz, 2015). The possibility of spillover implications justifies the need all members to engage in fiscal policy coordination in the European Monetary Union (EMU) (Ferre, 2008).

Several empirical studies devoted to policy interaction found that, in practice, there is evidence of a lack of strong coordination in many economies. This is especially so in small open economies (SIDS), emerging market and developing economies (EMDEs), including oil-producing economies. There are several reasons for the lack of policy coordination in these

economies. For instance, Worrell (2000) indicated that monetary and fiscal authorities in small open economies face a number of challenges that prevent a high degree of coordination. These include: (i) the limited effectiveness of monetary policies, (ii) fiscal indiscipline; (iii) the lack of well-developed financial markets; (iv) uncertainty about monetary policy transmission, and (v) potential conflicts between monetary policy and other central bank objectives. Jayaraman (2016) also explained that small open economies are particularly vulnerable to external shocks such as to commodity prices (e.g. energy prices) and food prices. In some oil-producing countries, governments often display fiscal indiscipline (and also adopt highly procyclical spending behaviours). These economies are also plagued by budgetary planning challenges including issues relating to inter-generational equity and fiscal sustainability. These issues may contribute to the lack of policy coordination which results in weak long-run growth performances and high inflation among oil-producers (Sturm et al. (2009)).

Muscatelli et al. (2002) investigated the response of monetary and fiscal policy to macroeconomic targets in G7 countries, using a VAR modelling technique. The results showed that monetary and fiscal policies were used as strategic compliments. The form of interaction is asymmetric and differs across countries. In the US and UK, monetary policy reacted (i.e. though a decline in the interest rate) significantly to a fiscal expansion. In the case of Italy, Germany, and France, the study did not find any clear monetary policy reaction.

In terms of developing economies, the degree of policy coordination was investigated in Tarawalie et al (2013) for the West African Monetary Zone (WAMZ) countries. The study employed a Set Theoretic Approach (STA) and VAR modelling technique and utilized data covering the period 1980 – 2011. The study revealed weak the existence of policy coordination in all the WAMZ countries over the period, contributing to the non-compliance with respect to inflation and fiscal deficit criteria of the WAMZ. The STA results showed a policy coordination of less than 50 per cent with Gambia attaining a score of 41.6%, Ghana (35.4%), Guinea (31.8%), Liberia (37.9%), Nigeria (46.6%) and Sierra Leone (41.3%).

Also, Arby and Hanif (2010) studied the extent of policy coordination for Pakistan. The sample period covered by the study is 1965 – 2009. The methodology involved the Granger causality test and cointegration analysis to determine the independence of both monetary and fiscal authorities. The STA approach was used to calculate the extent of policy coordination. The STA was calculated at 27% which suggests weak policy coordination. Andlib et al. (2012) also empirically tested this issue for Pakistan. The approach adopted is the unrestricted VAR model and data utilized covered the period 1980 – 2011. The results of the VAR test showed evidence of weak policy coordination and that shocks to monetary and fiscal variables have an insignificant impact on each other.

Policy coordination was also explored in Haleim (2016) for Egypt. The study covered the period 1974 - 2015, and adopted the approach of Arby and Hanif (2010). The results showed that policy coordination was weak over the period. The weak coordination is due to high fiscal deficits that

put pressure on monetary policy to conduct its objective in stabilizing prices. The study indicated further room to improve coordination between policies.

The interaction between monetary and fiscal policy in India was examined in Sethi (2016). The study used the VAR/VECM modelling technique and monthly data covering the period April 2010 to March 2015. The study found that fiscal policy responds well to changes in monetary policy but the reverse is not taking place. The study indicated that coordination of monetary and fiscal policies is a sufficient condition to achieve financial stability in the Indian economy.

Perez and Valdivia (2013) studied monetary and fiscal policy coordination in six Latin American countries (Bolivia, Brazil, Chile, Colombia, Peru, Uruguay, Venezuela) during the periods 2007-2008 and 2009-2010, through the application of a dynamic stochastic, general equilibrium model specified in parameters for each country and comparable in structure to each other. The results showed that there is effectiveness in the implementation of coordinated policies. The results also revealed that the degrees of policy coordination are very important in explaining the fundamentals of the economies.

In light of the shortage of research, our study will be meaningful addition to the existing literature relating to the Caribbean region.

3. Stylized Facts: History of Monetary and Fiscal Policies in TT

This section discusses some stylized facts on the conduct of monetary and fiscal policies in TT over the period 1967-2016. It should be noted that this historical period contains several different policy regimes ranging from direct policy instruments (such as reserve requirements and interest rate controls), fixed exchange rates, and financial repression in the earlier half of the sample period to financial liberalization and a more flexible exchange rate regime since 1994 and the use of indirect monetary policy instruments (or a policy interest rate) from 2002[1]. Nonetheless, we present the stylized facts based on an examination of the data.

The responsibility for monetary policy rests with the Central Bank of Trinidad and Tobago (CBTT)[2]. Under the Central Bank Act of 1964 Chap 79:02, the Bank's mandate is to maintain monetary stability, control and protect the external value of the monetary unit, administer external monetary reserves, and encourage an expansion in production employment and trade.

[1] See Public Education Pamphlet (September 2005) entitled "The Implementation of Monetary Policy in Trinidad and Tobago" issued by the Central Bank of TT for further details on the monetary frameworks adopted over the decades.

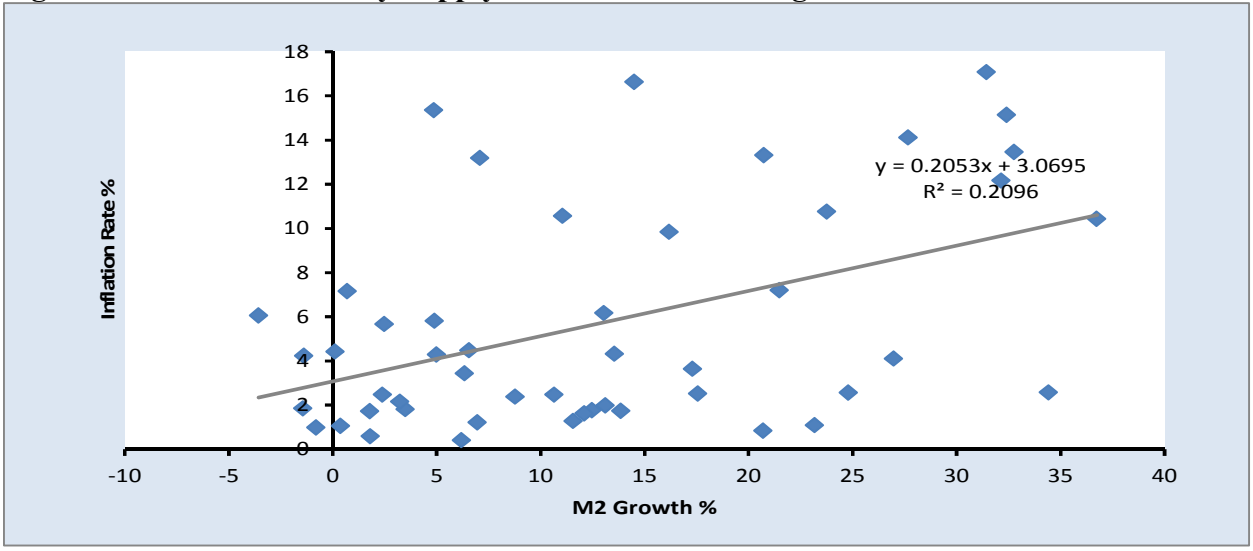
[2] In addition to these roles, the Central Bank Act of 1964 Chap 79:02 entrusts the Central Bank of TT with a range of other responsibilities. These include: the issuing and redeeming currency, acting as a banker and advisor to the government, acting as a banker to the commercial banks, issuing securities on behalf of the government, managing the foreign exchange market; investing the country's external reserves and Heritage and Stabilization Fund (HSF), and conducting intelligence-gathering and research.

Although the Act identifies several objectives of monetary policy, the Central Bank defines the main object of monetary policy as low inflation. For many years, the monetary policy framework of the Bank included the use of tools such as the direct credit controls, interest rates ceilings, and reserve requirements on financial system liquidity. Since the onset of trade and financial liberalization in 1993, the framework was amended to place a greater emphasis on the market-based instruments rather than direct policy instruments to implement monetary policy. However, both sets of policies are still being utilized.

The monetary policy decision-making function is carried out by the Monetary Policy Committee (MPC) which is supported by a Monetary Policy Secretariat (MPS). Both committees hold bi-monthly meetings to review developments in the local economy and internationally and make pronouncements on the policy interest rate (i.e. the "Repo" rate). The Bank also uses open market operations (OMO) or the issuance of treasury bills and notes to manage liquidity in the banking sector. The commercial banks are the primary dealers in this market and these institutions participate in auctions. The bank currently intervenes in the foreign exchange market to avoid excessive movements in the nominal exchange rate. Although the intervention in the foreign exchange market assists in managing financial system liquidity, it is not an explicit tool of monetary policy.

Figure 1 is a scatter plot of inflation versus the money supply growth over the period 1967 – 2016. The straight line is the trend line showing the best fit for the data. The trend line indicates a positive relationship between the money supply and the inflation rate. The coefficient of the money supply variable is 0.21 suggests that the money supply is not highly related to the inflation rate. Further, the coefficient of determination, R^2, is calculated as 0.21 also indicates a very low correspondence between the inflation rate and changes in the money supply. This implies that money supply alone does not explain much of the variability in the inflation rate.

Figure 1: Inflation vs Money Supply – Trinidad and Tobago 1967-2016



Source: Central Bank of Trinidad and Tobago

The result may also suggest that over the review period the Central Bank did not have much success in managing the money supply to address inflation. Further, given that during the pre-liberalization period the country adopted a fixed exchange rate regime, there is a possibility that more emphasis was placed by the Central Bank on maintaining the external value of the domestic currency. Even though the exchange rate was floated in April 1993, the remarkable rigidity displayed by the rate to date suggests that the Bank may have continued to place a heavy weight on maintaining the external value of the local currency.

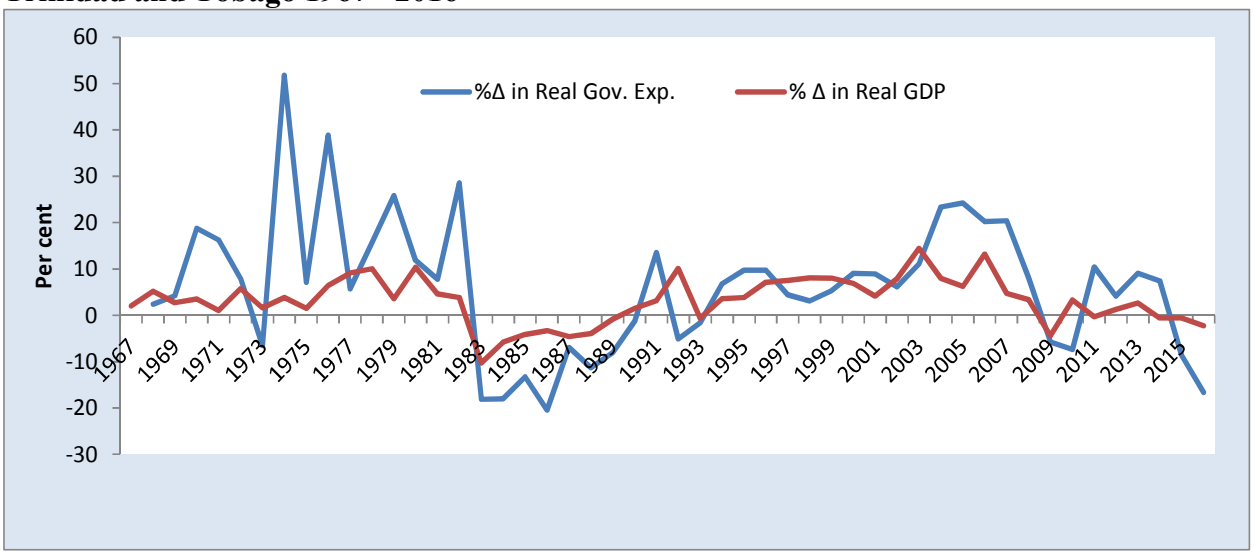
The responsibility for formulating and implementing fiscal policy rests with the Ministry of Finance of TT (MoF). The overall goal of the ministry is to implement balanced macroeconomic fiscal policies and initiatives that facilitate economic expansion and diversification of the domestic economy and which ensures fiscal sustainability. Other mandates of the ministry include: revenue collection and management; budget planning implementation; debt management and the management of state enterprises.

As an energy producer, a major source of foreign exchange and government's revenue comes from the local energy sector. For many decades the country's main export was crude oil but the second half of the 1990s the economy, shifted its dependence away from crude oil towards natural gas. Natural gas enabled the production of a wide range of oil-related products (that is liquefied natural gas (LNG), natural gas liquids and also petrochemical products (ammonia, urea and methanol). About 38% of the government's revenue comes from the energy sector[3]. However, with the recent decline in energy prices, government's revenue from the energy sector has declined fallen significantly to about 16.1% (as a % of total revenue) in FY2016/17.

Figure 2 shows the relationship between real government total expenditure and real total GDP growth in TT over the period 1967-2016. There is a general consensus among economists that fiscal policy should be countercyclical, (Hosein et al, 2017). It is clear from the graph that fiscal policy has instead tended to be procyclical. Further, the graph also indicates that the real price of crude oil (WTI) and the fiscal balance of the government are highly related. Over the review period increasing oil prices were associated with widening non-energy fiscal deficits. Conversely, lower prices were associated with lower fiscal deficit balances. Both the prices of crude oil and natural gas are also closely correlated so the graph also demonstrates the exposure of government's fiscal policy and the economy to swings in crude oil prices.

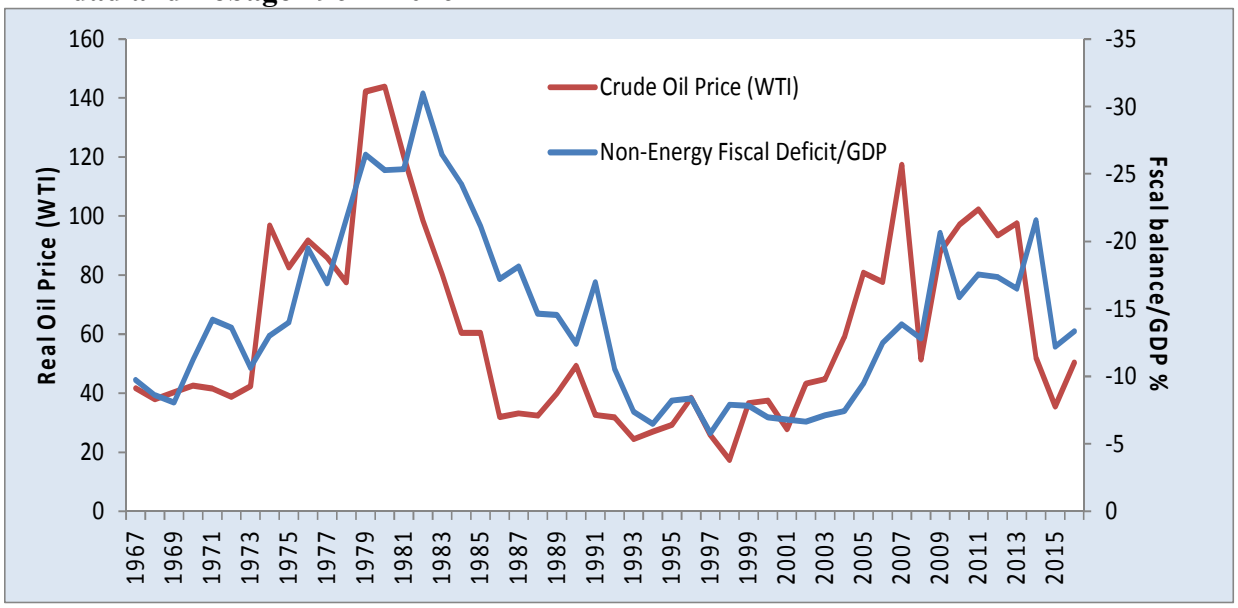
[3] Represents an average for the period 2006-2016

Figure 2: Relationship between Real Government Expenditure and Real GDP Growth – Trinidad and Tobago 1967 - 2016



Sources: Central Bank of Trinidad and Tobago, Ministry of Finance and Authors' calculations

Figure 3: Relationship between Real Crude Oil Price and Non-Energy Fiscal Deficit – Trinidad and Tobago 1967 - 2016



Sources: Central Bank of Trinidad and Tobago, Ministry of Finance and Authors' calculations

An examination of data resulted in some important observations about policy coordination over the years. Based on the money supply measure, the impact of monetary policy on inflation appears to be weak over the years. One of the possible reasons is that the Central Bank had to place a major emphasis on defending the fixed exchange regime adopted in past years which may have adversely affected policy coordination. Fiscal policies have tended to be procyclical in

nature which could have contributed to limiting the coordination of policies. Further, the macroeconomic performance of TT over the past 50 years shows a significant influence of external shocks, namely to energy commodity prices.

4. Measuring Policy Coordination

Monetary and fiscal policy coordination becomes an issue in instances where the two policy-making authorities are independent. Even if the institutions are not legally independent, the execution of monetary policy should at least be carried out independently. As regards the tests of independence, we apply the Granger causality tests to explore the existence of cointegration on two indicators of monetary and fiscal policies. The ratio of money supply to GDP (M2G) is used as an indicator of monetary policy stance and the non-energy fiscal deficit to GDP (FBG) is used as a proxy for fiscal policy. The changes in these indicators represent changes in the policy stance. The data on money supply are obtained from the CBTT and both GDP and non-energy fiscal deficit are sourced from the Ministry of Finance[4]. Both data sets are annual and cover the period 1967 – 2016.

We first conduct stationarity tests on the variables to determine the order of integration at the 5% and 1% significant levels. While the Granger causality tests determines the impact of past information on one variable on the current value of another variable, the cointegration tests establishes if there is an equilibrium relationship between the two variables over the long-run. The two institutions are considered independent if there is no cointegration between the two variables. To test of cointegration, we apply the single equation residual based Phillips-Ouliaris (1990) test on money supply and (LGM2G) and government spending (LGFBG)[5].

If independence is observed between the two institutions, the next step is to compute the extent of coordination between them given different macroeconomic shocks. We do this using the set-theoretic approach (STA) similar to Arby and Hanif (2010) and Haleim (2016). A fundamental advantage of this method is that the information contained in the primary data is sufficient for analysis, which unlike other statistical methods, require additional data to exist. Also, it is well suited for analysis of data constructs that are categorical and dimensional.

The STA involves the use of set theory. Under this approach two matrices are constructed, a macroeconomic environment shock matrix and a policy response matrix, which indicate the various paired outcomes. Both of these matrices can be compared to estimate the coordination coefficient between both policies. We define the coordination as follows:

[5] The Phillips-Ouliaris (1990) test for co-integration is based on adjusting the conventional statistic using the Newey-West estimator of error variance which is robust to serial correlation and (time-dependent heteroscedasticity.

Table 1: Macroeconomic environment matrix

		Shocks to Inflation	
		Positive	Negative
Shocks to Real Output Growth	Positive	P,P	P,N
	Negative	N,P	N,N

Given that real GDP growth rate and inflation rate are major indicators of economic performance, shocks to both indicators represent the macroeconomic imbalances that necessitate proper coordination of policies to address them. These shocks are presented in Table 1 where there are four possible combinations of positive (P) and negative (N) shocks to growth or inflation. For instance, the upper left corner cell refers to positive shocks to both growth rate and inflation, while the lower left corner cell refers to negative shocks to growth rate and positive shocks to inflation.

Another matrix is constructed which represents the coordinating responses of monetary and fiscal policies. In this policy response matrix, policies are assumed to be countercyclical to different shocks as shown in Table 2. Each cell in the policy response matrix represents the appropriate policy coordination to respond to the given shocks in the corresponding cell in the macroeconomic environment matrix. To clarify, the proper countercyclical response to positive shocks to both growth and inflation is simultaneous contractionary fiscal and monetary policies (CC). Similarly, negative shocks to both GDP and inflation require simultaneous expansionary monetary and fiscal policies (EE).

Table 2: Policy Response Matrix

		Change in Monetary Policy	
		Contractionary	Expansionary
Change in Fiscal Policy	Contractionary	C,C	C,E
	Expansionary	E,C	E,E

The extent of coordination *(ρ)* is obtained through the following equation:

$\rho = \omega/\sigma$

ω = n(PP ∩ CC) + n(PN ∩ CE) + n(NP ∩ EC) + n(NN ∩ EE)

σ is the number of years in the analysis.

Based on the above formula, a perfect coordination exists when the policy response matrix is harmonized with the macroeconomic environment matrix, i.e. ρ equals 1, while coordination is absent when $\rho = 0$. In addition, policy coordination is considered weak when $\rho \leq 0.50$ and is therefore the minimum benchmark for adequate policy coordination.

The strength of the coordination can also be tested using a vector autoregressive (VAR) modelling approach (Lutkehpohl, 2005). Similar studies have also employed VAR modelling techniques (e.g. Tarawalie et al. (2013), Sethi (2016). The VAR modelling technique is a very powerful for analyzing multivariate economic time series data. It can also provide a clearer understanding of the dynamic relationship among policy variables and their impact on the economy. However, VAR models can produce results that can be counter intuitive or contradicts economic theory.

The VAR model to be estimated is as follows:

$$Y_t = \alpha_1 + \sum_{s=1}^{n} \theta_s Y_{t-s} + \beta Z_s + \varepsilon_t$$

In the above, Y and Z are the vectors of endogenous and exogenous variables, respectively. Also, θ and β are the vectors of corresponding coefficients to be estimated, α is the vector of constants,

ε is the error term which is assumed to be a white noise process, and n is the optimal lag length of the model and is determined using the lag length criteria testing. The variables of the VAR model are the output gap, the inflation deviation, non-energy fiscal balance ratio, broad money ratio, and the real lending rate. Additional variables include the real crude oil price, and a dummy variable to represent the 2008/09 global financial crisis. The impulse responses of the money supply, non-energy fiscal deficit variables to innovations in the output gap, inflation and the lending rate are analyzed to determine the strength of the coordination. Table 3 below provides a list of the variables and their description. Note that since the switch to a managed float regime, it is possible that monetary policy may have had greater autonomy to respond to domestic inflation. Although, this may not necessarily be the case, since countries with more flexible exchange rate regimes continue to take global interest rates in account when setting domestic interest rates to avoid significant movements in their exchange rates. The VAR model data there covers the period, 1994 to 2016 and is of a quarterly frequency.

Table 3

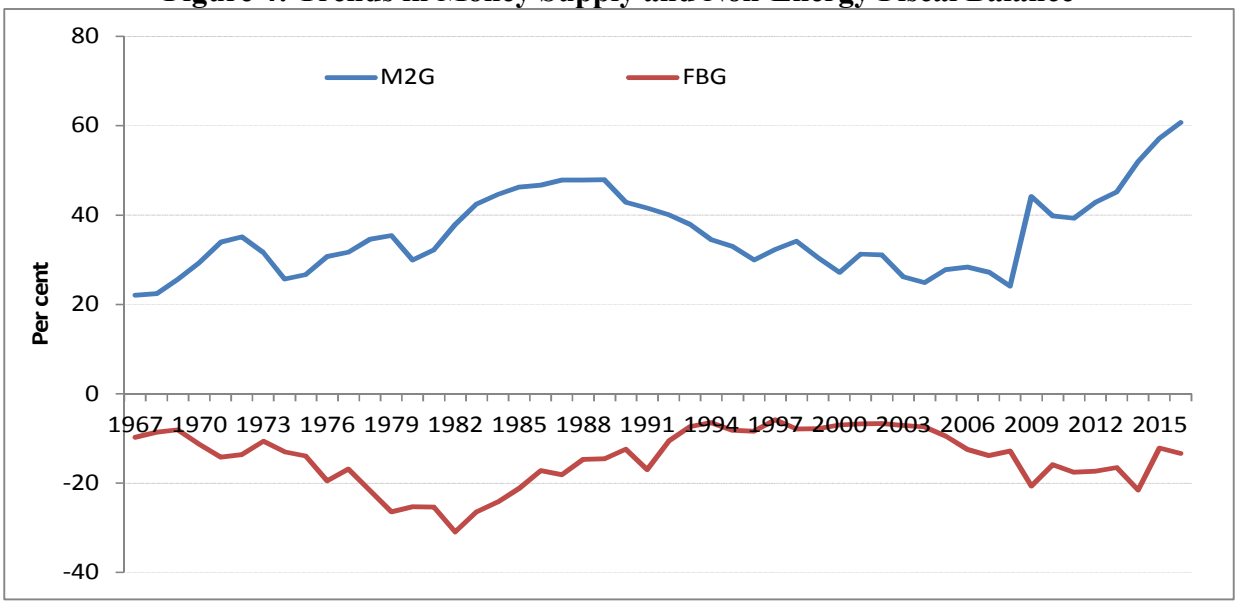
Variables	Notation	Description	Source
Output Gap	GAP_t	(Potential Total Real GDP - Actual Total GDP) / Potential GDP.	Central Bank of TT, CSO, Potential GDP - Authors calculation using the H-P filter in Eviews 8.0
Inflation Deviation from Threshold	$INFD_t$	Core Inflation - Inflation Threshold The inflation threshold is calculated using a similar method to Mubarik (2005).	CSO, Central Bank of TT Threshold Inflation - See App. 1 for author's calculation.
Non-energy Fiscal Deficit	FBG_t	(Total Non-Energy Revenue - Total Expenditure) / Total GDP	Ministry of Finance of TT, Central Bank of TT.
Broad Money	$M2G_t$	Broad Money / Total GDP	Central Bank of TT
Real Effective Exchange Rate	$REER_t$	Nominal Exchange Rates of Trading Partners adjusted for foreign and domestic inflation.	Central Bank of TT, CSO
Real Oil Price	$ROIL_t$	Nominal Crude Oil Price (WTI) x US CPI/TT CPI	International Financial Statistics and Central Bank of TT

5. Empirical Results

Figure 4 is a graphical representation of the two series of money supply and central government's non-energy fiscal deficit. The graph shows that there is no clear co-movement of the two variables. Although it can be conjectured that a developing country like TT that high deficits by the government could be associated with high budgetary borrowing from the central bank, the overall movement in the money supply through changes in the monetary base is

important from the perspective of the monetary stance. Figure 4 shows that the two variables trended quite differently during most of the period. For instance, during the period 1981 to 1989 the money supply was increasing while the non-energy fiscal deficit was declining. Between 1994 and 2002 both variables seemed to be trending similarly, but diverged thereafter from about 2003 when the money supply began to increase drastically compared to the non-energy fiscal deficit. The conflicting movements suggest that monetary and fiscal policies remained independent of each other in TT.

Figure 4: Trends in Money Supply and Non-Energy Fiscal Balance



Source: Retrieved from http://www.central-bank.org.tt/content/economic-statistics

(i) Testing for Independence (Granger Causality and Cointegration Results)

As tests for independence, we apply the Granger causality tests on the above indicators as well as the cointegration tests of Phillips-Ouliaris (single equation). The results of the Granger causality tests are reported in the Tables 4a and 4b. We could reject the hypothesis that LGM2G does not granger cause the LGFBG but we cannot reject the null-hypothesis that LGFBG does not granger cause LGM2G. So it appears that causality runs one way from LGM2G to LGFBG and not the other way. The results provide further confirmation that the monetary and fiscal policies are independent of each other.

Table 4a: Pairwise Granger Causality Test
Sample Period 1967-2016 Lags (1)

Null Hypothesis	F-Statistic	Probability	Decision
LGM2G does not Granger Cause LGFBG	5.09320	0.02399	Reject
LGFBG does not Granger Cause LGM2G	3.06723	0.08966	Do not reject

Source: Authors' calculations using Eviews 8.0

Table 4b: Pairwise Granger Causality Test Sample Period 1967-2016 Lags (2)			
Null Hypothesis	**F-Statistic**	**Probability**	**Decision**
LGM2G does not Granger Cause LGFBG	6.77461	0.0028	Reject
LGFBG does not Granger Cause LGM2G	2.71063	0.0779	Do not reject

Source: Authors' calculations using Eviews 8.0

Before carrying out the Phillips-Ouliaris (single equation) cointegration test it is important to determine the order of integration of the indicators of monetary and fiscal policies. In testing for stationarity, the unit root tests indicate that the monetary and fiscal stances are I(1) variables, but when first-differenced both were found to be I(0) variables (Table 8).

The result of the Phillips-Ouliaris (single equation) cointegration test, reported in Table 5, also supports this outcome. With the null hypothesis of no cointegration, both the tests statistics (tau and z) show that the series M2G and FBG are not cointegrated. This confirms that both monetary and fiscal policies in TT are carried out independently irrespective of the institutional standing of the CBTT vis-à-vis the Ministry of Finance (MOF).

Table 5: Results of Phillips-Ouliaris Cointegration Tests				
Series: LGM2G, LGFBG				
Sample Period 1967-2016				
Cointegrating equation deterministics: C Trend Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth)				
Dependent Variable	tau-statistic	Prob.	z-statistic	Prob.
LGM2G	-1.951696	0.8012	-8.810399	0.7039
LGFBG	-2.224438	0.6817	-9.577710	0.6484
* MacKinnon (1996) p-values				

Source: Authors' calculations using Eviews 8.0

(ii) Set Theoretic Model Results

Given the independence of both indicators in this study, we then measure the extent of coordination utilizing equation (1) described earlier which is based on the empirical information on the macroeconomic environment and policy response matrices. In the case of TT, the environment matrix is constructed based on shocks to real GDP and inflation for the country over the period (1967-2016). The shocks to growth rate are represented as deviations of the real

GDP from potential GDP. Shocks to inflation are indicated as the divergence of inflation from the threshold level of inflation (6 per cent)[6,7].

With regard to the policy response matrix, changes in the ratios of domestic money supply and changes in the non-energy fiscal deficit represent stances for both monetary and fiscal policies, respectively. The expansionary policies are defined as positive changes in the stances, whereas contractionary policies are identified by negative changes in the stances.

Table 6: Macroeconomic Shock Matrix for TT

		Inflation *(Deviation from Threshold)*	
		Positive	Negative
Growth *(Deviations from Potential Output)*	Positive	1968, 1978, 1979-1984, 2007, 2008,	1967, 1969, 1970, 1992, 2004-2006, 2009, 2010, 2013
	Negative	1972-1977, 1985, 1986	1971, 1987, 1993-2003, 2011, 2012, 2014-2016

Note: The numbers represents calendar year.

Table 7: Policy Response Matrix for TT

		Monetary Policy	
		Contractionary	Expansionary
Fiscal Policy	Contractionary	1974, 1995, 1996, 1998, 2003, 2004, 2007, 2011	1970, 1971, 1975, 1976,1978,1979, 1981, 1982, 1987,1991, 2005, 2006, 2009, 2014, 2016
	Expansionary	1973, 1980,1990, 1992-1994,1999, 2000, 2002, 2008, 2010	1967-1969, 1972, 1977, 1983-1986, 1988, 1989, 1997, 2001, 2012, 2013, 2015

Note: The numbers represents calendar year.

From the above tables, the extent of coordination can be calculated as follows:

[6] This study utilizes the core inflation rate instead of the headline inflation rate since this measure excludes the more volatile food prices. Appendix 1 provides details of the calculation of the TT core inflation threshold.

[7] This estimate is lower than that provided in Espinoza et al. (2010) where the threshold inflation rate for oil exporting economies (including Trinidad and Tobago) and emerging market calculated to be 10%.

$$\omega = n(PP \cap CC) + n(PN \cap CE) + n(NP \cap EC) + n(NN \cap EE)$$
$$= 1 + 4 + 1 + 6 = 12$$
$$\rho = 12/50 = 0.24$$

Results obtained from equation (1) suggest that coordination has been very low over the period 1967 – 2016. We calculate the coordination *(ρ)* for various sub-samples. The outcome of the test confirms the weak coordination of policies during over the 50 year period (0.24). It can be seen that coordination between policies was low during the pre-liberalization period (0.15) but improved slightly in the post-liberalization period (0.38). Notwithstanding the improvement, coordination still remained weak in the post-liberalization period. Coordination between policies was nil during the energy boom period of the 1970s (0.0). In comparison, during period of the second energy boom coordination between policies was relatively better (0.33). Further, between 2009 - 2016 coordination increased (0.38) as both fiscal and monetary authorities responded to the 2008 global financial crisis.

Two key factors may have accounted for the general lack of coordination over the sample period. First, fiscal policy was found to be highly procyclical in nature over the last 50 years. During the both boom periods, the government engaged in expansionary fiscal policy, which was camouflaged by overall fiscal surpluses. In the case of the second boom period, however, the government placed fund into the HSF indicating a small measure of fiscal discipline. Second, monetary policy was committed to maintaining the fixed exchange rate regime during the pre-liberalization period. This would have impacted the Bank's ability to use monetary policy in an independently to respond to domestic inflation. Although TT embarked on financial liberalization policies since 1993, the country adopted a tightly managed floating exchange rate system which may not have provided a high degree of monetary autonomy.

(iii) Vector Autoregressive (VAR) Model Results

Use of VAR model for policy coordination analysis requires certain preconditions to be met. First, VAR models require that all the variables must be stationary and not co-integrated. If certain variables are non-stationary, these variables must be converted to stationary status. This can be done using the method of first differencing. If however, the variables are non-stationary, and are of the same order of integration, then cointegration should be tested for these variables and a more applicable model would be the Vector Error Correction Model (VECM). If no cointegration exists then a VAR model can be estimated.

Table 8 provides the results of three conventional unit root tests which are utilized to determine the order of integration of variables for econometric modelling purposes. The tests indicate that all variables are integrated of order one (i.e. I(1)). Conventional tests, however, cannot provide conclusive evidence of the order of integration of the variables in the presence of structural

breaks. It is possible that the variables could have been affected by macroeconomic shocks such as the 2008 global financial.

Table 8: Unit Root Testing (ADF, PP and KPSS)

		LEVEL			FIRST DIFFERENCE		
Variable	**Notation**	**ADF**	**PP**	**KPSS**	**ADF**	**PP**	**KPSS**
Output Gap/Potential GDP (%)	GAP_t	-2.40	-1.60	0.36	-3.78	-3.60	0.10
Non-energy Fiscal Deficit/GDP (%)	FBG_t	-1.22	-1.36	0.98	-8.40	-8.34	0.12
Inflation Dev. from Threshold (%)	$INFD_t$	-1.44	-2.56	0.33	-7.49	-8.44	0.10
Broad Money/GDP (%)	$M2G_t$	-1.92	-2.47	0.26	-5.23	-9.69	0.04
Real Exchange Rate (%)	REX_t	-0.99	-1.12	1.18	-7.15	-6.62	0.15
Real Oil Price (%)	$ROIL_t$	-1.62	-1.68	0.78	-2.48	-4.27	0.06

Notes:
Critical values for ADF test are -3.50 (1%), -2.89 (5%), -2.58 (10%) - If T-stat > critical value, reject H_0:δ=0 (non-stationary)
Critical values for PP test are -3.57 (1%), -2.29 (5%), -2.60 (10%) - If T-stat > critical value, reject H_0:δ=0 (non-stationary)
Critical values for KPSS test are 0.739 (1%), 0.463 (5%), 0.347 (10%) - If T-stat > critical value, reject H_0:δ=0 (stationary)

Source: Authors' calculations using Eviews 8.0

Unit rooting testing, which accounts for possible structural breaks, are therefore conducted. Contrary to the earlier findings of the conventional tests, the results of the breakpoint test shows that the GAP_t variable is in fact stationary (Table 9). The VAR econometric estimation is carried out given that not all the variables are of the same order of integration and because one of the variables (i.e. GAP_t) was found to be stationary which restricts testing for cointegration.

Following the estimation, robustness checks are executed in order to determine the reliability of the model. Tests of diagnostics include: the optimal lag order selection criteria, the LM residual serial correlation test, residual normality tests and the inverse AR roots test. The estimated model passed the diagnostic checks of normally distributed residuals, no serial correlation and model stability (Appendix Tables 3 and 4).

The impulse response functions are based on the generalized decomposition approach which does not require the variables be placed in any specified order. This is specifically useful in cases where the degree of endogeneity of the variables is not clear to so as to determine the proper ordering of the variables. Figure 5 below shows the impulse response function of the non-energy fiscal deficit to a shock in the other variables[8]. A shock to the output gap causes almost no movement in the non-energy fiscal deficit. It should be noted that the response of the non-energy fiscal deficit to its own shocks results in the deficit improving in the quarter immediately following the shock. This implies that a deterioration in the deficit triggers an improvement in the deficit in the first three quarters. The deficit then stabilizes just above the zero line for the remainder of the forecast period. The fiscal deficit hovers around the zero line throughout over the forecast period following a shock to inflation. This may imply a non-supportive fiscal policy to increases in inflation. The response of the non-energy deficit to a shock in the money supply is

[8] A positive (negative) shock to the non-energy fiscal deficit implies a smaller (larger) deficit or a contractionary (expansionary) fiscal policy.

minimal over the first three quarters but dies off along the zero line for the forecast period. The fiscal deficit does not respond to a shock to the real effective exchange rate.

The initial response of the money supply to a shock in the output gap is to decrease over the first three quarters (Figure 6). The response fluctuates around the zero line from the fifth quarter and for the rest of the forecast period. The response of the money supply to a shock in the fiscal deficit is to decrease over the first two quarters but then increase towards the zero line for the remainder of the forecast period. Also, a shock to inflation results in a negligible response in the money supply over the forecast period. An own shock causes the money supply to increase significantly in the first quarter. However, the response is negative in the second and third quarters. The money supply then increases steadily towards the zero line, showing a tendency to die-off for the remainder of the forecast period. An increase in the real effective exchange rate causes the negligible movements in the money supply to increase.

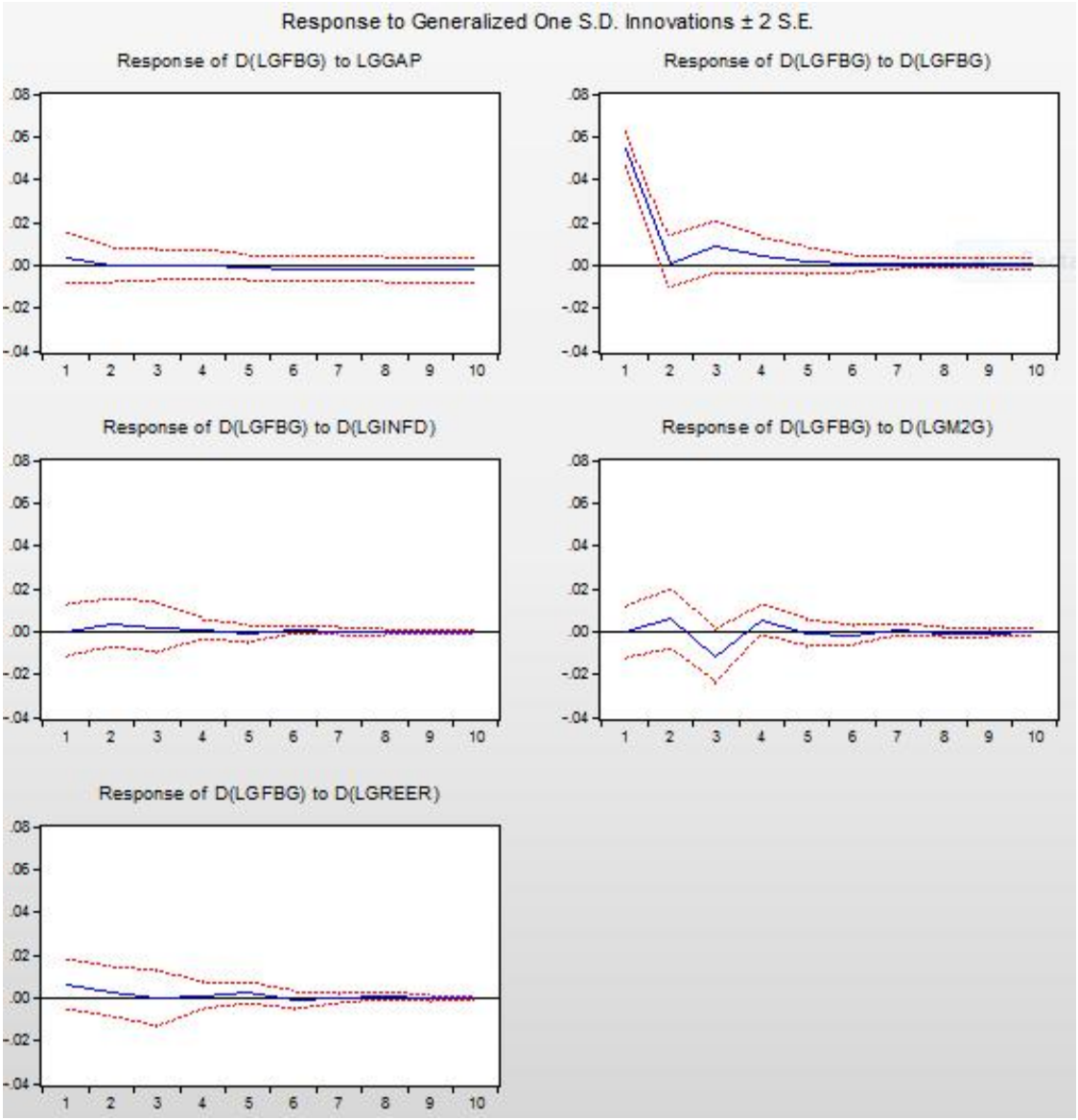
6. Conclusion

This paper empirically investigates the extent of coordination between monetary and fiscal policies in TT. This paper shows evidence of independence of monetary policy over the review period, even under the fixed exchange rate regime adopted prior to the liberalization in 1993.

Having established the independence of both policies, the paper then calculates the extent of coordination in response to macroeconomic shocks over the period 1967 – 2016. The results of the analysis indicate that over the last 50 years coordination of monetary and fiscal policies was observed in only 12 years[9]. The results of the VAR model impulse response functions also indicate evidence of weak coordination of fiscal and monetary policies since liberalization in the 1990s. Even though many structural changes have occurred in the economy especially over the last 2 decades (such as the liberalization of the foreign exchange market, interest rate liberalization, free capital flows and the shift towards indirect monetary policy) coordination of policies improved only slightly. While, policy coordination increased somewhat in the period following the 2008/09 global financial crisis a greater effort is needed by the authorities to ensure a high degree of policy coordination is embedded as part of macroeconomic policy-making in the country.

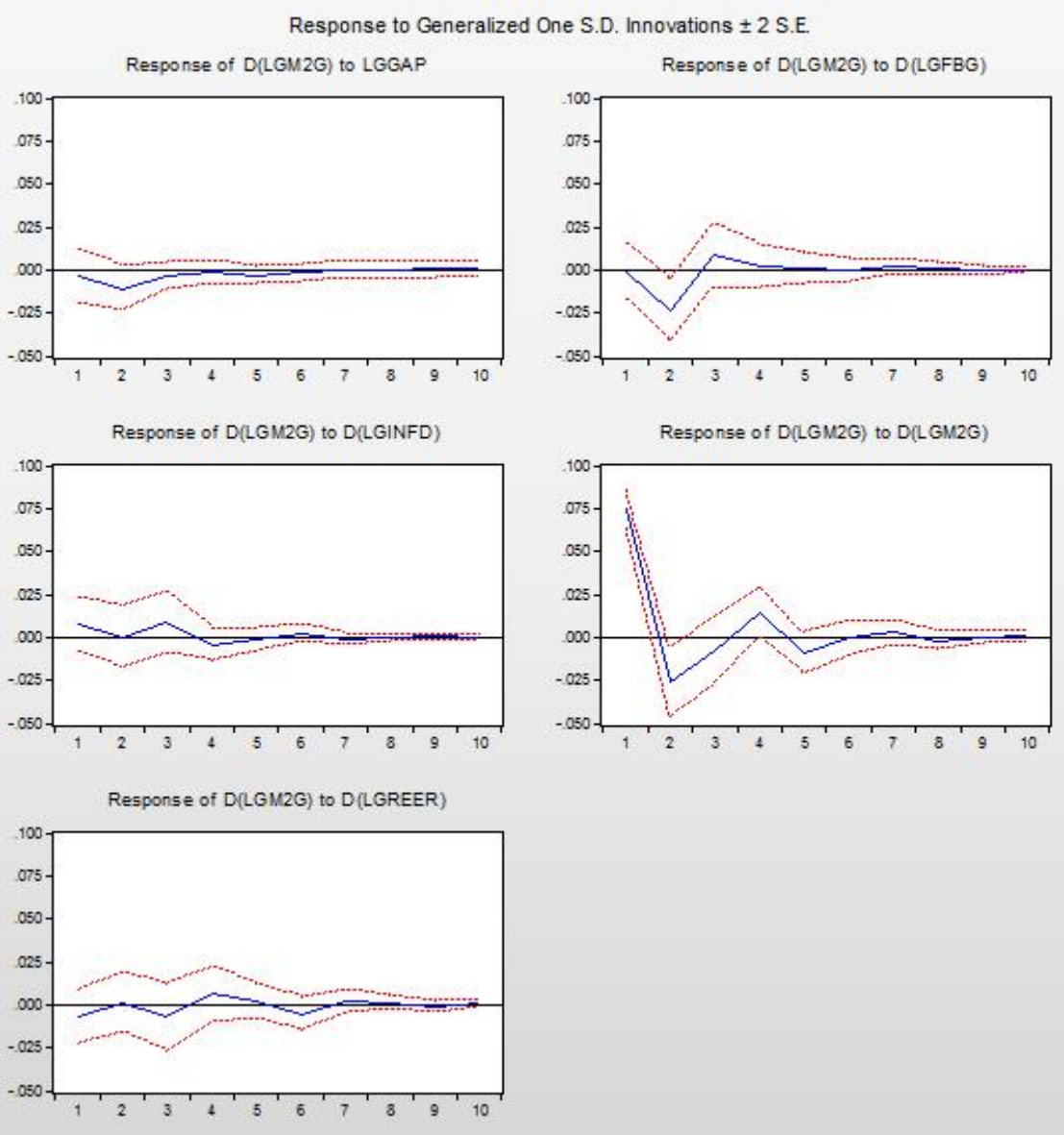
[9] The years in which coordination between policies occurred were as follows: 1970, 1973, 1988, 1989, 1997, 2001, 2005, 2006, 2007, 2009, 2012 and 2015.

Figure 5



Source: Authors' calculations using Eviews 8.0

Figure 6



Source: Authors' calculations using Eviews 8.0

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8. Appendix

A Note: Estimating the Threshold Inflation Rate for TT

The method used to estimate the threshold inflation rate is similar to Mubarik (2005) and Bhusal and Silpakar (2011). We use annual data on consumer prices and real non-energy GDP for the period 1967 to 2016 which were sourced from the CSO. Before estimating the model, Granger causality test is applied to measure the linear causation between inflation and economic growth. The results of this test are presented below in Tables 1 and 2.

Table 1 Pairwise Granger Causality Test
Sample Period 1967-2016 Lags (1)

Null Hypothesis	F-Statistic	Probability	Decision
INF does not Granger Cause RNGDP	0.03412	0.8543	Do not reject
RNGDP does not Granger Cause INF	0.52250	0.4734	Do not reject

Source: Authors' calculations using Eviews 8.0

Table 2 Pairwise Granger Causality Test
Sample Period 1967 – 2016 Lags (2)

Null Hypothesis	F-Statistic	Probability	Decision
INF does not Granger Cause RNGDP	0.24866	0.7810	Do not reject
RNGDP does not Granger Cause INF	3.41940	0.0419	Reject

Source: Authors' calculations using Eviews 8.0

The results of the Granger causality tests are not conclusive on the causal relationship between the real GDP and consumer prices. In Table 1 (whereby the testing is done using 1 lag), the null

hypothesis that "RNGDP does not Granger cause INF" and "RNGDP does not Granger cause INF" are rejected at the 5 % and 10 % significance level. This suggests no causality exists. Meanwhile, Table 2 (where testing is done using 2 lags) indicates a one-way causal relationship between the variables.

To estimate the threshold inflation rate for TT, the paper follows adopt an inflation threshold model similar to Mubarik (2005). This Ordinary Least Squares (OLS) model is specified in eq (1) below:

$$RNGDP_t = \beta_0 + \beta_1 INF_t + \beta_2 D_t(INF_t - K_t) + \beta_2 PCG_t + \beta_2 RLR_t + E_t \ldots\ldots\ldots\ldots\ldots\ldots \text{eq. 1}$$

where $RNGDP_t$ is the real non-energy GDP growth rate, INF_t is the core inflation rate, PCG_t is the private sector credit to GDP ratio, RLR_t is the real lending interest rate of commercial banks and K is threshold level of inflation rate. It is the rate of inflation at which structural break occurs and Ei is the random error term which represents measurement error in the explanatory variables. The dummy variable D is defined as follows:

$$D = 1 \text{ if } INF > K \text{ and}$$

$$= 0 \text{ if } INF < K.$$

When the inflation rate is below the threshold, the effect of inflation of real GDP is estimated by the coefficient of inflation ($\beta 1$). However, when the inflation rate is at higher levels the coefficient on inflation effect is the sum of the betas ($\beta 1 + \beta 2$). In order to locate the threshold inflation rate we first allow for one break by varying the inflation threshold rate from a low to high level. Standard statistical tools are used to identify the threshold point and check the reliability of the regression estimates. Regressions are estimated for the values of K in an ascending order from low to high.

Table 3 gives the exact value of the threshold inflation level and the impact of that inflation level on economic growth by estimating eq(1). The estimated value of the R^2 is taken into consideration in estimating eq. 1 for the threshold inflation level considering K = 1 to K = 8. However, the results are shown in the table for K ranging from 5% to 8%. In this approach, the threshold value is one that maximizes the value of R^2 or minimizes the residual sum of squares (RSS) from the respective regressions.

Based on the estimates, it could be seen that at the low threshold inflation levels (K< 6%) there is a statistical insignificant relationship between the dummy variable of the threshold level of inflation and economic growth. As K increases towards 6%, the statistical significance between economic growth and the dummy of threshold level of inflation rate increases. Based on this analysis, while the inflation rate below this threshold level has no significant effect on economic growth, inflation rates above it have a significant effect on economic growth. The empirical analysis suggests that if inflation is above 6%, then economic growth performance could be

adversely affected. It would be reasonable to conclude that policies that stabilize the inflation rate to a certain threshold level matters for long-run economic growth in TT.

Table 3: OLS Estimates for the Inflation Threshold Model for Trinidad and Tobago
Dependent Variable: Real Non-Energy Growth

K	Variable	Coefficient	Standard Error	t-statistic	Probability	R-Squared
5%	C	0.044614	0.682556	0.065364	0.9482	0.223313
	D(INF)	-1.59306	0.674724	-2.361047	0.0227	
	D(INF-K)	0.22454	1.115405	0.201306	0.8414	
	D(PCG)	-0.37237	0.162828	-2.286624	0.0271	
	D(RLR)	-1.5433	0.662822	-2.328395	0.0246	
5.5%	C	0.044614	0.682556	0.065364	0.9482	0.223313
	D(INF)	-1.593056	0.674724	-2.361047	0.0227	
	D(INF-K)	0.224537	1.115405	0.201306	0.8414	
	D(PCG)	-0.372327	0.162828	-2.286624	0.0271	
	D(RLR)	-1.543311	0.662822	-2.328395	0.0246	
6%	C	-0.188768	0.656297	-0.287626	0.7750	0.234120
	D(INF)	-1.731242	0.685856	-2.524205	0.0153	
	D(INF-K)	0.943437	1.159578	0.813604	0.4203	
	D(PCG)	-0.384931	0.162439	-2.369692	0.0223	
	D(RLR)	-1.658504	0.671041	-2.471540	0.0174	
6.5%	C	0.003267	0.639433	0.005109	0.9959	0.224830
	D(INF)	-1.634428	0.687486	-2.377400	0.0218	
	D(INF-K)	0.425778	1.196145	0.355959	0.7236	
	D(PCG)	-0.375864	0.162983	-2.306148	0.0259	
	D(RLR)	-1.579955	0.673642	-2.345394	0.0236	
7%	C	0.003267	0.639433	0.005109	0.9959	0.224830
	INF	-1.634428	0.687486	-2.377400	0.0218	
	D(INF-K)	0.425778	1.196145	0.355959	0.7236	
	D(PCG)	-0.375864	0.162983	-2.306148	0.0259	
	D(RLR)	-1.579955	0.673642	-2.345394	0.0236	
7.5%	C	0.127780	0.644089	0.198390	0.8437	0.215484
	D(INF)	-1.561454	0.716627	-2.178893	0.0349	
	D(INF-K)	0.098104	1.309528	0.074916	0.9406	
	D(PCG)	-0.368061	0.165443	-2.224700	0.0314	
	D(RLR)	-1.517909	0.695433	-2.182682	0.0346	
8%	C	0.091113	0.626865	0.145347	0.8851	
	D(INF)	-1.592874	0.702282	-2.268141	0.0283	
	D(INF-K)	0.154103	1.283937	0.120024	0.9050	
	D(PCG)	-0.373005	0.162994	-2.288455	0.0270	
	D(RLR)	-1.545327	0.682810	-2.263187	0.0286	

Source: Authors' calculations using Eviews 8.0

Table 3

VAR Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at lag order h

Date: 09/05/17 Time: 11:09

Sample: 1967 2016

Included observations: 46

Lags	LM-Stat	Prob
1	21.42832	0.6685
2	19.24343	0.7853
3	16.14987	0.9103
4	20.15251	0.7388
5	17.96340	0.8439
6	20.21061	0.7357
7	30.72685	0.1982
8	30.50758	0.2058
9	20.78093	0.7048
10	21.71134	0.6524

Probs from chi-square with 25 df.

Source: Authors' calculations using Eviews 8.0

Table 4: Diagnostics Checks

Residual Normality Tests		
	Skewness	Joint $\chi 2$ =4.37 (p=0.49)
	Kurtosis	Joint $\chi 2$ =5.97 (p=0.31)
	Jarque-Bera	Joint $\chi 2$ =10.34 (p=0.41)
Stability	No unit root lies outside modulus one	

Source: Author's calculations using Eviews 8.0