



**THE INTERDEPENDENCE OF
FISCAL AND MONETARY POLICY**

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FISCAL POLICY: EVIDENCE FROM BELIZE**

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The Interaction of Monetary and Fiscal Policy: Evidence from Belize*

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Abstract

This study investigates the extent to which monetary and fiscal policies affect each other in the Belizean economy through the government's consolidated budget constraint. The analysis hinges on the cointegration between macroeconomic variables, including central government's debt stock, foreign reserves, and private consumption using a quarterly data set from 1997Q1 to 2020Q1. Applying a Dynamic Ordinary Least Squares (DOLS) methodology, we find evidence of fiscal dominance in Belize over the review period, while a break-point evaluation shows stronger evidence of this from 2006Q1 to 2014Q3 with a higher percentage of Central Government's debt financed by the Central Bank. Furthermore, an Autoregressive Distributive Lag (ARDL) investigation on the impact of fiscal activities on foreign reserves highlighted a negative relationship between the two which becomes stronger with the degree of fiscal dominance. The results are indicative of the potentially de-stabilizing effects that this phenomenon can have in a fixed exchange rate regime

JEL Codes: C13, C22, C24, E52, E62.

Keywords: Fiscal Dominance, Foreign Reserves, Cointegration, DOLS, Fixed Exchange Rate.

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1 Introduction

Developing nations tend to have significant growth challenges, which makes a cooperative monetary-fiscal policy arrangement critical for their economic management and advancement prospects. However, it is understood that this interaction is typically characterised by fiscal dominance (FD), where the central bank is subservient to the fiscal authority. Prior studies in Belize have argued that for fiscal and monetary policy to be most effective, there must be better coordination between the two (Alvarez, 1986; Vellos and Sosa, 1996; Garcia, 2009). In the current economic environment, where a global pandemic has necessitated heightened levels of policy intervention and constricted the already paltry fiscal space in Belize, the interaction between monetary and fiscal policies and its impact on the macroeconomy becomes even more important to understand and manage. This study thus sets out to identify the degree of FD in Belize, the ramifications of potentially adversarial policy stances, and the implications of this interaction from a fixed exchange regime perspective.

Fiscal activities are known to affect the ability of central banks to carry out their mandate. The seminal work of Sargent and Wallace (1981) describes the monetary-fiscal interaction as a coordination game between both authorities. In a fiscally-dominant environment, the fiscal authority moves first and independently defines the path of its current and future balances, while the monetary authority is forced to oblige to ensure the former's solvency. In small open economies, FD is often present because the authorities depend upon deficit financing due to seasonal and timing mismatches in revenue and the inability of underdeveloped domestic capital markets to fully absorb bond issuances (Tanzi, 1982; Lybeck, 2004). Based on this financial structure, monetary and fiscal policies are closely linked through central bank's domestic credit that leads to monetary base expansion and in the case of fixed regimes, a loss in foreign reserves. This relationship is captured on the bank's balance sheet and its institutional framework. This situation calls into question the independence of the monetary authority (Fry, 1997), and as Worrell (2000) postulated, coordination of monetary and fiscal policies can only be successful when one monitors the effects of fiscal policy on key monetary and macroeconomic objectives in order to effectively react to it.

This study attempts to empirically evaluate the degree of FD in Belize, as the influence that the government is able to exert on the Central Bank of Belize (CBB) is historically evident and entrenched in its founding legislation. The relationship between the two policies is likely to be demonstrated through Central Bank's credit to government, especially after the 2006 debt restructuring when the country was excluded from international capital markets. The research adds to the discourse on the fiscal-monetary nexus in developing nations and provides insight into the impact of FD within fixed exchange regimes.

To assess the degree of FD and its impact in Belize, we use both the long-run fiscal policy rule developed by De Resende (2007) and Coppin’s (1994) foreign reserve model developed for Barbados, which is similar economically. Both employ cointegration regressions, with the former applying a DOLS estimation and the latter an ARDL. Using a quarterly data set from 1997Q1 to 2020Q1 the study finds that the government finances 74 percent of its debt with an even smaller percentage immediately following the restructuring. These results indicate that FD is present in Belize and manifests itself through the influence of fiscal deficits on Central Bank credit to government which translates into foreign reserve losses that grow with the level of government’s deficit spending.

The remainder of this paper is structured as follows. Section 2 defines the Central Bank’s legal and institutional framework and provides an analysis of the trends in fiscal outturn and financing. Section 3 provides a review of the empirical literature on fiscal and monetary policy interactions. Section 4 describes the data, while Section 5 discusses the methodological approaches employed in the analysis. Section 6 presents the results and discussion, followed by the conclusion in Section 7.

2 Background

This section provides a historical review of FD in Belize, by first examining the behaviour of the Central Government and subsequently, the main avenues through which they impact the activities of the Central Bank. The main focus of the latter will be an evaluation of the Central Bank Act (Act) which gives the legislative underpinnings of the FD case for Belize and, going further, an analysis of the impact of FD on the main variables of interest.

2.1 Review of Fiscal Activities 1997 - 2020

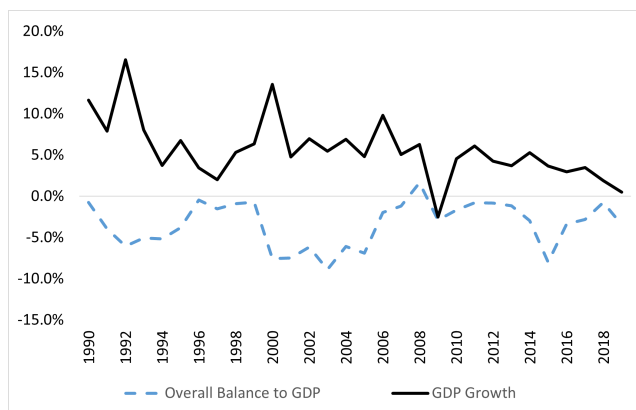
Whenever there is an economic environment of persistent fiscal imbalances and increasing public debt, as is the case of Belize, this enables the existence of FD, which now narrows down to a problem of the government’s financing constraint and central bank’s independence. Traditionally, the fiscal authorities relied on external financing, however, since the early 2000’s there has been a growing reliance on CBB financing for budget support, which jeopardises exchange rate stability and simultaneously fiscal solvency. The main occurrences underlying these dynamics are outlined below.

Since 1997, the budget deficit averaged 3.7 percent of GDP with 2008 being the only year in which a surplus was recorded. The negative relationship between the fiscal balance and GDP growth (see Figure 1) leaves an uncorrected deficit bias when fiscal policies in upswings are not fully offset during downturns. These deficits have largely been the result of an increasing wage bill coupled with rising capital outlays, financed from multilateral

project loans.

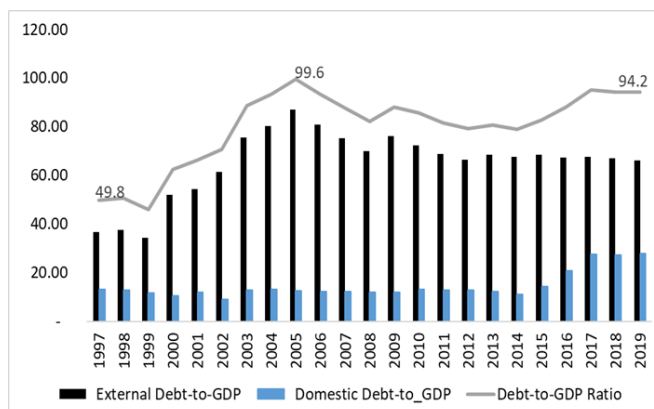
Debt doubled from 49.8 percent of GDP in 1997 to 99.6 percent at the end of 2005 (see Figure 2) with 87.1 percent being externally sourced as the country had access to international capital markets at the time. Subsequently, the external commercial debt had to be restructured (2006), when the country defaulted on its obligations resulting in Belize’s exclusion from these markets, with external borrowings now limited to official bilateral and multilateral disbursements¹.

Figure 1: Fiscal Balance versus GDP Growth (1997 -2019)



Notes: Overall fiscal balance as a percentage of nominal GDP and GDP growth rate in percentages. Sources: Central Bank of Belize and Statistical Institute of Belize.

Figure 2: Trends in Domestic and External Debt (1997-2019)



Notes: Debt indicators as a percentage of nominal GDP. Sources: Central Bank of Belize and Statistical Institute of Belize.

The debt-to-GDP ratio had been on a slightly downward trajectory since the early 2000’s but lately changed, owing to contingent liability payments for the nationalisation

¹External debt-to-GDP has remained stable with new external liabilities only sourced from bilateral and multilateral development partners like the Caribbean Development Bank (CDB) and tied to various development and social protection projects, such as infrastructure upgrades and urban social improvement projects.

of two utilities in 2016. Concurrently, domestic debt, primarily from the Central Bank, has been more prominent in the liability expansion (33.9 percent of GDP at the end of 2020Q1).

Recently, consolidation efforts have been tilted towards the revenue side (see Table A1) with several tax enhancement measures, while expenditure adjustments have been driven by reductions in interest payments from external debt restructurings². Notwithstanding the latter, that has kept interest payments stable (2.9 percent of GDP) over the past decade, total public sector debt remained high at 111.4 percent of GDP at the end of the first quarter of 2020. The persistence of deficits and the rise in total debt reveal underpinning structural causes related to the demands for government services and investments from a young nation and factors such as weak fiscal and debt management. Within this environment, the CBB was pressured to meet fiscal needs, especially given the institutional framework that allows government influence.

2.2 The Central Bank of Belize and The Fiscal Authority

CBB actions are influenced by Central Government and their policy stance, as provisions in the Act prevent institutional independence, primarily through its governance structure and credit policy regarding government. This section explores the parts of the Act that allow government's influence and examines the evolution of Central Bank's loans to Central Government.

2.2.1 Central Bank Act of 1982 – Governance Structure

Like other regional central banks, the CBB's Governor and some board members (4) are appointed by the government. The Act provides for a minimum term of office for the Governors and board members of five and four years, respectively, but does not guarantee the tenure, allowing further exposure to political pressure. Furthermore, the Act does not emphasise partisan neutrality of board members, enabling government influence. However, in 2009 the CBB established a Monetary Policy Committee (MPC) to make monetary policy prescriptions, facilitating a move away from a solely board-centred decision-making process.

2.2.2 Central Bank Policy Objectives and Instruments

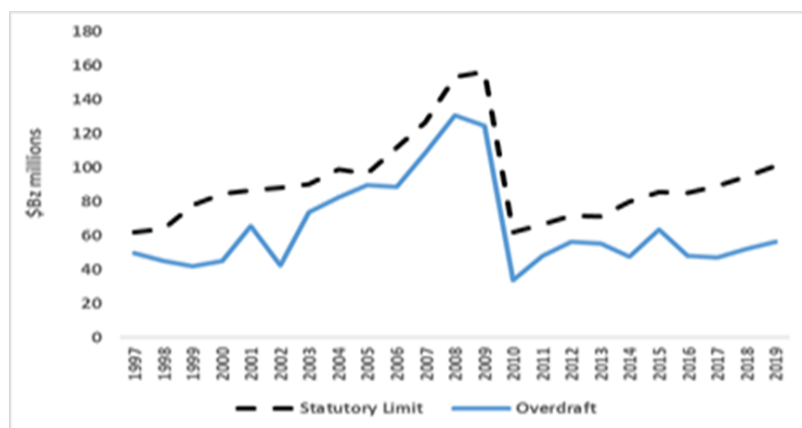
CBB's monetary policy is based on preserving the peg to the U.S. dollar by managing credit growth via commercial banks' liquidity through base money management. The Act

²After the 2006 restructuring of Belize's commercial debt, restructuring of this same portion occurred again in 2013 and 2017. The latter two were pre-emptive measures in response to weak economic fundamentals. The last restructuring contract included a commitment to a primary surplus target of 2 percent of GDP until 2021.

enables the Bank to operate in this regard by granting the power to issue directives, set reserve requirements, control interest rates, and credit expansion (Section 8, lines 45 and 47). Furthermore, the CBB has the power to operate in the capacity of exchange controller (Section 6, CBB Act). The MPC was created in part to enhance CBB’s instrument autonomy by utilising open market-type operations enabled by increasing the amount of government securities the CBB can hold and liberalising the Treasury bill yield, among other changes. Nevertheless, the CBB Act Section 9, line 66 states, “The (Finance) Minister may from time to time after consultation with the Board of Directors give to the Bank in writing such directions of a general nature about its policy and operations as appear to the Minister to be necessary in the public interest.” Though this provision is seldom used, it does enable FD.

2.2.3 Central Bank Credit to the Government

Figure 3: Overdraft Advances to Government versus Statutory Limit



Notes: The statutory limit for Central Government’s overdraft with the Central Bank is set as a percentage of the previous period’s current revenue. Source: Central Bank of Belize.

The CBB is by law the fiscal agent of the government (Section 6, line 31). Though this should invite coordination regarding debt management, it is not explicitly stated in the Act and this consultative relationship has not been fostered. As fiscal agent and due to an underdeveloped domestic capital market, the Central Bank underwrites a portion of debt subscriptions and provides direct credit. Ideally, this should not happen, but temporary, short-term advances with an explicit limit could be permitted where the market for government securities is not fully developed and mismatches in revenue and expenditure flows exist (Lybeck, 2004). The Act, while allowing direct advances also limited them as flows from this facility were ballooning following the first restructuring. In 2010, the ceiling was reduced from 20.0 to 8.5 percent of current revenue collected during the preceding fiscal year, while a provision (Section 7, line 34) for full repayment within three months was stipulated. Furthermore, in 2016, market-based interest rates

were applied to this facility. Despite legal provisions, the overdraft is never fully repaid, though it has not exceeded the statutory ceiling at the end of the calendar year (see Figure 3); however, the limit is continually increasing.

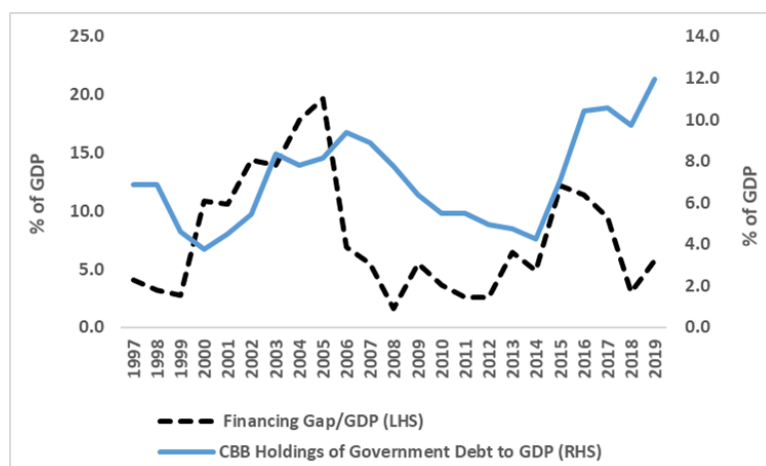
Figure 4: Amendments to Central Bank Capital and Authorised Holdings of Securities

February 2016	<ul style="list-style-type: none"> Limit on outstanding T-bills and T-notes raised from \$200.0mn to \$400.0mn and from \$225.0mn to \$450.0mn, respectively.
October 2016	<ul style="list-style-type: none"> Limit on outstanding T-bills and T-notes raised from \$400.0mn to \$600.0mn and from \$450.0mn to \$500.0mn, respectively.
October 2016	<ul style="list-style-type: none"> The Central Bank Act was amended to increase authorized capital from \$10.0mn to \$20.0mn and the amount of securities that the Bank could hold was increased from "10 times" to "20 times" its paid-up capital and General Reserve Fund.
February 2017	<ul style="list-style-type: none"> Limit on outstanding T-bills and T-notes adjusted from \$600.0mn to \$400.0mn and from \$500.0mn to \$1.0bn, respectively.
March 2017	<ul style="list-style-type: none"> The Central Bank Act was amended to increase the amount of securities the Bank can hold from "20 times" to "30 times" its paid-up capital and General Reserve Fund.

Notes: Changes made to the Central Bank and Treasury Bill Act that affected CBB's credit provision to Central Government. Source: Central Bank of Belize.

Additional reforms have been made since 2016 (see Figure 4) to allow the Bank to hold more government securities. However, unlike the earlier changes, these were completed to settle contingent liabilities associated with the nationalisation of two utility companies. The CBB's ability to purchase new securities was augmented by raising both its authorised capital and the multiple of this value which could be held in the form of government securities, while the statutory limit on the latter was increased. The impact was immediate as the CBB took up the unsubscribed portion of security offers. Thereafter, the share of its holdings of government debt to GDP increased (see Figure 5) underpinned by expansions in its Treasury notes (T-Notes) holdings.

Figure 5: CBB Debt Holdings versus Government Financing Gap



Notes: CBB Debt holdings include T-notes, T-bills and the overdraft; financing gap is the sum of the overall budget deficit and amortisation payments. Source: Central Bank of Belize.

Figure 6: CBB Debt Holdings versus Overall Fiscal Balance



Notes: CBB Debt holdings include T-notes, T-bills and the overdraft. Source: Central Bank of Belize.

2.3 Fiscal Deficits and Central Bank’s Domestic Assets

Central Bank holdings of government debt to GDP are inversely related to the fiscal balance (see Figure 6) over the period (-24.7 percent correlation), while the financing gap including contingent liabilities versus CBB’s holdings of public debt has a 32.4 percent correlation coefficient after 2005. The stipulations within CBB’s Act provide leeway for fiscal influence as the positive association between the fiscal deficit and Central Bank’s claims on government could be taken prima facie as evidence in favour of a high level of FD. Though there have been attempts to move away from this modus operandi, the exclusion of Belize from commercial debt markets and the payment for utility companies prompted government to exert its influence on the CBB.

3 Literature Review

The majority of the literature on the interaction between monetary and fiscal policy explores the idea of FD, where monetary policy is subordinate to fiscal and debt needs. Fiscal and monetary actions are shown to be linked through the government’s intertemporal budget constraint. However, policies can also be interrelated through causal effects on monetary policy targets such as inflation and, in fixed-exchange economies like Belize, foreign reserves. The former is particularly important in the FD literature, as the framework has provided the foundation for numerous studies. The main assumption is that adhering to the budget constraint under a no-Ponzi condition restricts fiscal behaviour unless the central bank intervenes. The empirical research based on this premise questions whether the time-series behaviour of fiscal variables is consistent with the intertemporal budget and as such requires cointegration.

It is well documented that central bank financing of fiscal deficits could undermine

its monetary policy targets as was illustrated in the seminal work of Sargent and Wallace (1981) – where the monetary-fiscal standoff is described as a coordination game between the authorities. If the central bank moves first, or there is monetary dominance (MD), it can impose discipline on the fiscal authority, constraining them to a primary balance and debt consistent with the money supply target. Alternatively, when there is FD, the fiscal authority moves first and defines the path of the primary balances, forcing the monetary authority to monetise its deficits. The resultant of this theoretical analysis under FD was a loss of inflation targeting ability, thus termed the “Unpleasant Monetarist Arithmetic”.

A similar framework was utilised by Aiyagari and Gertler (1985) – though they describe a Ricardian (MD) regime versus a non-Ricardian (FD) one – and Leeper (1991) – who designates the non-Ricardian situation as one where an active fiscal policy coincides with a passive monetary policy. They both come to the same conclusion as Sargent and Wallace (1981), that FD leads the monetary authority to lose control of inflation because of the expansion in the money supply and the consistency in results have led to its frequent use on the subject manner.

3.1 Fiscal versus Monetary Policy Empirical Research

Underpinned by the government’s budget constraint, Bohn’s (1998) backward-looking fiscal reaction function analysis evaluates whether an increase in past levels of debt would result in a larger primary surplus today. If the fiscal authorities improve its primary balance in reaction to rising liabilities, then the transversality condition is met, and the fiscal policy prevents excess debt accumulation. Using annual data on the U.S. between 1916 and 1984, he found evidence of a MD regime, when controlling for wartime fluctuations and cyclical factors. Cevick (2019) also estimated a fiscal reaction function for Belize and concluded that there was no positive response in the cyclically adjusted primary balance to changes in debt-to-GDP ratio when analysing annual data from 1976-2018. The results confirmed that Belize maintained pro-cyclical and unsustainable fiscal policy as explained in Section 2.

Canzoneri et al. (2001) presented a forward-looking approach to ascertain whether the primary deficit responds to changes in public liabilities in the U.S. within a VAR framework and his results coincided with Bohn (1998). Baja-Rubio et al. (2014) noted that in equilibrium, fiscal sustainability can exist in both MD and FD regimes though the distinction between the two depends on how sustainability is realised. Because distinguishing between frameworks is difficult, many studies with the same underpinnings have utilised (Mackiewicz-Lyziak, 2015; Afonso, 2017) a VAR estimation, focusing on the relationship between the primary balance and debt using either granger causality or impulse response functions.

De Resende (2007) explores the MD versus FD case and expresses this as a long-run

fiscal/monetary policy rule based on the variable δ , the proportion of debt backed by current and future primary surpluses, with the remainder $1 - \delta$, backed by the central bank. When $\delta = 1$, there is no FD and monetary policy is independent, while a value of 0 indicates that the central bank finances all government debt. The foundation of this methodology is that in response to different institutional features of the central bank, and any informal policy decision-making in practice, the monetary authority will face different obligations regarding fiscal policy (De Resende and Rebei, 2008). The results indicated that there is more evidence of FD in developing as opposed to developed nations.

3.2 Fiscal Impact on Monetary Policy Variables and Targets

Exploration of FD can also be conducted through an evaluation of the effects of fiscal deficit on monetary policy variables or policy transmission. Developing countries, have found it more fruitful to explore this relationship from a policy-implication standpoint because the government in many of these countries already depend upon some degree of deficit financing due to their inability to mobilise sufficient domestic resources. These types of analyses allow researchers to test how policy and non-policy variables respond to each other over time.

Catao and Terrones (2003) explored the inflationary effect of fiscal policy using an ARDL model on a panel of 107 countries. The authors examine the relationship between the fiscal deficit and inflation through what they describe as the inflation tax base to analyse both the short- and long-run impact of deficit spending. The results indicate a strong positive relationship between inflation and deficits in developing and high inflation countries, which exists to a lesser extent in more developed nations, indicative of FD.

In many developing and emerging market economies, monetary and exchange rate policy are linked. The notional impact of fiscal action on exchange rates or foreign reserves depends on the associated changes in sovereign default risk, the openness of the capital account, and the exchange rate system (Zoli, 2005). For Belize, which operates under a fixed exchange rate system, with low capital mobility, a fiscal expansion is expected to boost imports and the current account deficit and drain foreign reserves. The literature on the monetary approach to the balance of payments (MABP) is one in which the relationship between fiscal policy, central bank's domestic assets, and foreign reserves are examined.

Worrell et al. (2016) postulated that fiscal expansion becomes unsustainable when pressure on the foreign exchange market from fiscal deficits triggers a balance of payments crisis. The authors calculate the fiscal multiplier and the propensity to import for Barbados. Using these parameters, they next run stress tests on the historical foreign reserves by increasing money-financed fiscal deficit. The stress test outcome is compared to the actual reserves figure and found that fiscal deficits were a leading factor in foreign

reserve loss in Barbados.

Coppin (1994) investigated the determinants of international reserves for Barbados within an MABP framework using an OLS estimation on annual data for the period 1972-1987. He investigated the role of expansionary fiscal policy in determining foreign reserves and postulated that if central bank's domestic credit is used mainly for financing budget deficits, then that variable should be insignificant in the model. He found that fiscal expansion explained declines in foreign assets better than expansionary domestic credit.

Olivo (2001) tested the FD hypothesis for Colombia and Venezuela by estimating VECM and VAR models using annual data from 1978 to 1998. The author conjectured that under a managed exchange rate regime with imperfect capital mobility, FD should imply a dynamic relationship between fiscal deficits and net domestic credit of the Central Bank. The implications of FD should be evident when central bank's net domestic credit affects the inflation, real exchange rate, and foreign reserves. He found that for both countries that the FD hypothesis received weak support. However fiscal deficits and/or the rate of growth of domestic credit, had significant effects on the behaviour of inflation, but not on the real exchange rate or the stock of net international reserves.

The literature has pointed the researchers in the direction most commonly found in the developing nation context that FD exists in Belize. This premise is also backed by the historical evidence outlining any informal decision-making in practice and the legal stipulations of the CBB Act. De Resende's long-run fiscal/monetary policy rule captures this interaction, through the estimation of the parameter, δ , which reflects the government's behaviour in response to these institutional settings and the various obligations the CBB faces. To the extent that a high degree of FD may lead to an even greater drain on foreign reserves, values of δ may also have important policy implications for reserve management.

The main objective of the CBB is to foster confidence in the peg by maintaining adequate reserves through liquidity and credit growth management. For Belize, unsustainable public spending in a FD environment will induce a loss in foreign reserves undermining the Central Bank's main objective. Coppin's (1994) foreign reserve model seeks to investigate the extent to which this expansionary fiscal policy negatively impacts reserves. In order to evaluate both these relationships empirically, the authors will first gauge the degree of FD, using the methodology of De Resende (2007), and then examine the role of expansionary fiscal policy in the determination of foreign reserves, using Coppin's (1994) reserve model.

4 Data

The empirical assessment of the FD case for Belize, based on De Resende (2007) and Coppin (2001), respectively, will be explored using a quarterly data set from 1997Q1 to 2020Q1 from various sources, all cited in Table (B1). In the De Resende approach, monetary base, private consumption, and debt are all normalised to their corresponding population value with the coefficient on the debt per capita variable giving the degree of FD. The variables in the foreign asset estimation, including Central Bank’s credit to the government, enter the equation in natural logs, with the fiscal balance being the only exception that is normalised to GDP. The remaining variables enter the equations as control variables or in different iterations for robustness checks. Table (B2) presents the descriptive statistics for the full sample.

Figure 7: Graphical Representation of Main Variables Used in Econometric Estimation

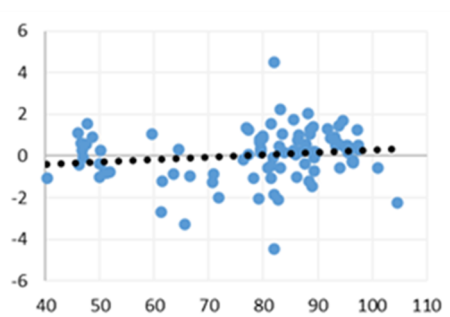


Notes: Quarterly current dollar values of monetary and fiscal variables and ratio of overall fiscal balance to GDP from Q1-1997 to Q1-2020. Sources: Central Bank of Belize and Ministry of Finance.

A visual inspection of the main data series in levels shows that most were trending over the review period, apart from the overall balance. The debt variables trended upwards at a high rate with a slight flattening after 2006’s restructuring, then accelerated after 2016 as described in Section 2.

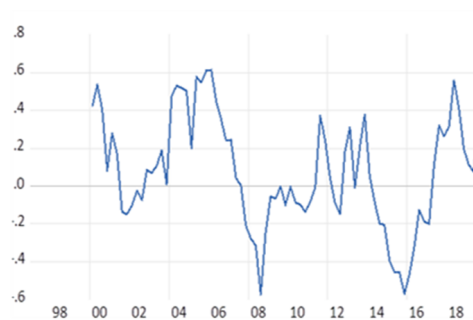
The expansion in CBB's credit to central government was moderate at the beginning of the review period but rose sharply after 2015Q1 with the government lacking access to external debt markets. Likewise, the movement in consumption and the monetary base take a similar path, with the latter experiencing a higher growth rate after 2011. This spike occurred as there was a notable upturn in domestic banks' excess liquidity, as a credit binge in the early 2000's was followed by rising non-performing loans as the Central Bank intervened to ensure compliance with statutory requirements to keep the banking system stable. The variables required for De Resende's approach (monetary base, consumption and total debt) to evaluate FD all seem to be non-stationary based on the eye test; however (see Figure 7), further analysis of the data is required to validate this.

Figure 8: Primary Balance (Percent of GDP) versus Debt-to-GDP Ratio (t-1)



Notes: Scatter plot depiction of variables with a trendline. Sources: Own estimations with data from Central Bank of Belize and Ministry of Finance.

Figure 9: Rolling Window Correlation of Primary Balance versus Debt-to-GDP Ratio (t-1)



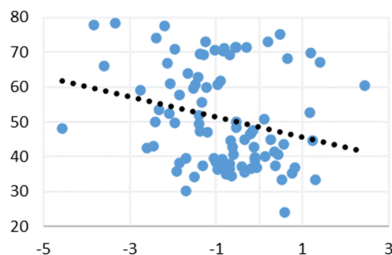
Notes: Correlation between primary balance and debt-to-GDP over a 12-quarter rolling window. Source: Own estimations with data from Central Bank of Belize and Ministry of Finance.

Unit root analysis verifies the visual inspection of the data set, as shown in Table (C1). The probability values are above ten percent and do not reject the null hypothesis of non-stationarity carried by Augmented Dicky Fuller (ADF) and Phillips-Perron tests. All variables are tested first with only the intercept in the test equation, and both the intercept and trend, after which only the overall balance was deemed to be stationary.

In examining Central Government's primary balance against the lag of its debt-to-GDP ratio on a scatter plot (Figure 8), there seems to be a weakly positive relationship between the two variables. To ascertain if this weak correlation could be coming from possible shifts in the relationship, we estimate a 12-quarter rolling window correlation. Figure (9) shows that the relationship has oscillated from positive to negative over the period, with the period before 2006 having relatively higher peaks in correlations than the period after; indicating that the primary balance (surplus) responds positively to debt for certain periods, which appear to be before the restructuring episodes, after which the

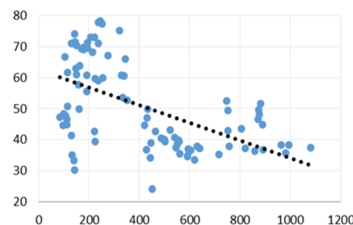
required relationship for sustainability declines.

Figure 10: CBB Credit to Central Government versus Overall Fiscal Balance



Notes: Scatter plot depiction of variables with a trendline. Sources: Own estimations with data from Central Bank of Belize and Ministry of Finance.

Figure 11: CBB Credit to Central Government versus CBB Net Foreign Assets



Notes: Scatter plot depiction of variables with a trendline. Sources: Own estimations with data from Central Bank of Belize.

Additionally, when examining the association between Central Bank financing and the overall fiscal balance (Figure 10) the expectation established from the previous section, holds. As the overall balance improves, there is less pressure on the monetary authorities to finance through credit to government. Furthermore, lower Central Bank financing is also associated with increases in foreign reserves (Figure 11), indicating that expansionary fiscal spending, or a deteriorating overall balance, leads to rises in imports, creating a drain on Belize’s foreign assets. Again, this dynamic is consistent with both Keynesian and Monetary Approach to Balance of Payments (MABP) theories and shows that FD can negatively impact economies functioning under a fixed currency regime. Having evaluated the data, we now address the empirical methodologies used in the research.

5 Econometric Models and Estimation

In Belize, with persistent deficits and rising debt, the FD case is straightforward to decipher because the accepted practices of the CBB do not discipline fiscal policy. Accordingly, a relevant evaluation for the country should monitor the degree of FD, and how the degree of FD changes based on the government’s access to debt markets and the monetary reforms that the CBB has enacted. It is equally important to investigate the effects of the government’s policy choices on key monetary objectives and variables, for Belize, its foreign reserves.

5.1 De-Resende (2007) Econometric Methodology

This study follows the methodology laid out by De Resende (2007). The authors utilise a DOLS regression to calculate the fraction of the outstanding debt, δ , backed by

current and future primary surpluses based on the equation (1) below

$$MB_t = \beta_0 + \beta_1 * C1_t + \beta_2 * D1_t + \mu_t \quad (1)$$

where MBt is the monetary base per capita, C1t is private consumption per capita and D1t is the debt per capita, all in time period t. β_0 is the intercept coefficient, β_j for $j = 1, 2$ are slope coefficients, and μ_t is the error term with well-defined statistical properties. An OLS estimation would provide a biased coefficient as the unit root tests established that the variables were non-stationary. With all variables integrated of the same order (I1) a cointegration regression can be performed, which will obtain robust coefficient estimates once it passes the required diagnostic checks. The DOLS methodology is a cointegrating estimation technique that uses leads and lags of the variables in the equation to establish a stable estimation model. Equation (1) thus has to be altered to show the functional form of DOLS estimation below:

$$MB_t = \beta_0 + \beta_1 * C1_t + \beta_2 * D1_t + \sum_{s=-p}^q (s = -p)\gamma_{1,s}\Delta C1_{t-s} + \sum_{s=-p}^q (s = -p)\gamma_{2,s}\Delta D1_{t-s} + \mu_t \quad (2)$$

Where $\gamma_{j,s}$ for $j = 1, 2$ and $s = -p, -p+1, \dots, q-1, q$ are slope coefficients. The suitable number of leads and lags for the estimation is chosen by the Akaike information criterion, with other methods of selection used for robustness checks. Of particular importance is the β_2 ³ coefficient which is used to calculate the variable of interest, δ using the simple computation, $\delta = 1 + \beta_2$. A value of less than one establishes that there is FD in Belize, which would be consistent with expectations.

5.1.1 De-Resende Estimation: Breakpoint Analysis

Establishing the degree of FD in Belize is important, however given the historic trends in the variables of interest, it is clear that the relationship is not wholly consistent over time (see Figure 9). To evaluate if there are structural changes in the parameters, particularly the value of δ over the sample, the authors employ a breakpoint least squares (BLS) pioneered by Bai and Perron (2006). The BLS estimation is a linear regression model in which some (or all) of the independent variables interact with regime dummy variables and is estimated in the following manner:

$$Y_t = \alpha * X_t + \theta_l * Z_t + \mu_t \quad (3)$$

The model is estimated for T periods with a maximum of m potential breaks and

³For a more complete breakdown of the theoretical underpinnings of the estimation see De Resende (2007).

$m + 1$ potential regimes. The matrix X_t is the set of variables whose coefficients α are constant across all time periods, while Z_t has coefficients that change structurally based on the regime and interact with the regime dummy variables. The coefficients θ_l carry different values from regimes $l = 0, \dots, m + 1$. Both the debt variable and consumption variables are considered breaking variables in the analysis, consequently, the functional form for the regression is as follows:

$$MB_t = \alpha + \theta_l * C1_t + \theta_l * D1_t + \mu_t \quad (4)$$

Where the variables carry different values for the $m + 1$ regimes indicated by the Bai and Perron (1998) test for break specifications. The ‘sequential L+1 breaks vs L’ test is used to identify the number of regimes based on which additional breakpoint most reduces the sum of squared residuals with a maximum of two structural breaks (three separate periods) allowed. A-priori expectations are that the breakpoint analysis will show that there has been a higher degree of FD during the periods just prior to the debt restructuring episodes in Belize.

5.2 Coppin (2001) Econometric Methodology

After empirically testing the FD hypothesis, we estimate the relationship between Central Bank’s credit to central government, government’s overall fiscal balance and foreign reserves⁴. The monetary/fiscal interaction is conceptualised by investigating how the inclusion of the fiscal variable alters domestic credit’s impact on reserves⁵. Therefore, a first specification of Equation (5) is estimated without the fiscal balance to test the association between CBB’s domestic credit to government and foreign reserves inclusive of the control variables in line with the specification of the MAPB. An alternative specification inclusive of the fiscal balance is estimated. If CBB’s domestic credit expansion is used mainly for financing government deficits, when the fiscal balance is added to the model, its coefficient should become statistically insignificant. If including fiscal balance in the model reduces the magnitude of CBB’s domestic credit, it reveals some form of mediating association between fiscal balance and domestic credit. Within this reserve specification, the latter means that Central Bank retains some small window to conduct autonomous monetary policy. By estimating the model in logarithmic form with added control variables, we are not inclined in testing the offset coefficient. The model is as

⁴Evaluation of the impact of fiscal activity on the inflation rate along the lines of Catao and Terrones (2003) was also carried out. However, Belize is pegged to the U.S. dollar and therefore, inflation is not an explicit policy target in macroeconomic analysis, although it is an implicit target through the exchange anchor. Based on an ARDL model a 1 percent increase in Central Bank financing led to a 0.1 percent increase in inflation. However, Belize is not an inflation targeting country; hence the focus of the study was shifted.

⁵Based on studies such as Mackinnon, Krull and Lockwood (2000), Armawaddin and Ahmad (2019).

specified below, with alternative specifications applied for more nuanced analysis.

$$NFA_t = \beta_0 + \beta_1 * DC_t + \beta_2 * CRED_t + \beta_3 * RCR_t + \beta_4 * OB_t + \beta_5 * RGDP_t + \beta_6 * TBRATE_t + \mu_t \quad (5)$$

Where NFA represents the net foreign assets of the Central Bank, DC is CBB domestic credit to government, CRED is private sector credit, RCR is the reserved cash ratio, OB is overall fiscal balance to GDP, RGDP is real GDP, TBRATE is the Treasury bill rate. The determinants of foreign asset holdings will be examined using the Unrestricted Error Correction Model (UECM) approach proposed by Pesaran et al. (2001), where short- and long-run effects are simultaneously estimated from the ARDL model. This versatile technique can accommodate sufficient lags, which allows the model to address intertemporal correlations among the covariates and provide unbiased estimates with valid t-statistics even in the presence of endogeneity (Harris and Sollis, 2003). This analysis can be applied irrespective of whether the time series are I(0), I(1) or a mixture of both (Pesaran et al. 2001). Another advantage is that this technique outperforms other cointegration methods at handling small sample size and dynamic sources of bias. However, it is essential to note that the ARDL presume a unique long-run relationship among the variables. Therefore, Johansen cointegration analysis is used to test for the number of cointegrating relationships among the set of non-stationary variables⁶. The general form of an ARDL model is as follows:

$$Y_t = \alpha_0 + \sum_{i=1}^p \gamma_i Y_{t-i} + \sum_{j=1}^k \sum_{l_j=1}^q \beta_{j,l_j} X_{j,t-l_j} + \mu_t \quad (6)$$

Where α_0 is the intercept coefficient, γ_i and β_{j,l_j} are the slope coefficients for lags of the dependent variable and the k independent variables respectively for $j = 1, \dots, k$. A cointegrating relationship exists between the foreign reserves and its determinants if the coefficients on the lagged level variables are jointly significant. This is a standard F-statistic test; however, its asymptotic distributions is non-standard and therefore, Pesaran et al. (2001) provide two sets of asymptotic critical values. On the one hand, if the F-statistic falls below the critical bound value, the null hypothesis of no cointegration cannot be rejected. On the other hand, if the F statistic lies above the upper bound critical value, there is cointegration. However, if the value falls within the bounds, the interpretation is inconclusive. Establishing cointegration is crucial in determining the short-run and long-run estimates of the estimated variables.

⁶The Johansen analysis indicated the presence of a unique long-run relationship among the set of variables.

6 Results and Discussion

6.1 De-Resende Empirical Estimation Results

Results of the De Resende estimation are displayed in Table (1). The Engle-Granger residual-based test provides evidence of a cointegrating relationship between the variables (see Table C2). The regression reveals a positive and statistically significant coefficient on nominal consumption per capita, β_1 , and estimates of δ are identified from the coefficient on the debt per capita variable from the calculation, $\delta = 1 + \beta_2$. The model passes all diagnostic checks and an ARDL estimation⁷ provides a robustness check of the results. For Belize, the estimate of δ is 0.74 and it is statistically different from 1, results validated by the Wald Test (see Table C3) with the aforementioned null hypothesis. The estimate of 0.74 is indicative of a fiscally-dominant environment.

Table 1: Results of Fiscal Dominance Estimation

Regressors	Statistics		
	Coefficient	p-value	δ Estimate
β_1 - private consumption	6.326	0.000	
β_2 - total government debt	-0.256	0.000	0.744
Model Diagnostics			
Lead - 8	Lags - 11		
Adjusted R-squared	0.913		
Jarque-Bera	0.793		
Observations	82		

Notes: Dependent variable: Monetary base. Sample: 1997Q1 to 2020Q1. Sources: Authors' estimation.

The Central Bank has made reforms over recent years to gain more functional autonomy. This begs the question as to whether these changes have been significant enough to bring changes in the δ -backing fiscal policy rule. Following De Resende (2007), a Bai-Perron method using sequential breaks was applied. Two structural breaks were endogenously determined by the data – the first break was identified in the year 2006, when Belize first defaulted on its commercial debt and lost access to international capital markets, and the second break was found in 2014.

Based on the analysis results (See Table 2), Belize's estimate of δ was closer to 1 before 2006 than after, though the relationship was statistically insignificant. Before 2006, Belize had access to the international capital markets, though this access was narrowing fast and borrowing terms were onerous with the last disbursements from the bond markets

⁷Results can be made available upon request.

coming in that year⁸. Subsequently, the government was forced to exercise fiscal restraint because of the debt restructuring exercise and the Central Bank faced increasing pressure to share the fiscal solvency burden coming mostly from legacy debt service payments and a rising wage bill. Between 2006 and 2014, it was estimated that the Central Bank had to finance 31.0 percent of government debt, indicative of the strain that the monetary authorities have faced in achieving their policy objectives. These results align with the earlier narrative in Section 2 as well.

Though there seems to be a moderation in FD after 2014, we cannot conclusively attribute this to the monetary reforms enacted after this period as major fiscal and debt events also occurred during this time that could have contributed to the moderation in fiscal dominance. The last two debt restructurings (2013 and 2017) brought an increase in the government’s fiscal consolidation effort by way of several tax hikes⁹. In addition, the increase in external debt inflows from the Venezuela Petrocaribe Agreement (mostly between 2015 and 2017) relieved pressure on CBB financing and built up international reserves.

Table 2: Results of Fiscal Dominance Breakpoint Estimation

Breaking Regressors	Statistics		
	1997Q1 - 2006Q1	2006Q2 -2013Q4	After 2014Q1
Observations	37obs	31obs	25obs
β_2 - total government debt	0.035	-0.310	-0.120
p-value	(0.128)	(0.009)	(0.076)
β_1 - private consumption	0.187	1.750	5.410
p-value	(0.562)	(0.000)	(0.000)
δ Estimate	1.035	0.690	0.880

Notes: Dependent variable: Monetary base. Sample: 1997Q1 to 2020Q1. Bai-Perron tests of L+1 vs. L sequentially determined breaks. Sources: Authors’ estimation.

Overall, the findings align with De Resende (2007) where his results showed that FD is common and more likely in developing countries than in developed countries. Results also align with Cevick (2019) in his analysis of Bohn’s fiscal reaction function where there

⁸This was to finance the repurchase of the water company in 2005Q3, and to help with principal payments that had sky rocketed, including a bullet payment and the payoff for investors on an early put option (Central Bank of Belize Annual Report, 2005).

⁹In the 2015/16 Fiscal Year (FY), excise duty on imported motor spirit, gasoline and diesel was increased. In 2016/2017 FY, stamp duty on foreign exchange permits was increased to 1.75 percent, the environmental tax on imported goods except for vehicles and fuel was increased, and the social fee on cigarettes imported into CFZ was increased. In 2017/18 FY, general sales tax was applied on the purchase of data services and government purchases and imports. The Free Zone social fee applied to goods other than cigarettes, liquor and fuel was increased, and social fee was applied to inbound duty free merchandise at the International Airport.

was marginal improvement in fiscal effort after the latest debt restructurings.

6.2 Coppin Empirical Estimation Results

Results of the ARDL estimations are summarised in Table (3). Four specifications of the reserve ARDL model were estimated. Models 1 and 2 are based on the estimation of equation (5) covering the sample period 1997Q1 to 2020Q1. Model 1 excludes the fiscal balance (OB_GDP) and Model 2 includes it to ascertain the change in the relationship between CBB's credit to government and foreign reserves given the fiscal variable¹⁰. Models 3 and 4 use the sample period before 2006 indicated by the breakpoint analysis in De Resende's approach, to explore whether higher degrees of FD lead to an even greater drain on foreign reserves. Results for all specifications indicate that there is cointegration between the variables. In line with the MAPB, the coefficients on domestic credit¹¹, monetary policy tool, interest rate and GDP have the expected signs across most specifications.

Long-run results for Model 1 show that a 1.0 percent increase in CBB domestic credit led to a 0.60 percent decline in foreign reserves. When the overall balance was included, this variable had a positive coefficient, indicating that an improvement in the government's fiscal position would increase reserves. Coppin (1994) indicated that if domestic credit expansion was utilised mainly for financing deficits, then it would become statistically insignificant when the fiscal balance is included in the model. Both were significant in Model 2; however, the magnitude of domestic credit fell to 0.45 percent, supporting some mediating association between fiscal balance and CBB domestic credit. These results show that the influence of overall fiscal balance explains a portion¹² (approximately 15.0 percent) of the relationship between Central Bank's credit to the government and foreign assets. Additionally, the overall fiscal balance is largely capital spending-driven and thus externally funded. It is the domestic portion, largely in the form of the wage bill that is expected to exert the most influence on the Bank's financing. The results affirm the conclusion of the MAPB that places domestic credit of the Central Bank as a key variable to monitor in order to maintain foreign reserves stability. Noteworthy is the negative and statistically significant impact of private sector credit on reserves across all specifications except Model 2, reinforcing why the CBB monitors credit growth.

¹⁰A supplementary regression was estimated in line with Judd and Kenny (1981), to establish a relationship between overall fiscal balance and CBB domestic credit. This was to support the conclusion of a mediating association between the two which showed a significant negative relationship.

¹¹It should be noted that any autonomous expansion in money is expected to show some deterioration in reserves regardless of the purpose of the expansion (fiscal or monetary-led) or the degree of capital mobility as this captures the "inefficiencies of monetary policy" for a small open fixed exchange economy.

¹²The coefficient of LDC in Model 1 subtract the coefficient of LDC in Model 2. Both coefficients of LDC in models 1 and 2 are significant, and therefore, it is expected that the portion of the relationship between Central Bank's credit to the government and foreign assets explained by the fiscal balance, is also significant.

Table 3: ARDL Estimation of Determinants of Foreign Reserves

Regressors	Long-Run Model			
	One	Two	Three	Four
LDC	-0.605 (0.000)	-0.454 (0.001)	-0.579 (0.002)	-0.974 (0.000)
LTBRATE	-0.106 (0.000)	-0.276 (0.000)	0.077 (0.653)	0.000 (0.993)
RGDP	3.195 (0.000)	3.817 (0.000)	1.88 (0.000)	1.367 (0.287)
RCR	-0.256 (0.170)	-1.402 (0.001)	0.217 (0.396)	3.162 (0.032)
OB_GDP		0.335 (0.000)	-0.186 (0.001)	0.216 (0.077)
PSC	4.512 (0.000)	1.207 (0.337)	-4.651 (0.002)	-1.006 (0.001)
Model Diagnostics				
Observations	85	85	40	40
Jarque-Bera (p-stat)	0.936	0.134	0.975	0.958
LM Test (p-stat)	0.436	0.090	0.617	0.340
Ramsey Reset Test (p-stat)	0.429	0.156	0.897	0.950
1 Percent LOS				
Model	F-stat	Lower Bound	Upper Bound	Result
One	6.04	3.41	4.68	Coin
Two	7.94	3.15	4.43	Coin
Three (Before 2006)	8.41	3.80	5.64	Coin
Four(After 2006)	8.54	3.80	5.64	Coin

Notes: Dependent variable: Foreign Reserves; p-statistics are below model coefficients in brackets; Model 3 Sample: 1997Q1 - 2005Q4; Model 4 Sample: 2006Q1 - 2020Q1; LOS = Level of Significance; Coin - cointegrating relationship found. Sources: Authors' estimation.

In the last two Models (3 and 4), we compare the magnitude of the coefficient on the domestic credit variable for the two sub-periods, before and after 2006. A priori expectations are that where the degree of FD is higher (post 2006), domestic credit should have a larger negative impact on reserves due to the more dominant role of fiscal expansion. Results show that the coefficient of CBB domestic credit was larger during the period of higher fiscal dominance at -0.97 (see Table 3, column 4). The post-2006 specification (Table 3, column 4) further demonstrates that in the presence of higher levels of FD, the reserve cash ratio has a positive significant reserve impact as it helps to counter the drain from expansionary Central Bank financing. It shows that for Belize, in a fiscally-dominant environment, the Central Bank could only at best react to set limits on the secondary expansion of money through instruments such as the cash reserve ratio and statutory liquidity ratio.

7 Concluding Remarks

This paper empirically finds evidence of fiscal dominance in Belize which manifests itself through the influence of fiscal deficit on debt dynamics and Central Bank's credit to government. De Resende's (2007) long-run fiscal policy rule indicates that the CBB financed roughly 25.6 percent of Central government's debt since 1997, however the relationship became stronger when the fiscal authorities faced more rigid financing constraints. After 2006, when Belize was excluded from international capital markets and restructured its debt three times, it is estimated that the Central Bank had to finance 31.0 percent of government debt, indicative of the strain that the monetary authorities have faced in achieving their policy objectives.

The CBB's main policy objective of maintaining a stable fixed exchange rate comes under pressure when facing a fiscally-dominant environment, as it was shown that monetising of the debt reduces international reserves. The ARDL models estimate that over the long run, every percentage increase in Central Bank financing leads to a 0.60 percent fall in international reserves, a worrisome trend given the fact that the CBB has no capability to 'discipline' the fiscal authorities in the current institutional environment. The results have also shown that a greater degree of fiscal dominance does in fact lead to greater foreign exchange losses from the CBB.

We concur with the main takeaways from the literature on the fiscal dominance subject matter, that developing nations are more prone to face this issue. Belize faces the same development challenges as our peers, including a high debt overhang, unsustainable fiscal practices, the lack of an independent central bank and an undeveloped capital market to absorb significant and steady amounts of government debt. All these issues are hard to remedy, especially in the short run. An important and necessary first step is fostering coordination between the Ministry of Finance, the Treasury and the Central

Bank. A committee with high-level representation from these institutions, with added representation from the central tax collection bodies such as Customs and the merged Tax Department, would be necessary to help forecast cash management which is weak in Belize. This committee would in turn, be supported by a working group that provides data for any decision making. Clear projections of financing needs ahead of time will provide the Central Bank with more time to make securities available to the market, removing the expectation for the Central Bank to act as first buyer for these cash management securities. Lastly, results from the analysis indicate that a fiscal responsibility law or fiscal rules would bolster fiscal authority's will to generate the primary surpluses needed to back debt obligations.

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Appendix

A Tax Enhancement Measures

Table A1: Summary of Main Revenue Adjustment Measures (2015 to Present)

Fiscal Year	Revenue Adjustment Measure
2015/2016	Excise Duty on imported motor spirit, gasoline and diesel was increased Excise Duty on local beer adjusted to the same rate of other CARICOM countries
2017/2018	Social Fee on goods and services imported into CFZ at a rate of 10.0 percent on fuel 6.0 percent on fermented beverages 20.0 percent on cigarettes and 1.5 percent on all other goods Introduction of a departure tax for non-Belizeans of BZD32.50 Excise Duty on fuel products Stamp Duty on foreign exchange permits was increased to 1.75 percent Exempt GST on electricity consumption up to BZD100.00 – down from BZD200.00 Environmental Tax on imported goods except vehicles and fuel was increased to 3.0 percent ad valorem Social Fee on cigarettes was reduced to 15.0 percent Stamp Duty levied on land transfers
2018/2019	GST applied on the purchase of data services GST applied on GOB contracts, imports and purchases GST applied on Business Processing Outsourcing Excise tax applied to kerosene imports synchronized with that of jet fuel, and those applied on fuel oils will be equivalent to the rate on diesel Free Zone social fee applied to goods other than cigarettes, liquor and fuel (3.0 percent) Social fee will be applied to inbound duty free merchandize at the PGIA

Notes: Source: Ministry of Finance

B Data Description

Table B1: Variable Definition and Sources

Main Variables	Definition	Source
Total Debt	Outstanding External and Domestic Debt Stock	CBB
Monetary base	CIC plus Domestic Banks' Deposits at the Central Bank	CBB
Consumption	Household private consumption	SIB
Foreign Reserves	Net Foreign Asset position of the CBB	CBB
Central Bank Domestic Credit	Securities plus Overdraft Advances	CBB
Overall Balance to GDP	Total Revenue and Grants – Total Expenditure	MOF
Reserve Cash Ratio	Required cash reserves as a percentage of deposit liabilities	CBB
Private Sector Credit	Net credit to the private sector as a ratio of domestic bank assets	CBB
Real GDP	GDP at constant market prices (2000 prices)	SIB
Treasury Bill Rate	90 – Day Treasury Bill Rate	CBB

Notes: Authors' calculations generated variables. Sources: CBB- Central Bank of Belize; SIB - Statistical Institute of Belize; MOF - Ministry of Finance

Table B2: Descriptive Statistics Regression Variables

Variable Name	Reg	Descriptive Statistics				Obs
		Avg	Std Dev	Min	Max	
Reserve Cash Ratio (percent)	RCR	7.60	2.00	3.00	10.00	93
Debt per Capita (BZD)	D1	4,985.75	1,812.89	1,444.98	6,630.02	93
Monetary Base (BZD mn)	MB	1,418.00	663.3	593.2	2,937.90	93
CBB Domestic Credit (BZD mn)	DC	196.6	104.9	55.3	499.5	93
Consumption per Capita (BZD mn)	C1	1,452.90	159.3	1,130.00	1,746.20	89
Foreign Reserves (BZD mn)	NFA	423.5	273.8	84.6	1080.4	93
Treasury Bill Rate (percent)	TBRATE	2.70	1.70	0.00	5.90	93
Private Sector Credit (percent of Assets)	CRED	67.35	3.9	58.5	74.9	93
Overall Balance to GDP (percent of GDP)	OB_GDP	-0.8	1.2	-4.6	2.4	93
Real GDP (BZD mn)	RGDP	526.1	117.2	323.1	714.9	93

Notes: Reg - name in regression; Avg - average; Std Dev - standard deviation; Min - minimum; Max - maximum; Obs - number of observations. Sources: Authors' own calculations.

C Supplementary Test Results

Table C1: Probability Values for Unit Root Tests of Variables in Levels

Variables	Augmented Dickey Fuller		Phillips-Perron	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend
RCR	0.635	0.654	0.626	0.639
MB	0.793	0.101	0.774	0.597
D1	0.537	0.822	0.525	0.842
C1	0.439	0.058	0.506	0.725
NFA	0.514	0.671	0.477	0.327
OB_GDP	0.000	0.000	0.000	0.000
CRED	0.314	0.316	0.386	0.402
DC	0.638	0.395	0.718	0.450
TBRATE	0.262	0.067	0.444	0.502

Notes: Unit root tests on variables to evaluate possibly cointegrating relationships; Probability values greater than 0.1 indicates non-stationarity. Sources: Authors' own calculations.

Table C2: Cointegration Test Results DOLS Estimation

Test Statistic	Statistic Value	p-value
Engle-Granger tau-statistic	-4.399	0.094
Engle-Granger Z-statistic	-58.720	0.000

Notes: P-values less than or equal to 0.1 indicate a cointegrating relationship. Source: Authors' own calculations.

Table C3: Wald Test Results

Tests	Statistics		
	Value	DOF	p-value
t-Test	-2.776	33	0.009
F-Test	7.706	(1, 33)	0.009
Chi-squared Test	7.706	1	0.005
Null Hypothesis $1 + \beta_2 = 0$			
Normalized Restriction (= 0)		Value	Std Error
β_2		-0.256	0.092

Notes: P-value of less than 0.1 means that we do not accept the null hypothesis. Sources: Authors' estimation.