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The Impact of the Sectoral Distribution of Credit on the External Current Account in Barbados

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Abstract

This paper seeks to determine the impact that the growth in the sectoral distribution of credit and other control variables can have on the external current account balance in Barbados. To do so, it employs an ARDL bounds testing cointegration approach coupled with quarterly data from 1994 to 2017. The findings suggest that increased credit to the public sector and households has both a short-run and long-run negative impact, while credit to the secondary sector only has a negative short-run impact on the current account. Additionally, other variables such as international prices, foreign incomes, external interest rates and the output gap can influence the current account balance in Barbados. This suggests that greater efforts are needed to increase the export base of the country and control the accumulation of external government debt. Moreover, the country can benefit by diversifying its exported goods and services to take advantage of increased foreign incomes in the long-run.

JEL Classification: F32, H81, G21, E31

Keywords: Current Account, Cointegration, Bounds Testing, Credit Growth

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1. Introduction

Since the onset of the 2008 financial crisis, there has been a renewed interest in the impact of international developments on the external current account by both academics and policy makers. Barbados has particularly been prone to external shocks and persistent current account deficits over the years given its high dependence on international trade to accommodate domestic consumption and drive economic growth (Worrell 2017). This dependence has led to a depletion of foreign exchange reserves as the country has a small productive capacity and is not a large earner of foreign exchange inflows compared to more developed countries (Moore, Beckles and Worrell 2015).

In order to facilitate growth, economic sectors must have the necessary wherewithal to finance investments which have led to an increased dependence on domestic banks. Unger (2016) reinforced this when he emphasised that banks have the ability to increase the purchasing power of individuals by distributing loans from deposits which also leads to increased imports.

However, although credit can lead to a deterioration of current account balances in the short-term, there is a general need to understand whether it can have positive influences on the country's external balance in the long-run. This concept is central to the intertemporal theory of the current account, which stresses that countries will run current account deficits today in order to earn a return in the future by exporting goods. Nevertheless, for developing countries this can lead to unsustainable current accounts if countries are unable to secure the necessary financing to cover short-term current account deficits.

Given this, the domestic and external factors influencing the external current account have been extensively analysed in the literature, the majority of which have been on developed or emerging economies and to a lesser extent developing countries. In fact, some small island studies have investigated the sustainability of the external current account balance over the years which includes Hudson and Stennett (2003), Greenidge, Holder and Moore (2009) and Lorde, Lowe and Francis (2013). Others such as Brown and Williams (2007) as well as Craigwell and Samaroo (1997) have analysed the determinants of the current account balance and its components. However, the evidence of an impact of financial variables on the current account balance in Barbados or small island developing states for that matter, is slim. The few that were discovered include Boamah, Jackman and Mamingi (2011) who analysed the impact of public and private sector credit growth on the current account balance in Barbados and Howard and Mamingi (2002), both analysing the monetary approach to the balance of payments in Barbados.

In doing so, these papers provided a comprehensive analysis of the factors influencing the country's external balance. However, their analysis contained aggregated data on domestic credit, which is likely to suppress important information of the underlying components within private and public sector credit that are driving fluctuations in the country's current account balance. It is with this in mind, that I will seek to contribute to the existing literature by analysing in depth the influence that commercial bank credit to consumers (households), the secondary sector, tertiary sector and public sector (via loans and securities) will have on Barbados' current account balance. This analysis is important because Barbados is highly dependent on activity within the tertiary and secondary sectors to earn foreign exchange and drive economic growth (ECLAC 2017). At the same time, extensive credit to economic

agents such as households and the public sector can deplete the country's foreign exchange reserves by increasing the demand for imports which can have negative implications on the country's fixed exchange rate regime.

In this instance, having a thorough understanding of the sectoral financial variables that are likely to contribute to a deterioration of the country's external position will be useful in crafting economic policies that will counteract the negative impact. It will also give authorities the opportunity to capitalise on and redistribute resources to sectors that are likely to improve the country's foreign exchange position, and by extension, its economic health. Most importantly, the estimation technique that will be employed will add further clarity as to whether the positive or negative influence of each variable occurs within the short-run or the long-run, which can be useful in economic discussions and enhancing economic forecasts.

Given this, the paper follows the approach used by Boamah, Jackman and Mamingi (2011) for the case of Barbados by using an Autoregressive Distributed Lag (ARDL) model developed by Pesaran et al. (2001), but differs from their study by firstly conducting the analysis on a longer time series with quarterly data ranging from 1994 to 2017. Secondly, it will analyse the impact of credit to the public sector and the sectoral distribution of private sector credit on the external current account. The remaining sections of the paper are as follows. Section 2 will provide an overview of the current account balance and the growth in private and public sector credit in the Barbados economy. Section 3 will discuss the theoretical and empirical literature on the topic. Sections 4 and 5 provide the data and methodology. Section 6 reports and discusses the empirical findings and finally, Section 7 provides the conclusion and policy implications.

2. Background

2. 1 Overview of the Current Account Balance and Domestic Credit in Barbados

Barbados is a small open economy that is highly dependent on foreign trade to drive economic growth and satisfy the consumption needs of economic agents within the country (United Nations 2001). According to Pierola, et al. (2018), the country's small export base and inability to influence world prices has made it increasingly vulnerable to external shocks. As a result, Barbados has recorded persistent external imbalances over the review period which led to the 2017 current account deficit increasing five times the amount recorded in 1995.

Historically, Barbados' current account movements have mostly been driven by changes in the merchandise trade and services balance and to a lesser extent, the income and transfers account (see Figure 1). In fact, prior to 1995 the country's current account benefitted from an uptick in economic growth in its major source markets (the United States of America and the United Kingdom) due to an acceleration in productivity and employment levels from 1993 to 1994. As a direct consequence, the country earned approximately $1. 9 billion in tourism related expenditure within that period, which caused the current account surplus to peak to 5. 0 percent of the country's Gross Domestic Product (GDP) by the end of 1994.

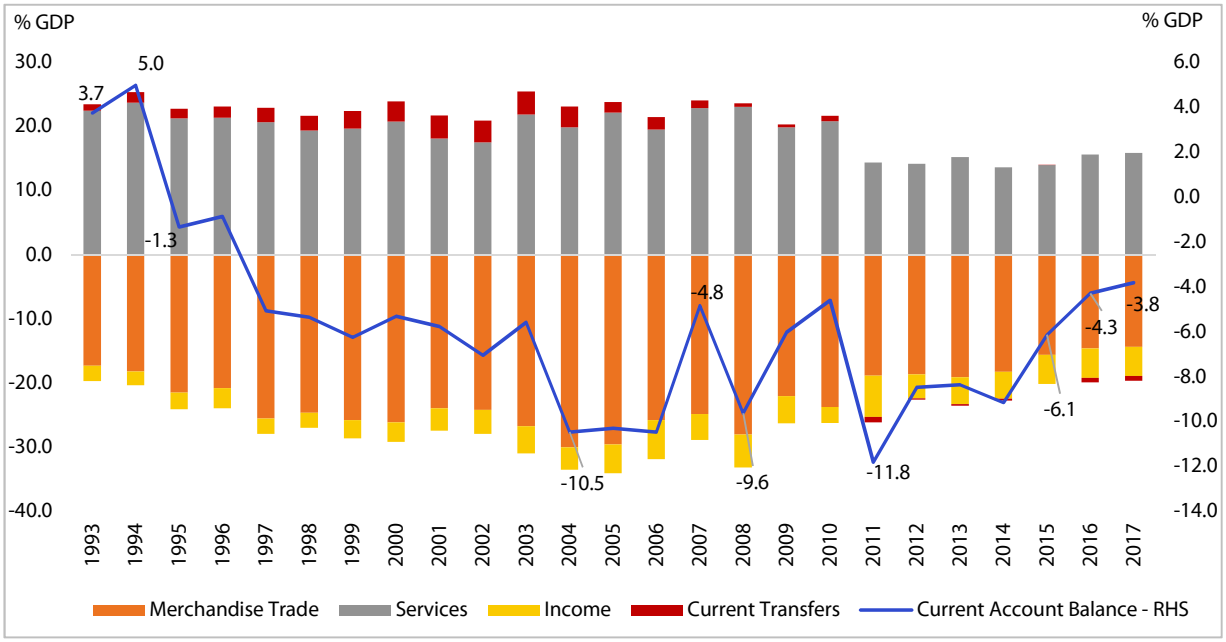
However, in 1995 with most industrial countries experiencing a slowdown in growth coupled with a fall in global demand (International Monetary Fund 1995), the positive trend quickly reversed as the current

account plunged to a deficit of 1. 3 percent of GDP. This trend continued for over a decade, with deficits averaging 6. 2 percent of GDP between 1995 to 2010 before reaching its highest point in 2011 of 11. 8 percent of GDP. Within that time, three significant global economic events occurring in 2004, 2008 and 2011 influenced the worsening of the current account. For one, in 2004 the deterioration of the current account to 10. 5 percent of GDP was attributed to a surge in international food and oil prices which led to an increase in the value of imported commodities. In 2007, the current account deficit registered a notable improvement which ended the period at 4. 8 percent of GDP. This outturn was mostly driven by the strong performance of travel credits which increased by 24. 0 percent as well as the dampened demand for imports over the period.

However, the onset of the 2008 financial crisis retracted the improvements generated in the previous year, which caused the deficit to worsen to 9. 6 percent of GDP. This development led to a slowdown in tourism receipts and the country also experienced a ballooning import bill as a result of increased values for intermediate goods.

Nevertheless, similar to the developments in 2004, the increase in the deficit registered in 2011 was driven by an increase in the price of imported fuel due to a hike in international oil prices as well as the fall in travel credits over the period. Since that time, the current account deficit has averaged rates lower than pre-crisis levels and has been on a downward trajectory since 2014. This improvement was as a result of contractionary fiscal policies implemented by the government to reduce aggregate demand, a fall in oil prices particularly in 2014, 2015 and 2017 as well as a steady increase in tourism receipts from 2014 to 2017.

Figure 1: The Current Account Balance and its Components as a Percentage of GDP[2]



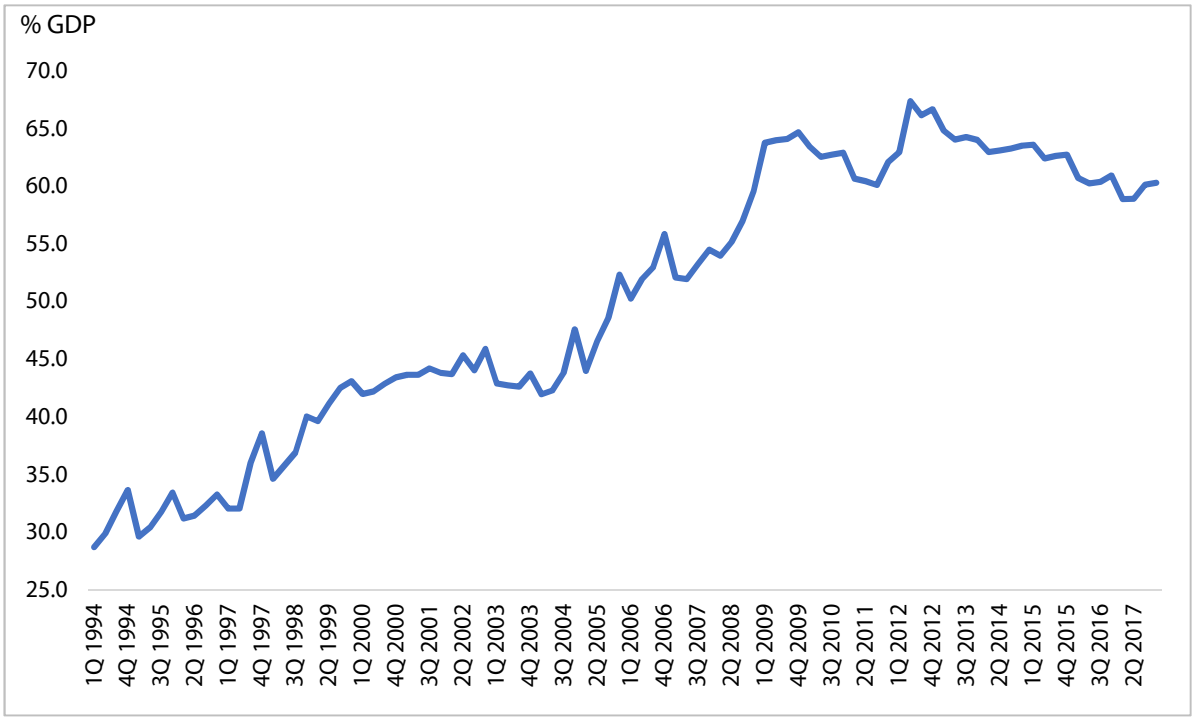
Sources: Central Bank of Barbados and Author's Calculations

[2] The share of the current account balance to GDP is calculated as a percent of annual nominal GDP.

Though the fluctuations in the current account have been largely influenced by external economic events, there is no doubt that domestic factors such as the expansion of credit and policies aiming to stimulate aggregate demand have influenced the trend. In Barbados, domestic credit has been on an upward trajectory for over a decade, increasing at an average rate of two (2) percent quarterly (7. 1 percent annually) between 1994 and 2017 (see Figure 2). However, since the global impact of the 2008 financial crisis, domestic credit growth has been sluggish moving from an average growth rate of 2. 6 percent quarterly between 1994-2008 (11. 0 percent annually) to a 0. 2 percent quarterly growth rate (0. 6 percent annually) between 2009 to 2017.

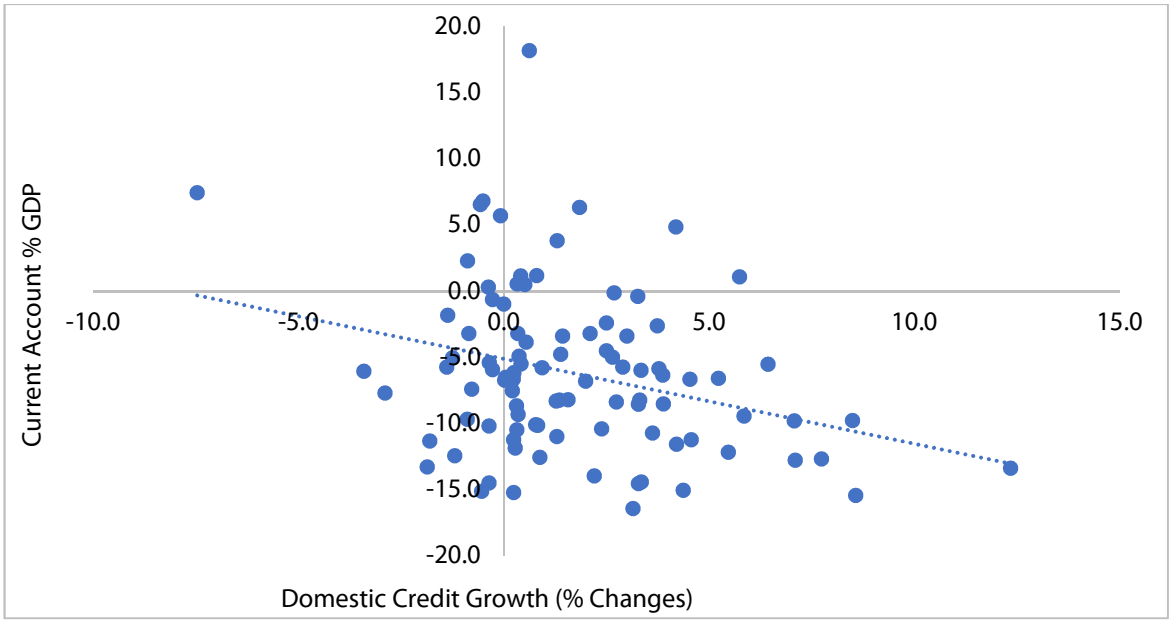
Despite these developments, a preliminary analysis of the relationship between domestic credit growth and the external current account shows that there is likely to be a negative relationship between the two variables (see Figure 3). This relationship also holds true for the disaggregated portion of domestic credit to the private sector which accounts for 94. 0 percent of domestic loans and the public sector which accounts for approximately 6. 0 percent of the total. Moreover, it is this pattern that will lay the foundation for my analysis of how the current account is influenced by the sectoral distribution of credit.

Figure 2: Quarterly Domestic Credit as a Percentage of GDP (1994-2017)



Sources: Central Bank of Barbados and Author's Calculations

Figure 3: Quarterly Domestic Credit Growth and the Current Account Balance as a Percentage of GDP (1994-2017)



Sources: Central Bank of Barbados and Author's Calculations

3. Literature Review

This section reviews the theoretical and empirical literature underpinning the factors influencing the external current account balance in both developed and developing countries.

3. 1. The Theoretical Literature

From a theoretical standpoint, there are a number of approaches that have been used as a workhorse to analyse the relationship between the Balance of Payments (BOP) and other economic variables. These approaches include the elasticities approach, the absorption approach, and the monetary approach to the BOP.

The elasticities approach predicts the effect that policy changes – particularly exchange rate adjustments – will have on a country's balance of payments. This approach is central to the Marshall-Lerner condition which was independently pioneered by two prominent economists, Marshall (1923) and Lerner (1944). The theory explains that a devaluation of the exchange rate will be successful in improving the BOP position only if the sum of the price elasticities of demand for imports and exports exceed one (1). However, if the sum of these price elasticities of demand are less than one, a devaluation of the exchange rate will worsen the trade balance. This shows that so long as demand is elastic, a devaluation of the exchange rate causes the domestic prices of imports to increase, making it more expensive to import, which will reduce the demand for foreign goods. In turn, foreign prices of exports will fall which will attract foreign demand for domestic goods thereby improving the trade balance. In this instance, for the Marshall-Lerner condition to hold, there must be a positive relationship between the exchange rate and the trade balance. Nevertheless, though a number of authors have found results supporting the Marshall-Lerner condition (Mehmood, et al. 2010; Gomes and Paz 2005),

others have disputed the applicability of a devaluation especially in the context of the Caribbean (see Worrell, Moore and Beckles 2018; Boyd and Smith 2005).

After the founding of the elasticities approach, the theory was confronted with a number of criticisms. According to Thirlwall and Gibson (1992), one of the main criticisms of the theory is that it is based on partial-equilibrium analysis which excludes the impact that exchange rate changes will have on income and expenditure levels. Secondly, it unrealistically assumes that the supply of imports and exports are perfectly elastic after a devaluation. However, the fall in the price of exports after a devaluation does not mean that a country has the capacity to instantly increase its supply of exports (International Monetary Fund 2000). Moreover, although changes in export and import quantities will affect other components of national income, the elasticity approach failed to incorporate this.

To correct these shortfalls, Alexander (1952) established the absorption approach to the BOP which analyses the income effect of a devaluation by showing that the BOP deficit is a result of individuals absorbing or consuming more than they produce. In this instance, a BOP surplus (deficit) indicates that persons are producing (consuming) more goods and services than they are consuming (producing). The theory argues that a currency devaluation increases exports and reduces the demand for imports which increases national income. The extra income creates a multiplier effect which is then used to increase domestic consumption.

One shortfall of both the elasticity and absorption approach to the BOP is that they both failed to analyse the influence that financial assets or changes in the money supply has on a country's BOP position. Because of this, Johnson (1972) developed the monetary approach to the balance of payments which emphasises that the BOP deficit is a monetary phenomenon and changes in the balance of payments is a function of the demand and supply of money. Essentially, as the demand for money increases more than the supply of money, the excess demand will be satisfied by foreign inflows which will improve the BOP position. However, if the supply of money exceeds demand, the excess supply will result in a loss of foreign reserves which will cause the trade balance to deteriorate. Because of this, the theory emphasises that a balance of payments disequilibrium can only be corrected using monetary measures (International Monetary Fund 2000).

However, according to Thirlwall and Gibson (1992), it is difficult to forecast movements in the BOP as a result of changes in the money supply since there is not a one-to-one relationship between the two variables. This is due to the fact that income and interest rates will change significantly with changes in the quantity of money over time.

Despite the criticisms noted for each theory, they provide various perspectives of the factors that are likely to influence BOP adjustments within a country. However, this research paper focuses on the influence that commercial bank credit to various institutional sectors will have on Barbados' current account balance. As a result, the monetary approach to the balance of payments is most applicable and will therefore be analysed in the context of this study.

3. 2. Analysis of the Empirical Literature

3.2.1 Credit Growth and the Current Account Balance

The underlying causes and sustainability of current account deficits have captured the attention of researchers across the world given the increased level of globalisation and the onset of a number of financial crises over the years. To this end, the direct link between current account deficits and their impact on the domestic economy have raised questions as to whether these deficits are inherently good or bad. However, the answer seems to depend on whether current account deficits are sustainable and to the extent that they increase the financial vulnerabilities of a country (Devadas and Loayza 2018).

In the literature, current account deficits are generally referred to as the outcome from the difference between domestic savings and domestic investment. According to Yigitbas (2017), when domestic spending surpasses domestic savings, a current account deficit problem arises as more foreign funds are demanded and used. Because of this, Devadas and Loayza (2018) noted that persistently large current account deficits that are fuelled by consumption through excessive credit, rather than investment, can be harmful to the economy. Additionally, countries with high external debts, large financial outflows and negative net foreign inflow positions are likely to incur domestic financial stability risks that will lead to persistently high current account deficits. The aforementioned was supported in an earlier study by Reisen (1997), who noted that some clear warning signs of unhealthy current account deficits include overvalued currencies, a sharp drop in savings and increased risk-taking in the banking system through excessive credit levels.

These developments can assist in creating a foundation for understanding the factors influencing persistent current account deficits experienced in countries over the years. For one, a number of studies have linked domestic demand booms with a deterioration in the current account while others have noted that the magnitude of current account deficits depend on the country's level of financial development. In fact, Comunale and Hessel (2014) emphasised that increased domestic demand which is precipitated by financial cycles, is the most important determinant of trade imbalances rather than price competitiveness. According to the authors, there are a number of factors that can trigger these financial cycles in the Euro Area, such include house prices or even the increase in domestic credit. These findings were supported by Mirdala and Ďurčová (2017) who noted that even though price and cost competitiveness dominated the effects on current account imbalances in pre-crisis periods within the Euro Area, demand shocks significantly amplified the vulnerabilities of the current account over a longer period of time (see also Zoričić, Cota and Erjavec 2020).

Interestingly, domestic credit seems to be the most stated driving force of increased domestic demand throughout the academic literature. For example, Ekinci et al. (2014) found that the acceleration of domestic credit led to a larger deterioration in the current account balance of forty-nine (49) industrial and developing countries. This deterioration was even larger for countries that were in the early stages of development (low financial-depth) compared to larger and more developed countries (high financial-depth) (see also Chinn and Ito 2007). According to Karahan and Gencur (2019), the reason for this is that the more developed the country and its financial system, the more savings can be generated which will lead to improvements in the country's current account balance. However, in developing countries the current account balance is likely to worsen as increased access to credit leads to much lower domestic savings, increased consumption levels and reduced funds for investment purposes given the budget constraints faced by these countries.

Unger (2016), confirmed the findings in Ekinci et al. (2014) as the author showed that credit pull factors such as the flow of bank loans to the domestic non-financial private sector had a negative impact on the external current account in a number of Euro-Area countries. This finding suggests that a credit boom causes domestic demand to surpass the potential output within these countries, which leads to an increase in the current account deficit. Similarly, Soydan (2016) was able to show that there is a significant and unidirectional causality running from domestic credit (total private sector credit and credit to households) to external current account imbalances in Turkey. But according to Tarihi (2020), this one-way causality is due to the acceleration in loans to households and firms increasing the appetite for durable consumer goods and other investments from abroad, which led to a worsening of the external current account balance.

The above findings suggest that the sectoral distribution of credit can also have implications on the current account balance. However, the sign of the relationship between the two variables depends on the extent that an increase in credit to these sectors increases productivity or increases unproductive expenditure on foreign goods. This was reinforced by Işık, Yılmaz and Kılınç (2017) who used a disaggregated approach to analyse the impact of credit to firms, households and government on the current account balance in 26 OECD countries. The results indicated that credit to households and firms led to a deterioration in the current account in the short-run as it expanded the demand for foreign goods and capital (see also Coricelli, Mucci and Revoltella 2006). However, given the capacity of the government and exporting firms to use the supply of credit to boost economic activity and exports, a positive relationship is realised in the long-run. Alioğulları, et al. (2015) also found that an increase in consumer loans negatively impacted the current account deficit in Turkey. However, contrary to the findings in the existing literature, commercial loans had an insignificant effect on the current account balance. The author explained that while commercial loans are used to finance imported inputs, a simultaneous growth in output and exports is likely to limit the worsening of the current account balance.

Using both an aggregated (total credit) and disaggregated (public and private sector credit) approach, Boamah, Jackman and Mamingi (2011) showed that in the case of Barbados, total domestic credit had a negative impact on the external current account balance in both the short-run and the long-run. However, unlike the findings in Işık, Yılmaz and Kılınç (2017), the results suggested that credit to the private sector had equally a negative short and long-run impact on the current account while credit to the public sector displayed only a negative short-run impact (see also Howard and Mamingi 2002).

The disparity in these findings, justify the importance of economic development and productivity in driving the improvement of the external current account within the long-run. Essentially, the countries analysed by Işık, Yılmaz and Kılınç (2017) are regarded as developed and high-income economies with large production and import substitution competencies. These competencies are used to their advantage by increasing foreign trade and reducing external imbalances compared to small developing economies such as Barbados. In fact, Yurdakul and Ucar (2015) mentioned that countries which have the ability to increase their rate of exports while reducing production costs, will generate an improvement in their current account deficit. However, countries that are highly dependent on imports to increase production and exports that contribute to the country's economic growth, will continuously generate current account deficits as income rises.

3.2.2 *Other Factors Influencing the Current Account Balance*

While credit growth has been associated with a deterioration in the current account balance, there have been a number of other domestic and external influential variables noted in the empirical literature. External factors have particularly increased the vulnerabilities of small open economies given their limited capability to influence the world economy and high dependency on larger countries for trade in goods and services. According to Khan and Knight (1983), typical external factors that have negatively impacted the current account balance in non-oil developing countries comprised of the decline in the terms of trade; the deterioration of economic activity in industrial countries; and the increase of real interest rates in international financial markets (see also Craigwell and Samaroo 1997; Fayaz and Sandeep 2016). Some authors have even stated that commodity price instability has been a major source of current account imbalances in both developed and developing countries (Aleksandrova 2016). In this regard, increases in international prices tend to positively affect the trade balance of net-exporters of goods that are subjected to price changes, while the opposite holds true for net-importers of the good (Kudaisi and Olomola 2019).

Domestic factors that are intrinsic to various countries, have also been noted to impact the current account balance throughout the literature. A common factor in most studies has been the influence that economic growth has had on the external balance but these findings have been mixed (Calderon, Chong and Loayza 2000; Sanni, Musa and Sani 2019). There has also been empirical evidence that the outputgap, persistent fiscal deficits, trade openness and an appreciation of the exchange rate have contributed to current account imbalances within various countries over the years (Downes and Moore 2005; Seshaiah 2014; Altayligil and Çetrez 2020).

An analysis of the literature shows that credit disbursed to the public and private sector, has various influences on the current account balance in both the long and short-run. However, there is a scarcity of studies that have thoroughly investigated the segments of private sector credit contributing to current account imbalances across countries. Because of this, the main objective of this study is to fill this gap by analysing in depth, the impact that the sectoral distribution of credit is likely to have on the external current account balance in the case of Barbados. Additionally, the estimation process will be supported by the inclusion of a number of control variables that have been recorded in the empirical literature. Common influential variables range from domestic factors such as the fiscal balance, real effective exchange rates, GDP growth and the output gap. Moreover, external factors mentioned across studies comprise of foreign incomes, trade openness, foreign interest rates and international prices.

4. Data

This paper includes quarterly time series data from the period 1994 to 2017 on Barbados with a total of 96 observations. The data was collected from a number of sources, including the Central Bank of Barbados, the International Monetary Fund, the Barbados Statistical Service, the Federal Reserve Bank of St. Louis and the World Bank Indicators (see Table 1).

In this paper, the Current Account Balance is as a proportion of Nominal GDP while the Output Gap is as a proportion of potential Real GDP. Natural logarithms are used to transform foreign income, international commodity prices and the credit variables.

Table 1: Description of Variables[3]

Variables	Source	Name
Commercial Bank Credit to the Private Sector:	Central Bank of Barbados	
Secondary Sector Loans		SEC
Tertiary Sector Loans		TER
Consumer Loans		CONS
Commercial Bank Credit to the Public Sector:	Central Bank of Barbados	
Public Sector Loans		PUB
Commercial Bank Government Investments		COMM
Current Account Balance	Central Bank of Barbados	CAB
Nominal GDP and Real GDP	Central Bank of Barbados	
Output Gap	Central Bank of Barbados and the author's own calculations	YGAP
International Commodity Prices	IMF Commodity Data Portal	PRICE
Foreign GDP	Barbados Statistical Service, World Bank Indicators and the author's own calculations	FGDP
US Risk-Free Rate	Federal Reserve Bank of St. Louis	USR

5. Empirical Specification and Methodology

It should be noted that as a precursor to the study a number of variables were considered given those stated in the literature and particularly those used by Boamah, Jackman and Mamingi (2011). However, after using the general-to-specific modelling technique, the variables quoted in Table 1 provides the best model in terms of significance and the fit of the model. Moreover, Table A. 1 in Appendix A presents the correlation matrix of the model which shows that prices, foreign income and the US Risk-Free Rate seem to be highly correlated with some of the credit variables. Nevertheless, excluding the highly correlated variables did not show a significant difference in the fit of the model or the results which resulted in their inclusion for the purpose of this study. In this instance, the issue of multicollinearity among the variables is not a concern in the models to be presented.

5. 1 Description of the Variables

5.1.1 *Dependent Variable*

Current Account Balance

The current account balance of Barbados is the sum of net exports of goods and services, net income and net current transfers expressed as a proportion of nominal GDP. A positive number means that the country is a net lender to the rest of the world, while a negative current account balance indicates that the country is a net borrower.

[3] Before the transformation of the variables, the Current Account Balance, Credit Variables, Nominal and Real GDP, the Output Gap as well as Foreign GDP are in millions of Barbados dollars.

5.1.2 Main Independent Variables

Commercial Bank Credit to Various Sectors

The sectoral distribution of commercial bank credit is disaggregated into five different sections which include loans to consumers[4], the secondary sector, tertiary sector, public sector, and commercial bank government investments. Loans to consumers include mortgages, vehicle loans and other personal loans. Secondary sector loans comprise of loans to the public utilities, manufacturing and construction sectors. Loans to the tertiary sector include credit extended to the distribution, tourism, entertainment, transport, financial and other services sectors. Moreover, loans to central government and statutory bodies are captured in public sector loans while commercial bank government investments include commercial bank holdings of long-term and short-term government securities. For the purpose of this study, both commercial bank loans to the public sector and investment in government securities will represent commercial bank credit to the public sector.

Based on the literature, the impact of credit on the current account is ambiguous in that, increased credit across sectors is likely to increase the spending power of individuals which translates into higher imports and a negative impact on the country's external current account balance (Işık, Yılmaz and Kılınç 2017). However, it is also possible that over time an increase in credit can lead to improvements in the current account as this facilitates investment and growth which generates increased exports and an improvement in the merchandise trade balance (Boamah, Jackman and Mamingi 2011).

5.1.3 Control Variables

Apart from credit, the literature highlights a host of variables that influence the current account balance. In this study, the following controls are included: the Output Gap, International Commodity Prices, Foreign GDP and the US Risk-Free Rate.

Output Gap

The Output Gap is calculated as the difference between the actual real GDP of Barbados and its maximum potential GDP converted as a proportion of potential real GDP[5]. Most studies have used the domestic output gap as an indicator of the level of excess aggregate demand stemming from transitory factors such as business cycles (Seshaiah 2014; Amador and Silva 2019). However, the impacts of the variable on the current account balance have been mixed throughout the literature. For example, Downes and Moore (2005) found that in the case of countries operating under a fixed exchange rate regime, a negative relationship existed since pegged regimes do not automatically adjust to temporary expansions in aggregate demand. As a result, a positive output gap will lead to increased spending on imported goods and services which will contribute to a worsening of the country's current account balance. At the same time, some studies have found that there is also likely to be a positive relationship since an increase in real output can contribute to boosting exports which will eventually lead to an improvement in the external balance (Boamah, Jackman and Mamingi 2011; Fayaz and Sandeep 2016).

[4] For the purpose of this paper, commercial bank loans to consumers also represents household loans. Because of this, consumer and household credit (loans) will be used interchangeably.
[5] Potential real GDP is calculated using the Hodrick-Prescott filter.

International Commodity Prices

The International Commodity Price variable includes both fuel and non-fuel price indices. Given that small open economies such as Barbados tend to be price-takers, the impact of a rise in international commodity prices is likely to be ambiguous. Essentially, an increase in international prices will have the effect of increasing the value of the country's imports that are impacted by the price change, which will lead to a worsening of the current account (Aleksandrova, 2016). However, if the country is a net-exporter of the goods subjected to the price change, increases in international prices will be reflected in the value of exports, thereby generating an improvement in the country's current account balance (Boamah, Jackman and Mamingi 2011).

Foreign GDP

Foreign income or foreign GDP is calculated as the trade-weighted average of real GDP of Barbados' top four main trading partners expressed in trillions of Barbados dollars. These trading partners include Canada, the United Kingdom, Trinidad and Tobago and the United States. It is likely that an increase in the income of Barbados' main trading partners will lead to an increase in the demand for exports which will improve the country's current account position (Boamah, Jackman and Mamingi 2011). At the same time, earnings from exports may result in an increased demand for imports to facilitate growth enhancing ventures which can lead to a deterioration of the current account (Craigwell and Samaroo 1997).

US Risk-Free Rate

The US Risk-Free Rate is used as a proxy to capture the impact of the cost of borrowing and interest income on the external current account. Ideally, if the country is a net debtor to the rest of the world increases in this rate can lead to an increase in the foreign exchange needed to service interest payments on external debt which can negatively affect the net income balance of the current account and by extension the current account deficit (Khan and Knight 1983). On the other hand, if the country is a net creditor to the rest of the world, an increase in the rate can lead to improvements in the current account balance as interest income is earned on foreign investments (Boileau and Normandin 2004).

Table 2 below presents the descriptive statistics of the variables for the estimation period 1994 Q1 to 2017 Q4, and Figure A. 1 in Appendix A plots a graph of all the variables.

Table 2: Descriptive Statistics

	CAB	COMM	CONS	FGDP	PRICE	PUB	SEC	TER	USR	YGAP
Mean	-0. 062	7. 044	7. 352	1. 370	4. 511	5. 248	6. 434	6. 741	0. 024	0. 000
Median	-0. 066	7. 046	7. 518	1. 335	4. 592	5. 709	6. 391	6. 936	0. 017	-0. 007
Maximum	0. 182	7. 624	8. 181	1. 795	5. 297	6. 495	6. 879	7. 456	0. 060	0. 111
Minimum	-0. 164	6. 350	5. 778	1. 078	3. 775	3. 147	6. 084	5. 648	0. 000	-0. 088
Std. Dev.	0. 062	0. 322	0. 719	0. 157	0. 460	1. 067	0. 225	0. 486	0. 022	0. 040
Skewness	0. 969	0. 196	-0. 647	1. 101	0. 081	-0. 702	0. 374	-0. 435	0. 253	0. 337
Kurtosis	4. 543	2. 293	2. 280	3. 717	1. 582	2. 034	2. 006	2. 272	1. 370	2. 665
Jarque-Bera	24. 555	2. 610	8. 776	21. 439	8. 147	11. 624	6. 185	5. 144	11. 647	2. 271
Probability	0. 000	0. 271	0. 012	0. 000	0. 017	0. 003	0. 045	0. 076	0. 003	0. 321
Observations	96	96	96	96	96	96	96	96	96	96

Source: Author's Calculations

5. 2 Econometric Approach

In this paper, the functional form of the model used to determine the impact of credit growth on the current account is in accordance with the approach used by Boamah, Jackman and Mamingi (2011). In this instance, the functional form of each model can be formally represented as:

$$CAB_t = f(CREDIT_t, YGAP_t, PRICE_t, FGDP_t, USR_t) \quad (1)$$

where for the five different models, $CREDIT_t$ represents individually, SEC, TER, CONS, PUB or COMM. Based on the literature there are various methods that can be used to conduct cointegration tests, including tests related to Engle and Granger (1987), Johansen (1988), Johansen and Juselius (1990) and the Pesaran et al. (2001) ARDL method. However, for the purposes of this paper, the ARDL bounds testing approach to cointegration is used for a number of reasons.

First, the ARDL supports variables that are purely I(0) (stationary), purely I(1) (nonstationary) or mutually cointegrated, unlike the Johansen and Engle-Granger approaches which require the series to be all I(1). However, similar to the other approaches, the ARDL model is not applicable if these variables are integrated of order two, that is, I(2). Secondly, the ARDL approach is most suitable for data sets with small sample properties, unlike other cointegration techniques. Thirdly, the ARDL model is simple as it has the ability to simultaneously estimate the short-run and long-run dynamics of the model. It also has the capability of automatically selecting the appropriate lag length for each variable in the model which does not have to be of the same lag order. Lastly, the lag length structure overcomes the potential problem of serial correlation and endogeneity among the variables.

5. 2. 1 ARDL Bounds Test of Cointegration - Model Specification

The ARDL model uses five different specifications or cases to determine if there exists a long-run relationship among the variables (see Pesaran et al. 2001: 295-296). For the purpose of this paper and

in accordance with empirical literature of this kind, the conditional error correction model will take the following specification:

Unrestricted intercepts and no trend

$$\Delta y_t = c_0 + \pi_{yy} y_{t-1} + \pi_{yxx} x_{t-1} + \sum_{i=1}^{p-1} \psi_i' \Delta z_{t-i} + \alpha' \Delta x_t + u_t \qquad (2)$$

In equation (2), $\boldsymbol{y}$ represents the dependent variable (CAB). For each model, **x** represents the independent variables CREDIT, YGAP, PRICE, FGDP and USR. The variable **z** includes CAB, CREDIT, YGAP, PRICE, FGDP and USR. Δ is the first difference operator, $\boldsymbol{u_t}$ is the error term and $\boldsymbol{c_0}$ is the constant term. The other symbols, π_{yy}, π_{yxx}, ψ_i' and α' represent the parameters to be estimated.

The long-run or levels relationship is found by using an F-test of joint significance within the bounds testing framework where the null hypothesis H_0: $\pi_{yy} = \pi_{yxx} = 0$ represents no long-run relationship and the alternative hypothesis H_1: $\pi_{yy} \neq \pi_{yxx} \neq 0$ which indicates cointegration.

These hypotheses are represented by two critical bounds where the lower bound classifies the variables as I(0) and the upper bound is represented as I(1). If the calculated value of the F-statistic is more than the upper bound, then there is cointegration. On the other hand, if the F-statistic is less than the corresponding lower bound then there is no cointegration. So long as there is cointegration, the long-run model and corresponding error correction model can be estimated. The error correction model in this instance is represented as:

$$\Delta y_t = c_1 + \sum_{i=1}^{p-1} \emptyset_i' \Delta z_{t-i} + \omega ECT_{t-i} + \varepsilon_t \qquad (3)$$

where c_1 is the constant term, ε_t is the error term, $\emptyset'$ represents the short-run coefficients of the variables and ECT is the error correction term which is the lagged value of the error term from the long-run equation. In this instance, it measures the speed of adjustment toward the long-run equilibrium in the case of disequilibrium. Additionally, ω is the ECT parameter which ranges from -1 to 0 and should be statistically significant.

6. Results and Discussion

6. 1 Results

6.1.1 Unit Root Tests

In this study, three unit root tests are employed which includes the Augmented Dickey-Fuller (ADF), Phillips and Perron (PP) and the Kwiatkowski–Phillips–Schmidt–Shin (KPSS). From the tests, the order of integration is chosen based on the corresponding results from two out of three tests. In Table 3, the Output Gap, Consumer Loans variable and the US Risk-Free Rate are I(0) (stationary) while all other variables are I(1) (nonstationary). That is, the non-stationary variables include the four credit variables (SEC, TER, PUB and COMM), the Current Account Balance, International Commodity Prices and Foreign GDP. In this instance, the results from the unit root tests give further justification that we can proceed to model the variables using the ARDL model.

Table 3: Unit Root Tests

Variable	ADF - P-value (AIC)			PP - P-value			KPSS - LM-Stat		Overall Decision
	Nature of Series	Levels	First Difference	Nature of Series	Levels	First Difference	Intercept & Trend Levels	Intercept & Trend First Difference	
SEC	None	0. 775	0. 000*	None	0. 770	0. 000*	0. 257	0. 091*	I(1)
TER	None	0. 895	0. 025*	None	0. 984	0. 000*	0. 227	0. 072*	I(1)
PUB	None	0. 989	0. 000*	None	0. 988	0. 000*	0. 305	0. 090*	I(1)
CONS	Intercept	0. 085*	-	Intercept	0. 010*	-	0. 254	0. 057*	I(0)
COMM	Intercept & Trend	0. 149	0. 002*	Intercept & Trend	0. 218	0. 000*	0. 102*	-	I(1)
CAB	None	0. 457	0. 000*	None	0. 000*	-	0. 368	0. 103*	I(1)
PRICE	None	0. 873	0. 000*	None	0. 879	0. 000*	0. 168	0. 080*	I(1)
FGDP	Intercept & Trend	0. 354	0. 000*	Intercept & Trend	0. 032*	-	0. 171	0. 113*	I(1)
YGAP	None	0. 000*	-	None	0. 000*	-	0. 047*	-	I(0)
USR	Intercept & Trend	0. 041*	-	None	0. 1911	0. 000*	0. 057*	-	I(0)

The symbol * represents rejection of the unit root null hypothesis at the 10% significance level based on p-values.

For the KPSS test the symbol * represents acceptance of stationarity (no unit root) for the critical values at the 10% significance level.

I(0): integrated of order zero (stationary); I(1): integrated of order one (nonstationary); None: No intercept; no trend

Source: Author's Calculations

6.1.2 The ARDL Bounds Testing Approach

6.1.2.1 The ARDL - Diagnostic Tests

In the first stage of the ARDL, the variables are estimated using equation two (2) for the five models and the Akaike Information Criterion (AIC) is used to determine the automatic lag length selection for each model.

Prior to examining the long-run and short-run relationships, a series of diagnostic tests were carried out on the models (see Table 4). From these results, the residuals of each model seem to be normally distributed and they do not suffer from autocorrelation or heteroskedasticity. The cumulative sum (CUSUM) and CUSUM of squares tests also reinforces that the models are stable (see Figure C. 1 to Figure C. 5 in Appendix C).

Lastly, to determine the appropriateness of the model, the model selection summary was examined. The summary confirms that each model is appropriate since the lowest AIC value is chosen for the corresponding lag structures as seen in Figure D. 1 to Figure D. 5 in Appendix D.

Table 4: Summary of Diagnostic Tests

	COMM Model	CONS Model	PUB Model	SEC Model	TER Model
Autocorrelation					
Breush-Godfrey LM-Test	0. 609	0. 289	0. 104	0. 145	0. 109
Correlogram - Q-Stat	No auto.	No auto.	No auto.	No auto.	No auto.
Normality Test					
Jarque-Bera - P-value	0. 726	0. 458	0. 832	0. 933	0. 707
Heteroskedasticity Test					
Breusch-Pagan-Godfrey F-test	0. 876	0. 971	0. 678	0. 566	0. 677
Stability Diagnostic					
CUSUM	Passed	Passed	Passed	Passed	Passed
CUMSUM of Squares	Passed	Passed	Passed	Passed	Passed
No auto. indicates no autocorrelation (see Appendix B, Figure B. 1).					
Values in this table represent the p-values of the respective tests.					

Source: Author's Calculations

6.1.2.2 The Long-run and Short-run Analysis

To determine if a long-run relationship exists, the bounds test is conducted on all models and the F-statistic is compared to the 10% critical value for the upper and lower bounds. As seen in Table 5, the F-statistic in each model surpasses the I(1) upper bound at the 10% critical value. The CONS model includes four rather than five parameters since the US Risk-Free Rate is excluded to improve the quality and results of the estimated model.

Table 5: Bounds Test Results

Model: k=5	**F-statistic**		**Model: k=4**	**F-statistic**	
COMM	6. 512		CONS	6. 065	
PUB	6. 966				
SEC	5. 878				
TER	4. 889				
Bounds	**I(0)**	**I(1)**	**Bounds**	**I(0)**	**I(1)**
Critical Values			**Critical Values**		
1%	3. 725	5. 163	1%	4. 096	5. 512
5%	2. 787	4. 015	5%	3. 010	4. 216
10%	2. 355	3. 500	10%	2. 548	3. 644
N. B: The bounds are based on the actual sample size					

Source: Author's Calculations

Given these results, the long-run models are presented in Table 6 while the corresponding error correction models are presented in Table 7 to Table 9. In each model, the variables will be analysed and interpreted at the 10% significance level.

Table 6: Estimation of Long-run Coefficients

Case 3: Unrestricted Constant and No Trend				
Dependent Variable: CAB	ARDL (2, 1, 1, 2, 3, 0)			
COMM Model: Regressors	Coefficient	Standard Error	t-Statistics	P-value
COMM	-0. 159	0. 056	-2. 813	0. 006
FGDP	0. 248	0. 084	2. 952	0. 004
PRICE	-0. 017	0. 020	-0. 874	0. 385
YGAP	-0. 235	0. 374	-0. 629	0. 531
USR	-0. 525	0. 545	-0. 965	0. 338

Dependent Variable: CAB	ARDL (5, 5, 0, 0, 0)			
CONS Model: Regressors	Coefficient	Standard Error	t-Statistics	P-value
CONS	-0. 059	0. 026	-2. 232	0. 029
PRICE	0. 011	0. 028	0. 386	0. 701
FGDP	0. 142	0. 061	2. 323	0. 023
YGAP	0. 492	0. 209	2. 356	0. 021

Dependent Variable: CAB	ARDL (4, 1, 0, 0, 0, 1)			
PUB Model: Regressors	Coefficient	Standard Error	t-Statistics	P-value
PUB	-0. 031	0. 013	-2. 339	0. 022
FGDP	0. 117	0. 044	2. 669	0. 009
PRICE	0. 000	0. 022	-0. 020	0. 984
YGAP	0. 459	0. 191	2. 395	0. 019
USR	-0. 312	0. 384	-0. 812	0. 419

Dependent Variable: CAB	ARDL (4, 2, 0, 0, 0, 0)			
SEC Model: Regressors	Coefficient	Standard Error	t-Statistics	P-value
SEC	0. 080	0. 079	1. 016	0. 313
FGDP	0. 149	0. 096	1. 558	0. 123
PRICE	-0. 076	0. 043	-1. 773	0. 080
YGAP	0. 733	0. 366	2. 002	0. 049
USR	0. 012	0. 622	0. 020	0. 984

Table 6 Continued: Estimation of Long-run Coefficients

Dependent Variable: CAB	ARDL (4, 0, 0, 0, 0, 0)			
TER Model: Regressors	Coefficient	Standard Error	t-Statistics	P-value
TER	-0. 002	0. 042	-0. 050	0. 960
FGDP	0. 110	0. 073	1. 500	0. 138
PRICE	-0. 041	0. 038	-1. 062	0. 291
YGAP	0. 735	0. 363	2. 025	0. 046
USR	-0. 120	0. 630	-0. 190	0. 850

From the results in Table 6, the models show that an increase in consumer loans (CONS) as well as credit to the public sector in the form of loans (PUB) and commercial bank investment in government securities (COMM), has a significant and negative impact on the current account balance in the long-run. However, credit disbursed to the secondary and tertiary sectors displayed an insignificant influence on the current account within the corresponding models.

The results for the remaining independent variables varied in each of the long-run models (see Table 6**)**. For instance, in the COMM, CONS and PUB model, the foreign income variable is significant which implies that an increase in the variable leads to an improvement in the current account balance in the long-run. But this relationship is insignificant in both the SEC and TER models. Similarly, although the output gap is insignificant in the COMM model, the variable has a positive and significant influence on the current account balance across all other models. The findings also reveal that an increase in international prices causes a deterioration in the dependent variable particularly in the SEC model, but interestingly, the cost of borrowing is an insignificant determinant of current account imbalances in the long-run.

Table 7, Table 8 and Table 9 present the short-run dynamics from the long-run relationship through the use of an error correction model. As seen in each of the models, the error correction term is negative, ranges between -1 and 0 and is also significant. Moreover, in the COMM, CONS and PUB models the speed of convergence to the long-run equilibrium in the case of a short-run shock seems to be faster than the SEC and TER models. In this instance, the COMM, CONS and PUB models show that the system corrects its previous period disequilibrium at a speed of 73. 9 percent, 78. 9 percent and 85. 7 percent respectively. However, in the SEC and TER models, the disequilibrium from the previous quarter converges to the long-run equilibrium in the current quarter at a speed of 49. 3 percent and 51. 3 percent respectively.

An analysis of the independent variables confirms that in most of the models (excluding the CONS and PUB models), an increase in the lagged value of the current account at least one period prior is significant in influencing a deterioration in the current account balance in the current period. However, in the CONS, PUB, SEC and TER models this short-run relationship manifests up to three periods prior (see Table 7 to Table 9).

Similar to the long-run models, each of the short-run models seem to have varying results for the control variables which is partly influenced by the maximum lag order used. For instance, in the COMM model,

an increase in international prices has an instantaneous and negative impact on the current account balance. The model also shows that as the output gap rises there is a significant improvement in the dependent variable. This positive relationship is maintained even when the output gap is lagged up to two periods (see Table 7).

Notably, Table 8 highlights that out of all the independent variables, an increase in the cost of borrowing (US Risk-Free Rate) has an immediate and the largest negative influence on the current account balance in the short-run.

In examining the credit variables, the models show that most credit variables have a negative and significant impact on the dependent variable and there are also a number of differences in terms of the period of impact. For example, the PUB model emphasises that in the short-run, an increase in loans to the public sector precipitates an immediate and negative influence on the current account balance. In the SEC model, the negative relationship between loans to the secondary sector and the dependent variable only manifests when lagged up to one period while in the CONS model, the negative relationship is realised up to four lags of the consumer loans variable (see Table 7 and Table 8). However, although commercial bank holdings of government securities in the current period is significant in the short-run, its sign is contrary to the short-run predictions in the existing literature (see Table 7).

Table 7: Error Correction Representations of the COMM and CONS ARDL Models

Error Correction Representations of ARDL Models				
Case 3: Unrestricted Constant and No Trend				
Dependent Variable: ΔCAB	ARDL (2, 1, 1, 2, 3, 0)			
COMM Model: Regressors	Coefficient	Standard Error	t-Statistics	P-value
C	0. 594	0. 092	6. 451	0. 000
ΔCAB_{t-1}	-0. 308	0. 089	-3. 449	0. 001
ΔCOMM	0. 161	0. 061	2. 619	0. 011
ΔFGDP	-0. 006	0. 084	-0. 069	0. 945
ΔPRICE	-0. 131	0. 054	-2. 407	0. 019
$\Delta PRICE_{t-1}$	-0. 072	0. 048	-1. 490	0. 140
ΔYGAP	0. 582	0. 122	4. 787	0. 000
$\Delta YGAP_{t-1}$	0. 733	0. 113	6. 475	0. 000
$\Delta YGAP_{t-2}$	0. 297	0. 109	2. 715	0. 008
ECT_{t-1}	-0. 739	0. 115	-6. 448	0. 000
R-Squared	0. 743	DW-Statistic	2. 015	
Adjusted R-Squared	0. 715	F-Statistics:	26. 696	
S. E of regression	0. 039	P-value (F-Statistic)	0. 000	

Table 7 Continued: Error Correction Representations of the COMM and CONS ARDL Models

Dependent Variable: ΔCAB	ARDL (5, 5, 0, 0, 0)			
CONS Model: Regressors	Coefficient	Standard Error	t-Statistics	P-value
C	0. 109	0. 019	5. 590	0. 000
$\Delta CAB2_{t-1}$	-0. 055	0. 142	-0. 389	0. 699
$\Delta CAB2_{t-2}$	-0. 037	0. 133	-0. 279	0. 781
$\Delta CAB2_{t-3}$	-0. 275	0. 105	-2. 624	0. 011
$\Delta CAB2_{t-4}$	0. 135	0. 087	1. 549	0. 126
ΔCONS	-0. 227	0. 136	-1. 663	0. 101
$\Delta CONS_{t-1}$	-0. 101	0. 136	-0. 744	0. 459
$\Delta CONS_{t-2}$	0. 144	0. 135	1. 070	0. 288
$\Delta CONS_{t-3}$	0. 051	0. 135	0. 376	0. 708
$\Delta CONS_{t-4}$	-0. 371	0. 134	-2. 780	0. 007
ECT_{t-1}	-0. 789	0. 140	-5. 650	0. 000
R-Squared	0. 802	DW-Statistic	1. 921	
Adjusted R-Squared	0. 777	F-Statistics:	32. 333	
S. E of regression	0. 035	P-value (F-Statistic)	0. 000	

Table 8: Error Correction Representations of PUB and SEC ARDL Models

Error Correction Representations of ARDL Models				
Case 3: Unrestricted Constant and No Trend				
Dependent Variable: ΔCAB	ARDL (4, 1, 0, 0, 0, 1)			
PUB Model: Regressors	Coefficient	Standard Error	t-Statistics	P-value
C	-0. 046	0. 008	-5. 901	0. 000
ΔCAB_{t-1}	-0. 107	0. 118	-0. 911	0. 365
ΔCAB_{t-2}	-0. 165	0. 102	-1. 611	0. 111
ΔCAB_{t-3}	-0. 414	0. 070	-5. 906	0. 000
ΔPUB	-0. 153	0. 035	-4. 434	0. 000
ΔUSR	-1. 967	0. 909	-2. 164	0. 034
ECT_{t-1}	-0. 857	0. 129	-6. 664	0. 000
R-Squared	0. 806	DW-Statistic	1. 661	
Adjusted R-Squared	0. 793	F-Statistics:	58. 935	
S. E of regression	0. 034	P-value (F-Statistic)	0. 000	

Table 8 Continued: Error Correction Representations of PUB and SEC ARDL Models

Dependent Variable: ΔCAB	ARDL (4, 2, 0, 0, 0, 0)			
SEC Model: Regressors	Coefficient	Standard Error	t-Statistics	P-value
C	-0. 222	0. 036	-6. 166	0. 000
ΔCAB_{t-1}	-0. 438	0. 087	-5. 008	0. 000
ΔCAB_{t-2}	-0. 416	0. 083	-5. 006	0. 000
ΔCAB_{t-3}	-0. 543	0. 065	-8. 333	0. 000
ΔSEC	-0. 067	0. 072	-0. 928	0. 356
ΔSEC_{t-1}	-0. 128	0. 072	-1. 765	0. 081
ECT_{t-1}	-0. 493	0. 081	-6. 121	0. 000
R-Squared	0. 779	DW-Statistic	1. 858	
Adjusted R-Squared	0. 763	F-Statistics:	49. 849	
S. E of regression	0. 036	P-value (F-Statistic)	0. 000	

Table 9: Error Correction Representation of the TER ARDL Model

Error Correction Representations of ARDL Models				
Case 3: Unrestricted Constant and No Trend				
Dependent Variable: ΔCAB	ARDL (4, 0, 0, 0, 0, 0)			
TER Model: Regressors	Coefficient	Standard Error	t-Statistics	P-value
C	-0. 011	0. 004	-2. 589	0. 011
ΔCAB_{t-1}	-0. 410	0. 096	-4. 298	0. 000
ΔCAB_{t-2}	-0. 381	0. 091	-4. 175	0. 000
ΔCAB_{t-3}	-0. 522	0. 069	-7. 616	0. 000
ECT_{t-1}	-0. 513	0. 092	-5. 579	0. 000
R-Squared	0. 764	DW-Statistic	1. 787	
Adjusted R-Squared	0. 753	F-Statistics:	70. 411	
S. E of regression	0. 037	P-value (F-Statistic)	0. 000	

6. 2 Discussion

The findings in this paper covered the intended purpose of the study, as it shows that the sectoral distribution of credit has various effects on the external current account balance in both the long and short-run. In this instance, the arguments posed by Boamah, Jackman and Mamingi (2011) and Howard and Mamingi (2002) are confirmed in that the balance of payment changes in Barbados can be deemed a monetary phenomenon.

The results indicate that loans disbursed to households has the largest negative influence on the current account balance in the short-run compared to all other credit variables and this relationship is maintained well into the long-run. Based on the short-run results, the effect is not instantaneous but occurs when loans are distributed to consumers up to four quarters prior. This negative relationship is in line with theoretical predictions and corroborates the findings in both Işık, Yılmaz and Kılınç (2017) and Alioğulları, et al. (2015). Essentially, loans disbursed to households are used to facilitate the construction and outfitting of homes and the purchasing of vehicles and non-durable goods which cannot be sourced locally. This is likely to lead to a high demand for imports of both durable and non-durable consumer goods which contributes to a worsening of the external current account.

The empirical results also confirm that commercial bank credit to the public sector in the form of loans has an immediate and negative impact on the current account in the short-run which also persists into the long-run. Additionally, a similar long-run relationship is seen with increased commercial bank holdings of government securities. These results partially conflict with the findings in Boamah, Jackman and Mamingi (2011) since the authors found that the negative relationship exists when public sector credit is lagged by one period in the short-run.

In essence, commercial bank loans to the public sector are mostly used to aid the financing of public projects which is likely to increase the demand for foreign supplies and materials. Additionally, credit to the public sector in the form of securities is used to cover the fiscal short-falls of the government which too can generate a deterioration in the current account balance. This is due to the fact that increased spending on areas such as public sector wages and salaries, goods and services as well as transfers to individuals and public institutions, expands consumption levels and individuals' appetite for imported goods and services.

Although loans to the secondary sector did not have a significant impact on the current account balance in the long-run, the model shows that there is a short-run negative influence when lagged by one period. This is in accordance with the fact that loans disbursed to the secondary sector usually finance manufacturing and construction projects in the private sector with a large import content that can lead to a worsening of the current account in the short-run.

Moreover, contrary to the expectations of this paper, credit distributed to the tertiary sector did not have a significant effect on the current account balance in the short or long-run. Loans disbursed to the services sector encompassed credit to the tourism industry, transportation as well as professional and financial services (just to name a few). This indicates that the increased liquidity to this sector through loans is likely to increase the spending power of firms for domestic rather than external services. It is possible that this outcome could especially be the case for firms falling under professional and financial services. However, as it relates to the tourism industry, loans to this sector are used to attract tourists and increase capacity either through advertising or investments in hotels and other attractions. Foreign inflows from the increased visitor intake may offset the negative effects of greater spending power from loans to purchase imported goods. Nevertheless, to be certain that this is the case, credit to this sector will have to be analysed in greater detail against the exports and imports of the current account balance.

Overall, the findings indicate that credit distributed across most sectors has a negative impact on the external current account in the long-run. However, unlike the findings in Işık, Yılmaz and Kılınç (2017), the permanent decline shows that credit disbursed to these sectors is not directly linked to increased productivity and exports as a positive relationship did not manifest in the long-run.

In accordance with the literature, the control variables used in this paper had differing but significant impacts on the external current account balance. For one, in the long-run models analysed, there was a positive and significant relationship between the output gap and the current account. This is similar to the findings in Boamah, Jackman and Mamingi (2011) but conflicts with the findings in Downes and Moore (2005). This positive relationship could be indicative that increased output or productivity is translating to an increase in the exportation of goods and services which in turn will lead to an improvement in the current account balance. This was also reinforced by Fayaz and Sandeep (2016), but to be certain, the relationship between income and exports will need to be examined in depth.

Given Barbados' sensitivity to the economic health of international markets, the results show that foreign incomes play a positive and significant role in influencing the current account balance within the country. However, this relationship is only realised in the long-run which is generally in line with the empirical literature (see Craigwell and Samaroo 1997; Boamah, Jackman and Mamingi 2011). Essentially, an increase in the income of Barbados' major trading partners is likely to translate to increased demand for the country's goods and services which will lead to improvements in the external current account. This is especially true as it relates to tourism where increased travel credits have led to significant improvements in the country's current account balance over the years.

Moreover, in accordance with Khan and Knight (1983), the heavy reliance on borrowing from international financial institutions has been proven to have a harmful impact on Barbados' external balance. This is reinforced by the fact that an increase in the cost of borrowing is shown to have an immediate and negative impact on the country's current account as more foreign currency is demanded to settle these external obligations.

Additionally, past changes of the current account balance up to three quarters prior are also likely to negatively affect the current account balance in a given period. This implies that historical patterns of the current account are likely to affect its current value, which can be beneficial for forecasting and policy formulation purposes.

Lastly, in both the short and long-run models estimated, increases in international commodity prices contributed to a worsening of the current account balance. This is expected since Barbados is a price-taker and is also highly dependent on imported goods to satisfy the consumption needs of economic agents within the country. Because of this, increases in international prices can increase the vulnerabilities of the country by making imports more expensive which can have an adverse impact on the country's current account balance. Overall, these results are generally in line with the findings in Aleksandrova (2016), but conflicts with Boamah, Jackman and Mamingi (2011) since those authors did not find a negative and significant relationship between the two variables in the short-run.

7. Conclusion

This paper sought to analyse the relationship between the external current account and the sectoral distribution of credit in Barbados. To facilitate the process, an ARDL bounds testing cointegration approach was employed on quarterly data from 1994 to 2017. In addition to the five credit variables used, a number of control variables were also introduced. The findings indicate that commercial bank loans disbursed to the public sector and households negatively impacts the current account balance in both the long-run and the short-run. However, loans disbursed to the secondary sector and increased holdings of commercial bank government securities seem to only have a short-run and long-run negative effect, respectively. Interestingly, loans distributed to the tertiary sector had no significant impact on the current account balance within the estimated models. Moreover, other influential variables contributing to a deterioration in the current account balance include international prices and foreign interest rates, while increases in the output gap and foreign incomes positively influenced the external balance.

These results can give insights as to how firms and policy makers can craft policies to control persistent current account deficits. For one, the short-run and permanent deterioration of the current account as a result of credit to the public sector suggests that the government should be cautious of accumulating increased domestic expenses and excessive levels of credit. Similarly, authorities should aim to limit any increases in its external debt stock since the associated interest rates can compromise the country's balance of payments position. This is important since a large debt overhang can cripple the economy and the current account, especially if these expenses are not significantly contributing to increased exports or the country's economic growth. Additionally, if left unchecked, an increase in the spending power of households is likely to deplete the foreign reserves of the country through increased imports. As such, there should be policies set in place to curb or limit the level of household borrowing to avoid a worsening of the country's balance of payment position.

Despite loans to the secondary sector displaying only a short-run negative impact on the current account, there should be a concerted effort by firms to find innovative ways to boost production that can cater to external demands. This will have the benefit of earning foreign exchange and by extension, improving the current account balance and economic growth within the country in the long-run.

Moreover, the positive and significant relationship between the current account and foreign incomes suggest that there should be an ongoing effort to diversify the foreign exchange earning products and services of the country. In doing so, the country can seek to target higher income or faster growing economies with its domestically produced goods and services. These can include tourism services, transportation services and the manufacturing of local goods. This will have the effect of boosting the competitiveness of the country by making it a more attractive destination or trading partner for doing business. Additionally, as the country is a price-taker this initiative can counteract the negative impact of increased international prices on the current account. In this instance, increasing the export base of the country will enable these goods and services to capture the higher international prices which will lead to long-term improvements in the current account.

Overall the study has achieved its intended purpose of analysing the relationship between sectoral credit and the external current account balance in depth. However, a limitation of the study is that it did not analyse the impact that excessive Central Bank credit to government can have on the current

account. This is important because Central Bank financing has been noted to increase the money supply which can have a negative impact on the current account balance. Additionally, data limitations hindered the inclusion of variables which measures the competitiveness of the country within the study.

Nevertheless, areas of further research can include Granger causality tests to determine the relationship between income and exports which can give insights into whether this link leads to improvements in the current account for Barbados. Secondly, the current account can be disaggregated by imports and exports and separate models can be estimated to determine which credit variables are driving the relationship between these variables. There is also need to carefully analyse the impact of foreign interest rates on the net income balance of the current account. Lastly, a comparative study between developed and developing countries can be conducted to determine if the distribution of credit has differing effects on the current account in these countries.

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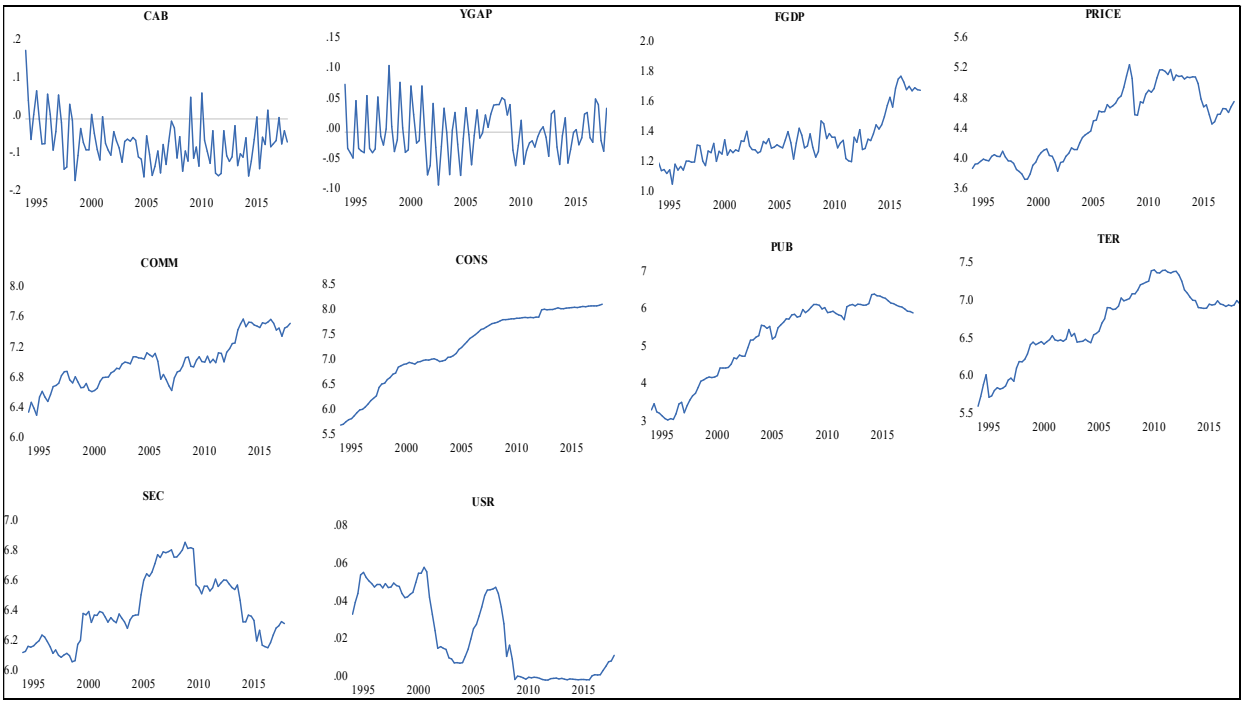
9. Appendices

Appendix A

Table A. 1: Correlation Matrix

	CAB	COMM	CONS	FGDP	PRICE	PUB	SEC	TER	USR	YGAP
CAB	1. 000	-0. 302	-0. 384	-0. 104	-0. 328	-0. 389	-0. 314	-0. 402	0. 236	0. 479
COMM		1. 000	0. 825	**0. 771**	0. 640	0. 793	0. 138	0. 634	**-0. 807**	-0. 085
CONS			1. 000	**0. 713**	**0. 834**	0. 968	0. 561	0. 937	**-0. 773**	0. 017
FGDP				1. 000	0. 368	0. 660	0. 023	0. 505	-0. 569	0. 081
PRICE					1. 000	**0. 842**	0. 680	**0. 859**	-0. 682	0. 012
PUB						1. 000	0. 623	0. 918	**-0. 807**	-0. 007
SEC							1. 000	0. 701	-0. 299	0. 076
TER								1. 000	**-0. 733**	-0. 011
USR									1. 000	0. 139
YGAP										1. 000

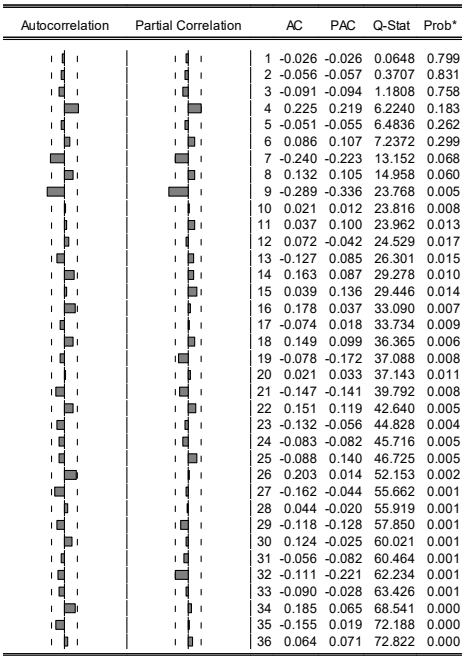
Figure A. 1: Graphs of Variables



Appendix B

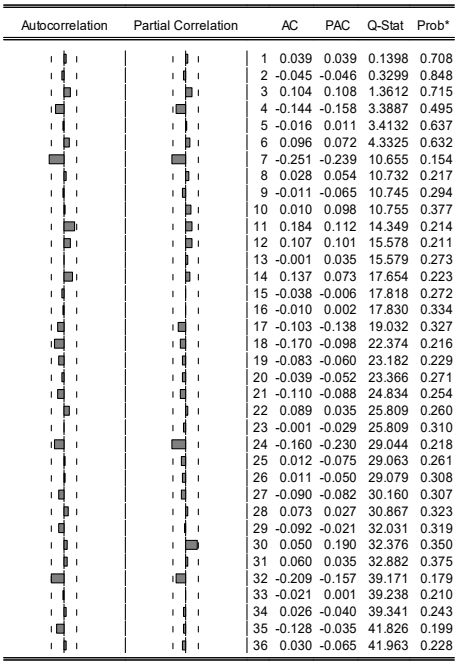
Figure B. 1: Correlogram of Residuals Q-statistic Probabilities

COMM Model



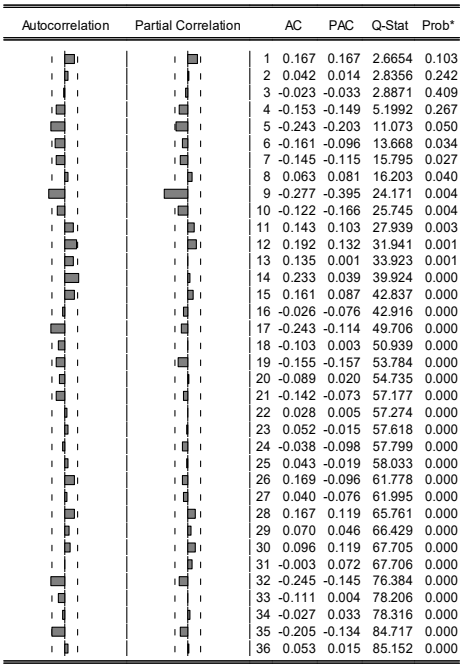
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.026	-0.026	0.0648	0.799
		2	-0.056	-0.057	0.3707	0.831
		3	-0.091	-0.094	1.1808	0.758
		4	0.225	0.219	6.2240	0.183
		5	-0.051	-0.055	6.4836	0.262
		6	0.086	0.107	7.2372	0.299
		7	-0.240	-0.223	13.152	0.068
		8	0.132	0.105	14.958	0.060
		9	-0.289	-0.336	23.768	0.005
		10	0.021	0.012	23.816	0.008
		11	0.037	0.100	23.962	0.013
		12	0.072	-0.042	24.529	0.017
		13	-0.127	0.085	26.301	0.015
		14	0.163	0.087	29.278	0.010
		15	0.039	0.136	29.446	0.014
		16	0.178	0.037	33.090	0.007
		17	-0.074	0.018	33.734	0.009
		18	0.149	0.099	36.365	0.006
		19	-0.078	-0.172	37.088	0.008
		20	0.021	0.033	37.143	0.011
		21	-0.147	-0.141	39.792	0.008
		22	0.151	0.119	42.640	0.005
		23	-0.132	-0.056	44.828	0.004
		24	-0.083	-0.082	45.716	0.005
		25	-0.088	0.140	46.725	0.005
		26	0.203	0.014	52.153	0.002
		27	-0.162	-0.044	55.662	0.001
		28	0.044	-0.020	55.919	0.001
		29	-0.118	-0.128	57.850	0.001
		30	0.124	-0.025	60.021	0.001
		31	-0.056	-0.082	60.464	0.001
		32	-0.111	-0.221	62.234	0.001
		33	-0.090	-0.028	63.426	0.001
		34	0.185	0.065	68.541	0.000
		35	-0.155	0.019	72.188	0.000
		36	0.064	0.071	72.822	0.000

CONS Model



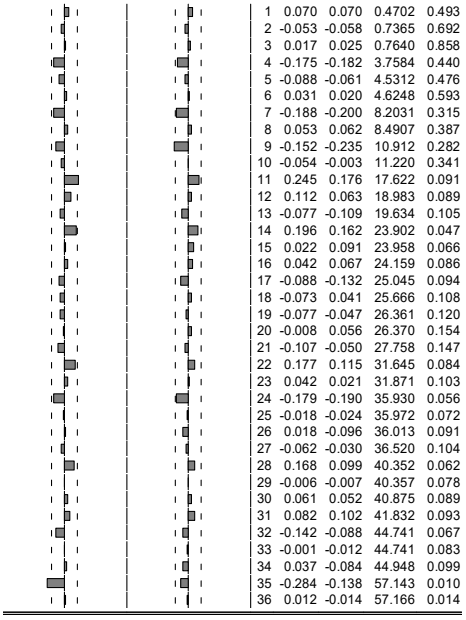
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.039	0.039	0.1398	0.708
		2	-0.045	-0.046	0.3299	0.848
		3	0.104	0.108	1.3612	0.715
		4	-0.144	-0.158	3.3887	0.495
		5	-0.016	0.011	3.4132	0.637
		6	0.096	0.072	4.3325	0.632
		7	-0.251	-0.239	10.655	0.154
		8	0.028	0.054	10.732	0.217
		9	-0.011	-0.065	10.745	0.294
		10	0.010	0.098	10.755	0.377
		11	0.184	0.112	14.349	0.214
		12	0.107	0.101	15.578	0.211
		13	-0.001	0.035	15.579	0.273
		14	0.137	0.073	17.654	0.223
		15	-0.038	-0.006	17.818	0.272
		16	-0.010	0.002	17.830	0.334
		17	-0.103	-0.138	19.032	0.327
		18	-0.170	-0.098	22.374	0.216
		19	-0.083	-0.060	23.182	0.229
		20	-0.039	-0.052	23.366	0.271
		21	-0.110	-0.088	24.834	0.254
		22	0.089	0.035	25.809	0.260
		23	-0.001	-0.029	25.809	0.310
		24	-0.160	-0.230	29.044	0.218
		25	0.012	-0.075	29.063	0.261
		26	0.011	-0.050	29.079	0.308
		27	-0.090	-0.082	30.160	0.307
		28	0.073	0.027	30.867	0.323
		29	-0.092	-0.021	32.031	0.319
		30	0.050	0.190	32.376	0.350
		31	0.060	0.035	32.882	0.375
		32	-0.209	-0.157	39.171	0.179
		33	-0.021	0.001	39.238	0.210
		34	0.026	-0.040	39.341	0.243
		35	-0.128	-0.035	41.826	0.199
		36	0.030	-0.065	41.963	0.228

PUB Model



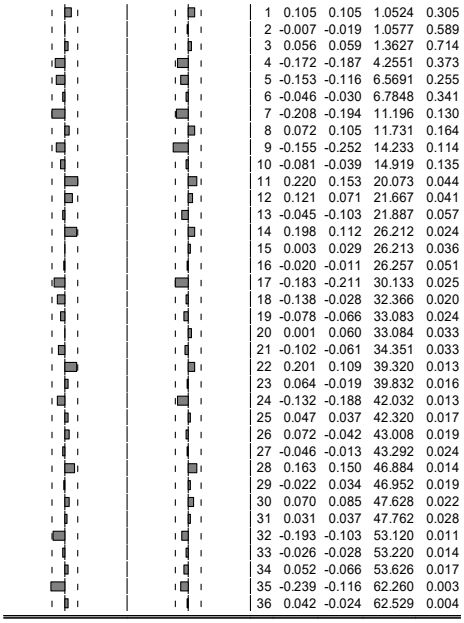
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.167	0.167	2.6654	0.103
		2	0.042	0.014	2.8356	0.242
		3	-0.023	-0.033	2.8871	0.409
		4	-0.153	-0.149	5.1992	0.267
		5	-0.243	-0.203	11.073	0.050
		6	-0.161	-0.096	13.668	0.034
		7	-0.145	-0.115	15.795	0.027
		8	0.063	0.081	16.203	0.040
		9	-0.277	-0.395	24.171	0.004
		10	-0.122	-0.166	25.745	0.004
		11	0.143	0.103	27.939	0.003
		12	0.192	0.132	31.941	0.001
		13	0.135	0.001	33.923	0.001
		14	0.233	0.039	39.924	0.000
		15	0.161	0.087	42.837	0.000
		16	-0.026	-0.076	42.916	0.000
		17	-0.243	-0.114	49.706	0.000
		18	-0.103	0.003	50.939	0.000
		19	-0.155	-0.157	53.784	0.000
		20	-0.089	0.020	54.735	0.000
		21	-0.142	-0.073	57.177	0.000
		22	0.028	0.005	57.274	0.000
		23	0.052	-0.015	57.618	0.000
		24	-0.038	-0.098	57.799	0.000
		25	0.043	-0.019	58.033	0.000
		26	0.169	-0.096	61.778	0.000
		27	0.040	-0.076	61.995	0.000
		28	0.167	0.119	65.761	0.000
		29	0.070	0.046	66.429	0.000
		30	0.096	0.119	67.705	0.000
		31	-0.003	0.072	67.706	0.000
		32	-0.245	-0.145	76.384	0.000
		33	-0.111	0.004	78.206	0.000
		34	-0.027	0.033	78.316	0.000
		35	-0.205	-0.134	84.717	0.000
		36	0.053	0.015	85.152	0.000

SEC Model



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.070	0.070	0.4702	0.493
		2	-0.053	-0.058	0.7365	0.692
		3	0.017	0.025	0.7640	0.858
		4	-0.175	-0.182	3.7584	0.440
		5	-0.088	-0.061	4.5312	0.476
		6	0.031	0.020	4.6248	0.593
		7	-0.188	-0.200	8.2031	0.315
		8	0.053	0.062	8.4907	0.387
		9	-0.152	-0.235	10.912	0.282
		10	-0.054	-0.003	11.220	0.341
		11	0.245	0.176	17.622	0.091
		12	0.112	0.063	18.983	0.089
		13	-0.077	-0.109	19.634	0.105
		14	0.196	0.162	23.902	0.047
		15	0.022	0.091	23.958	0.066
		16	0.042	0.067	24.159	0.086
		17	-0.088	-0.132	25.045	0.094
		18	-0.073	0.041	25.666	0.108
		19	-0.077	-0.047	26.361	0.120
		20	-0.008	0.056	26.370	0.154
		21	-0.107	-0.050	27.758	0.147
		22	0.177	0.115	31.645	0.084
		23	0.042	0.021	31.871	0.103
		24	-0.179	-0.190	35.930	0.056
		25	-0.018	-0.024	35.972	0.072
		26	0.018	-0.096	36.013	0.091
		27	-0.062	-0.030	36.520	0.104
		28	0.168	0.099	40.352	0.062
		29	-0.006	-0.007	40.357	0.078
		30	0.061	0.052	40.875	0.089
		31	0.082	0.102	41.832	0.093
		32	-0.142	-0.088	44.741	0.067
		33	-0.001	-0.012	44.741	0.083
		34	0.037	-0.084	44.948	0.099
		35	-0.284	-0.138	57.143	0.010
		36	0.012	-0.014	57.166	0.014

TER Model



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	0.105	0.105	1.0524	0.305
		2	-0.007	-0.019	1.0577	0.589
		3	0.056	0.059	1.3627	0.714
		4	-0.172	-0.187	4.2551	0.373
		5	-0.153	-0.116	6.5691	0.255
		6	-0.046	-0.030	6.7848	0.341
		7	-0.208	-0.194	11.196	0.130
		8	0.072	0.105	11.731	0.164
		9	-0.155	-0.252	14.233	0.114
		10	-0.081	-0.039	14.919	0.135
		11	0.220	0.153	20.073	0.044
		12	0.121	0.071	21.667	0.041
		13	-0.045	-0.103	21.887	0.057
		14	0.198	0.112	26.212	0.024
		15	0.003	0.029	26.213	0.036
		16	-0.020	-0.011	26.257	0.051
		17	-0.183	-0.211	30.133	0.025
		18	-0.138	-0.028	32.366	0.020
		19	-0.078	-0.066	33.083	0.024
		20	0.001	0.060	33.084	0.033
		21	-0.102	-0.061	34.351	0.033
		22	0.201	0.109	39.320	0.013
		23	0.064	-0.019	39.832	0.016
		24	-0.132	-0.188	42.032	0.013
		25	0.047	0.037	42.320	0.017
		26	0.072	-0.042	43.008	0.019
		27	-0.046	-0.013	43.292	0.024
		28	0.163	0.150	46.884	0.014
		29	-0.022	0.034	46.952	0.019
		30	0.070	0.085	47.628	0.022
		31	0.031	0.037	47.762	0.028
		32	-0.193	-0.103	53.120	0.011
		33	-0.026	-0.028	53.220	0.014
		34	0.052	-0.066	53.626	0.017
		35	-0.239	-0.116	62.260	0.003
		36	0.042	-0.024	62.529	0.004

Appendix C

Figure C. 1: COMM Model CUSUM and CUSUM of Squares

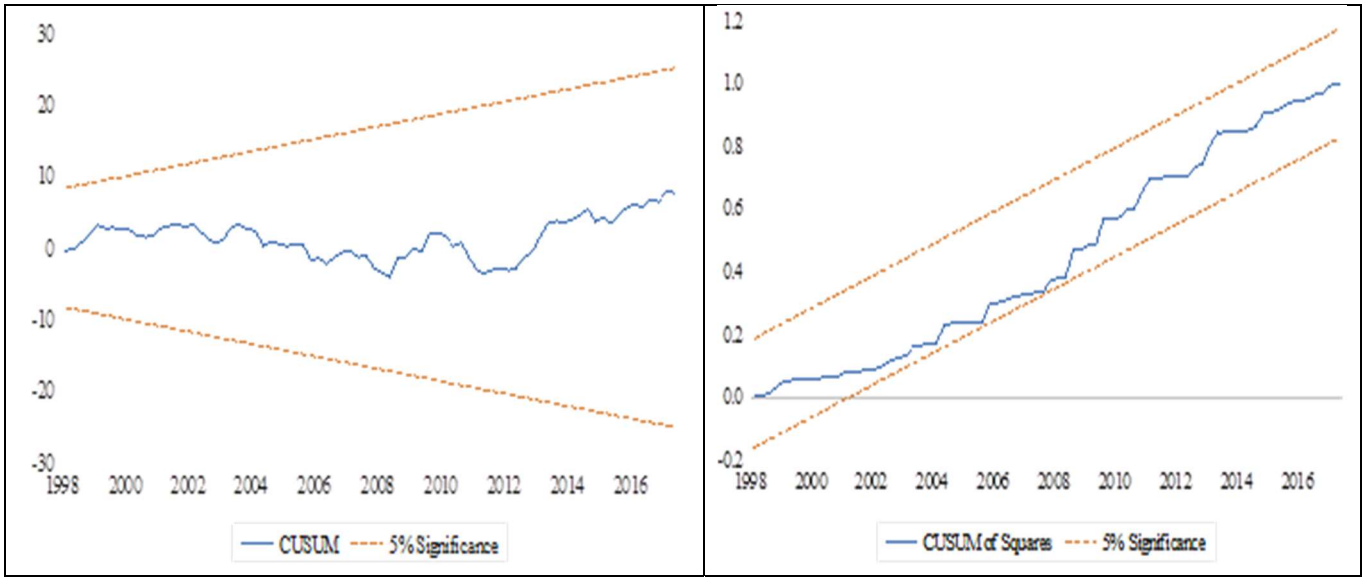
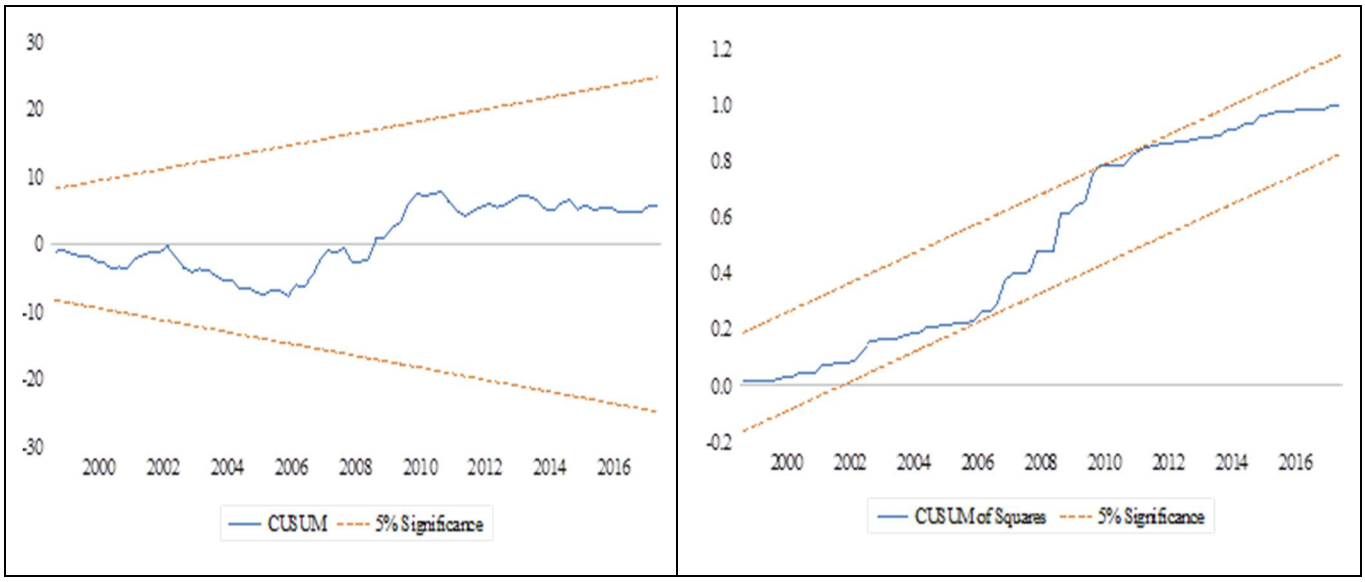


Figure C. 2: CONS Model CUSUM and CUSUM of Squares



Appendix C (Continued)

Figure C. 3: PUB Model CUSUM and CUSUM of Squares

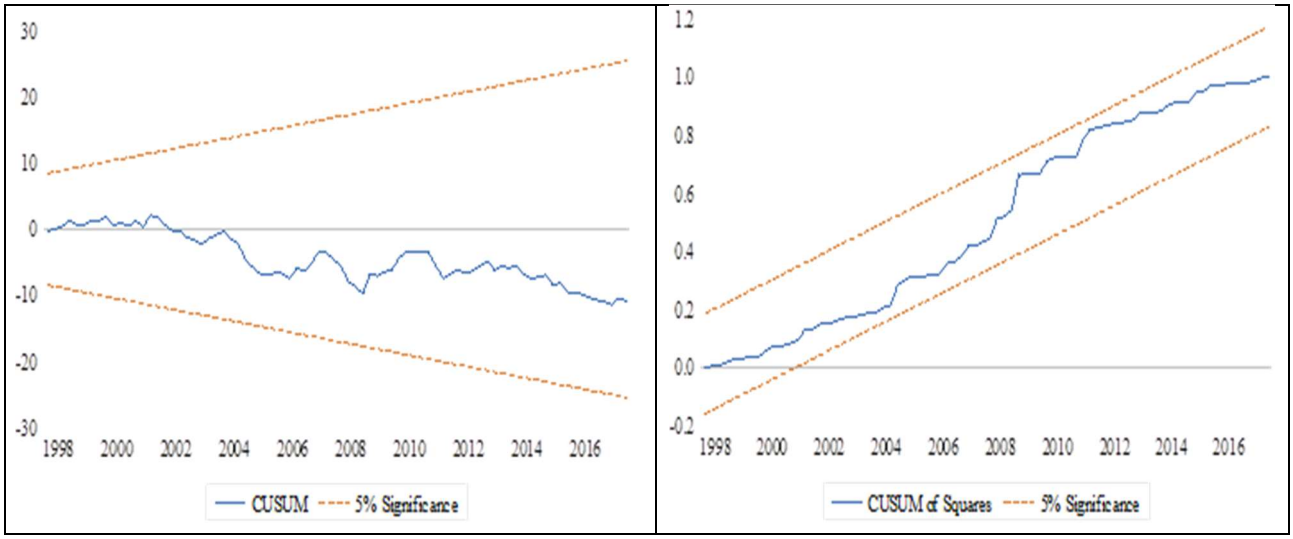
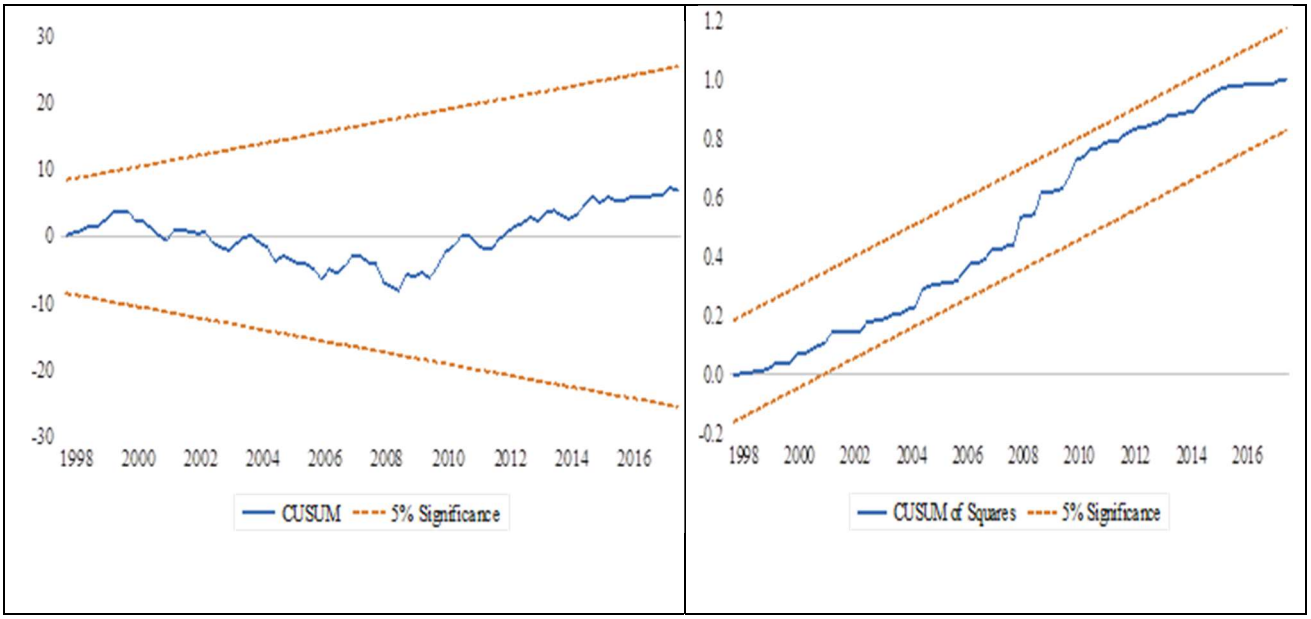
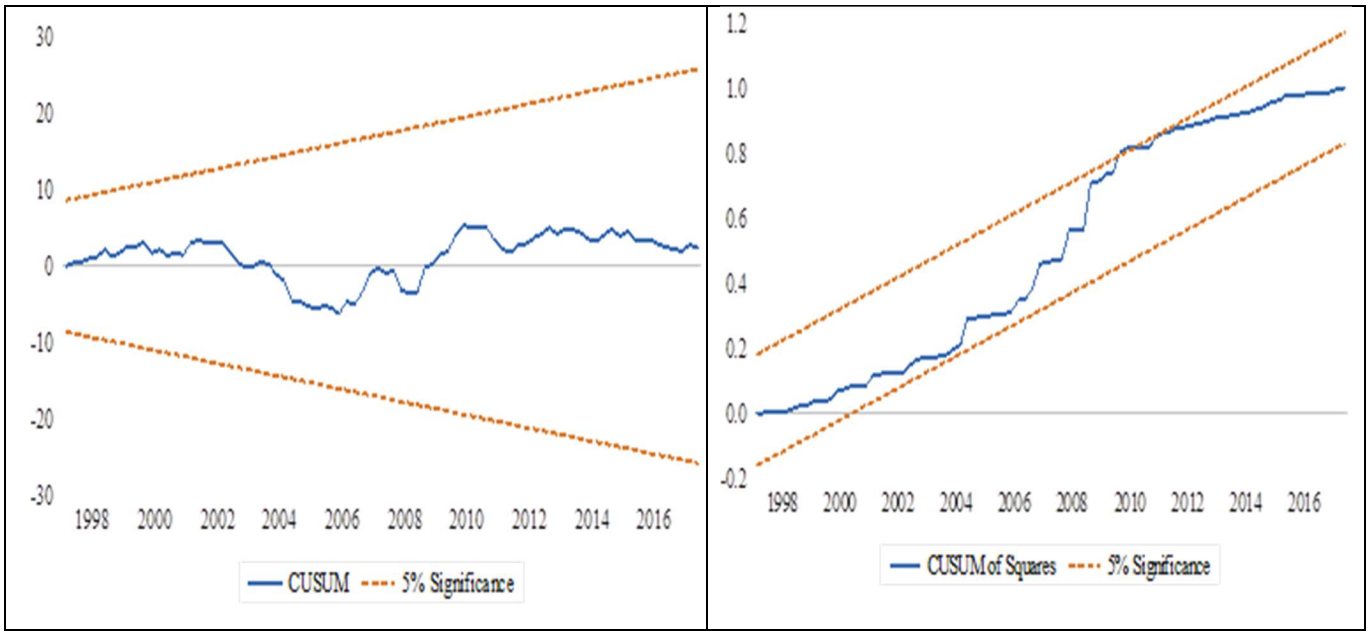


Figure C. 4: SEC Model CUSUM and CUSUM of Squares



Appendix C (Continued)

Figure C. 5: TER Model CUSUM and CUSUM of Squares



Appendix D

Figure D. 1: COMM ARDL Model AIC Criteria Graph (top 20 models)

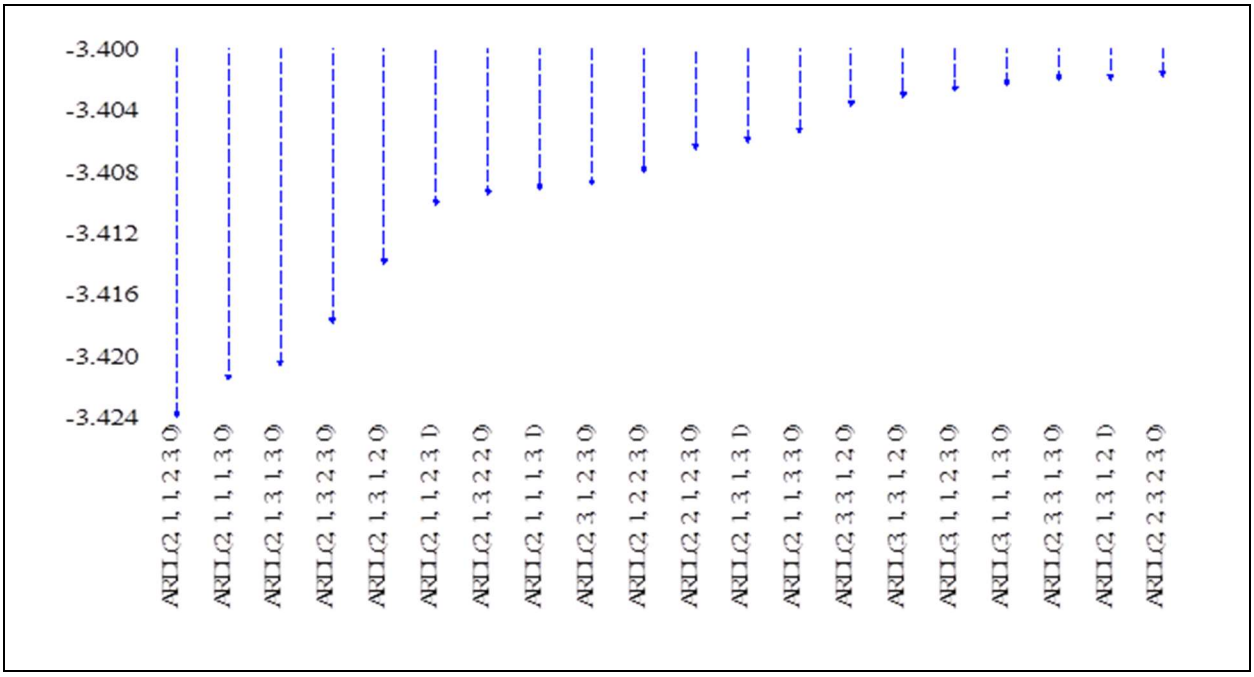


Figure D. 2: CONS ARDL Model AIC Criteria Graph (top 20 models)

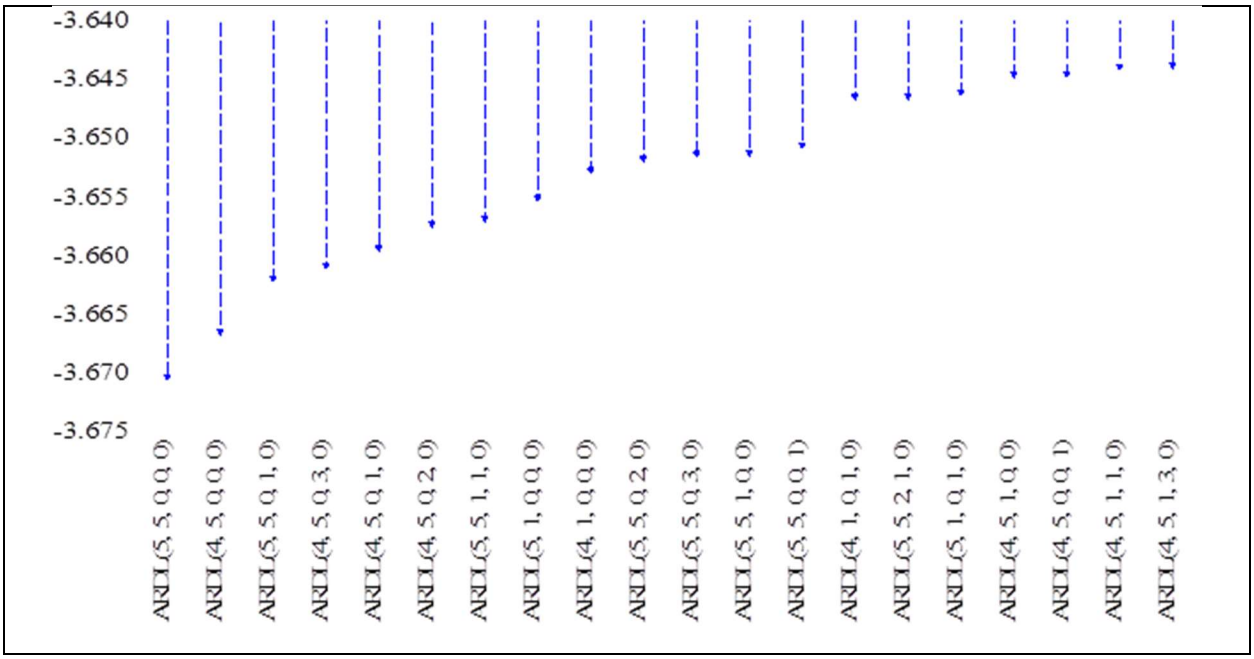


Figure D. 3: PUB ARDL Model AIC Criteria Graph (top 20 models)

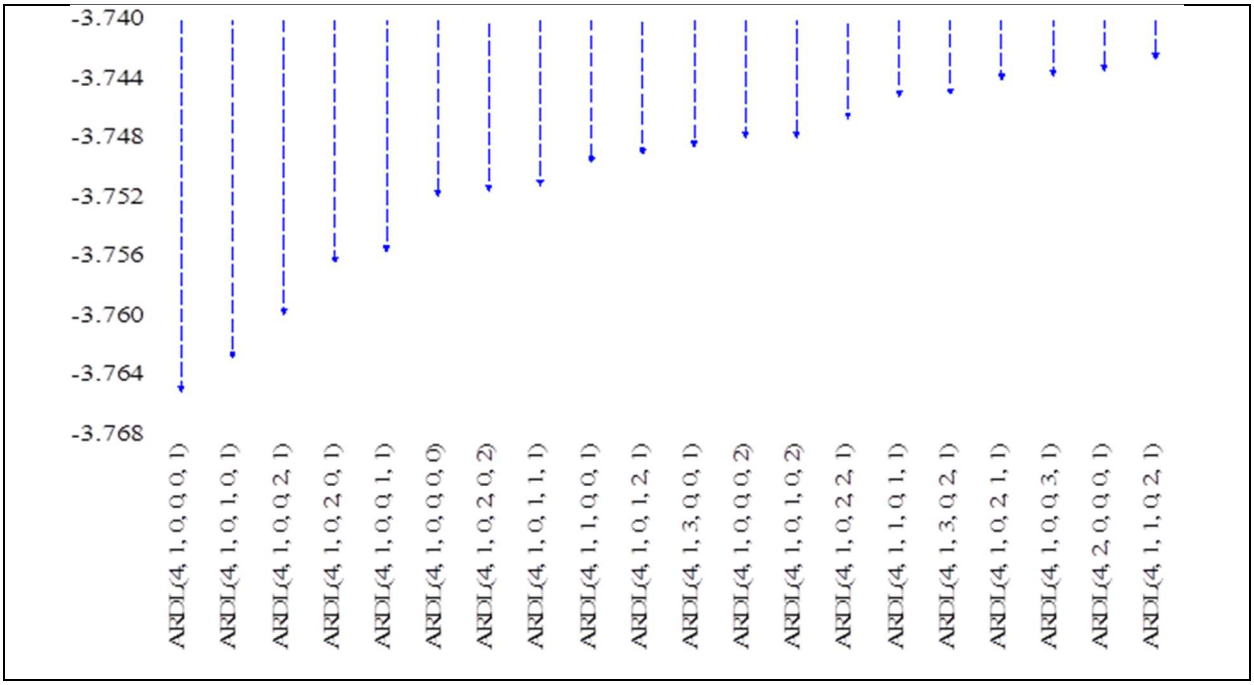


Figure D. 4: SEC ARDL Model AIC Criteria Graph (top 20 models)

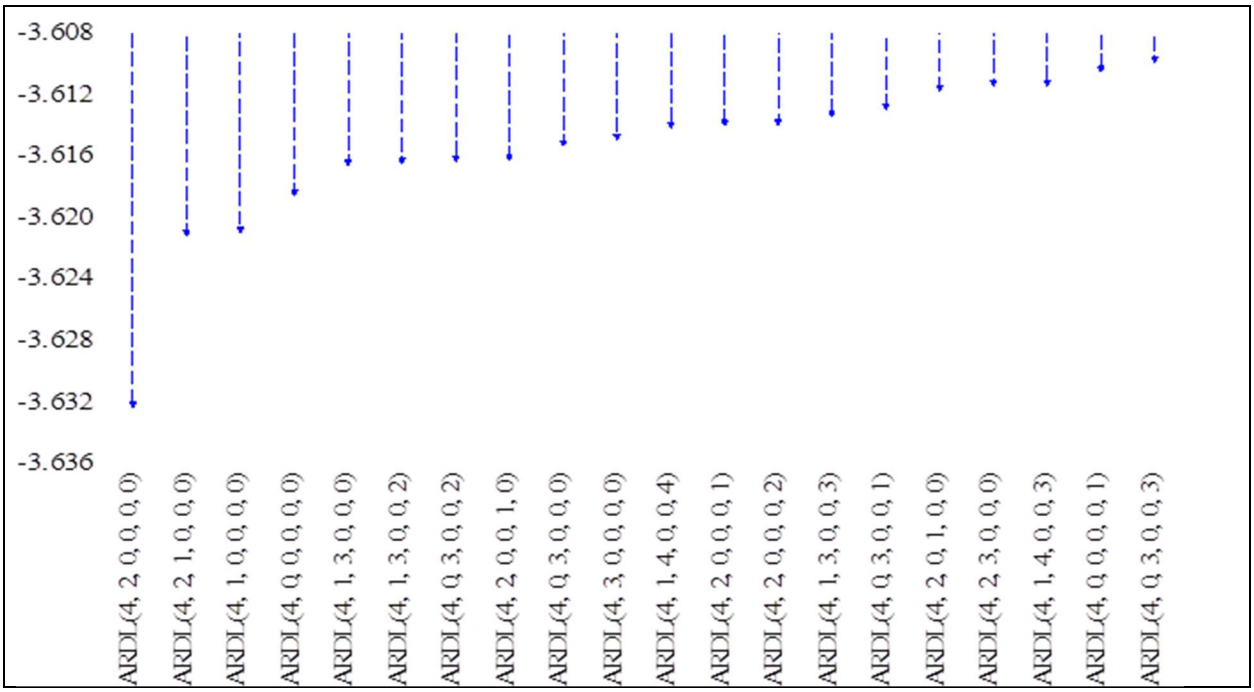


Figure D. 5: TER ARDL Model AIC Criteria Graph (top 20 models)