



UNISA ECONOMIC RESEARCH WORKING PAPER SERIES

The determinants of import demand in South Africa: An empirical investigation

Nomfundo P. Vacu

Nicholas M. Odhiambo

Working Paper 12/2018

May 2018

Nomfundo P. Vacu

Department of Economics

University of South Africa

P. O. Box 392, UNISA

0003, Pretoria

South Africa

Emails: n.vacu@yahoo.com

Nicholas M. Odhiambo

Department of Economics

University of South Africa

P. O. Box 392, UNISA

0003, Pretoria

South Africa

Emails: odhianm@unisa.ac.za /

nmbaya99@yahoo.com

UNISA Economic Research Working Papers constitute work in progress. They are papers that are under submission or are forthcoming elsewhere. They have not been peer-reviewed; neither have they been subjected to a scientific evaluation by an editorial team. The views expressed in this paper, as well as any errors, omissions or inaccurate information, are entirely those of the author(s). Comments or questions about this paper should be sent directly to the corresponding author.

The determinants of import demand in South Africa: An empirical investigation

Nomfundo P. Vacu¹ and Nicholas M. Odhiambo²

Abstract

This study investigates the determinants of import demand in South Africa from 1985 to 2015, using the autoregressive distributed-lag estimation approach. Unlike some previous studies that used a single model, the study uses four models, incorporating both the aggregate and disaggregated import demand. The study employs exports of goods and services, gross national income, investment spending, relative import price, consumer spending, government spending, and a dummy for trade liberalisation policy as independent variables. The empirical results suggest that the elasticity of import demand varies for each of these variables and depends on the import category used as a dependant variable. The long-run findings show that aggregate import demand is positively determined by trade liberalisation policy, investment spending, and gross national income. Import demand for consumer goods and import demand for capital goods appear to be positively associated with gross national income and trade liberalisation policy, while import demand for intermediate goods is positively determined by trade liberalisation policy. In the short run, the results suggest that aggregate import demand is positively determined by gross national income, investment spending, and consumer spending, but negatively determined by government spending. Import demand for consumer goods is positively associated with gross national income and trade liberalisation policy, while import demand for intermediate goods is positively determined by investment spending, trade liberalisation policy and consumer goods, but negatively determined by exports of goods and services and relative import price. Finally, import demand for capital goods is found to be positively and negatively determined by gross national income and investment spending, respectively.

Key words: ARDL Approach, Import demand, South Africa

¹ Corresponding author [Nomfundo P. Vacu]; Department of Economics, University of South Africa, P.O. Box 392, UNISA 0003, Pretoria, South Africa. Email: n.vacu@yahoo.com

²Professor; Department of Economics, University of South Africa, P.O. Box 392, UNISA 0003 Pretoria, South Africa. Email: odhianm@unisa.ac.za

JEL Classification Code: F1

1. Introduction

Emerging studies in the field of international economics are devoted to understanding the elasticity of import demand in developing countries (see Butts and Mitchell, 2012). This is because the behaviour of import demand has macroeconomic policy implications since imports play an important role in economic development (Aljebrin and Ibrahim, 2012). Every country strives to benefit from international trade in order to develop its economy. South Africa is not different, as the country is involved in international trade, predominantly on the importing side.

Over the past years, South Africa has been persistently recording trade deficits and negative current account balances, and has been highly dependent on imports. During the period from 2010 to 2016, imports as a percentage of GDP remained significant at an annual average of 30.1% (World Bank, 2016). In addition, the imports in this country have been growing faster than exports. The former had been growing at an average rate of 3%, while the latter grew at 1% (International Monetary Fund, 2015). Estimates from the World Bank (2015) show that in some years imports in South Africa had been growing at a rate that is higher than the world's imports growth rate. This is a disquieting trend, considering that the country has implemented trade liberalisation policies in an effort to mend its trade balance and balance of payments.

In light of this, the study carries out a thorough examination of the determinants of aggregate and disaggregated import demand. Understanding this would enable policy makers to predict deviations on balance of payments and terms of trade, and assist them when deciding on short-run and long-run development strategies and trade-related policies, including import demand management policy. A thorough understanding of imports behaviour would also give a clear picture of a country's foreign regime (Afzal, 2007).

The rest of the paper is organised as follows: Section 2 provides theoretical and empirical literature on import demand. Section 3 presents the model specifications and the econometric methodology used in the study. Empirical results are presented in Section 4. Section 5 concludes the paper.

2. Literature Review

2.1. Theoretical Literature

In literature, the major theories explaining the import demand function include the imperfect substitution theory, Keynesian theory, neo-classical theory, Monetarist theory and the production theory. These theories emphasise the role of income, price and exchange rates in the determination of trade (Hong, 1999). The imperfect substitution theory, also known as the new trade theory, was developed in the early 1980s by Paul Krugman. According to this theory, the link between income and import demand goes beyond the purchasing power effect. It emphasises the assumption of differentiated goods, economies of scale and monopolistic competition (Bathalomew, 2010). The theory assumes that imports and exports are not perfect substitutes and explains the role of income in determining the volume of imports at a more disaggregated level (Shuaibu and Fatai, 2014).

The Keynesian approach, developed by Keynes *et al.* (1952), emphasises the importance of goods and services for balance of payments. It comprises three theories: the Absorption theory, Elasticity theory and Keynesian Multiplier approach. The Absorption theory proposed by Alexander (1952) focuses on macroeconomic factors affecting a country's current account. The Elasticity approach, also known as the J-Curve, puts more emphasis on the impact of real devaluation of exchange rates on balance of trade depending on the demand and supply of foreign exchange and foreign goods (Duasa, 2005). The Keynesian Multiplier approach is based on the macroeconomic multiplier analysis (Bathalomew, 2010). It explains the import demand as a function of income and price, while assuming that employment is variable and capital movements are adjustable (Englama *et al.*, 2013).

The Neoclassical theory is associated with the Heckscher Ohlin (H-O) framework, which was developed based on the work of Ricardo (1817). It assumes that countries differ by factors of production, therefore they import goods for which they have least factor endowment (Englama *et al.*, 2013).

The Monetarist theory emphasises the need to analyse the trade balance from the monetary demand and supply point of view. It perceives balance of payment as a monetarist phenomenon and argues that disequilibrium in the balance of payments can be eliminated through an adroit manipulation of monetary variables, especially domestic credit, under fixed exchange rate, absence of sterilization by the monetary authorities, and stable demand for money function (Akpansung, 1998, cited in Akpansung (2013)).

2.2. Empirical Literature

A significant amount of empirical work has been carried out in an attempt to examine the determinants of import demand, in developed and developing countries. Pattichis (1999) estimated the price and income elasticities of disaggregated import demand for Cyprus, using annual time series data covering the period from 1975 to 1994. To estimate this, the study employed the bounds test, and the results suggested that relative import price and income are the major determinants of import demand.

Similarly, Egwakhide (1999) examined the determinants of import demand in Nigeria using the ordinary least squares and error correction method on a time series data covering the period from 1953 to 1989. The study modelled import demand as a function of income and relative import price, and the results showed that relative import price is the major determinant of import demand in Nigeria. Rijal *et al.* (2000) also examined the determinants of import demand in Nepal using Johansen's co-integration method on a time series data covering the period from 1968 to 1997. The study specified import demand as a function of relative import price levels, domestic price levels and gross domestic product (GDP) as a measure of income. The findings revealed that income is the main determinant of import demand in Nepal, in the long run as well as the short run. Furthermore, it was found that Nepal's import demand is less responsive to changes in relative import price and cross-prices. It is also worth noting is that Nepal's import demand responds mostly to general price changes than it responds to import price.

A similar study by Mah (2000) for Korea used the bounds test to examine the determinants of import demand for information technology products over the period from 1980 to 1997. The study specified import demand as a function of relative import price and income. The results showed that the impact of income is insignificant, while the relative import price is the most significant factor. Anaman *et al.* (2001) also studied the determinants of aggregate import demand for Brunei Darussalam over the period from 1964 and 1997. The study modelled import demand as a function of real effective exchange rate, real GDP and population. Findings from the ordinary least squares suggested that all of the specified determinants have a significant impact on import demand. However, population appeared to be the most influential determinants of import demand.

Tang (2002) re-assessed aggregate import demand behaviour for Indonesia using the bounds test and data for period from 1960 to 1999. To empirically estimate the Indonesian import demand function, the study adopted the traditional theory of import demand as a function of GDP and relative import price computed as a ratio of imports price index to domestic price

index. This was done with the assumption that other variables can be incorporated in the two variables. The results confirmed stability in import demand function for Indonesia in the short run. In the long run, income has been found to have a positive and significant effect on import demand.

Masih and Masih (2000) used Johansen's multivariate co-integration procedure and quarterly time series data for the period from 1974:1 to 1989:2 to re-assess long-run elasticities of Japanese's import demand. The study expressed the import demand as a function of relative import price and real income. The results show that there is a long-run relationship between import demand and these variables. Furthermore, the study concluded that, in the long run, both relative import price and income have a significant impact on import demand and are major determinants of import demand.

Similarly, Chinn (2003) tested the existence of a relationship between import demand and its determinants for the United States of America over the period from 1975 to 2001. The study tested this using Johansen's co-integration approach, and the results showed that exchange rates and real income have no significant impact on import demand. Using the bounds test approach, Bahamani and Kara (2003) estimated the import demand function for nine industrial countries, that is, Australia, Austria, Canada, France, Germany, Denmark, Italy, Japan and the USA. The study covered the period from 1973Q1 to 1998Q2. In the long run, income was found to have a significant influence on import demand

3. Methodology

3.1. Model Specification

The analytical framework for import demand is underpinned by three theories, namely, the imperfect substitution theory, Neo-classical theory, and Keynesian theories. These theories together prescribe the national income and relative import price as major determining factors of import demand. Under the imperfect substitution theory, the assumption underlying the prescribed influence of income and prices on import demand is that imports and domestic products are not perfect substitutes (see Abrishami and Mehrara, 2002). This is in line with the argument in the conventional microeconomic theory, where a rational consumer is assumed to maximise utility subject to a budget constraint (see Barker, 1987). The importance of relative import price for import demand is underscored in the Neo-classical theory (Bathalomew, 2010). Under this theory, there is no emphasis on the effects of income on imports, because the theory assumes a fixed level of employment, and full and efficient employment of resources

(Cakmak *et al.*, 2016). In contrast to the Neo-classical theory, the Keynesian theory assumes constant prices and variable income. It emphasises the importance of income for import demand (Bartholomew, 2010). The specification of the import demand model in these theories is in line with the traditional import demand model. According to Gafar (1988) and Tang (2002), the traditional model is given as follows:

$$IMD_t = f(Y_t, RP_t) \dots \dots \dots (1)$$

Where IMD is the import demand, Y is the national income for the importing county, and RP represents relative import price.

In the traditional model, all other variables are sub-modelled within the national income and relative import price variables (Tang 2003 and Hong 1999, cited in Bathalomew, 2010). However, the modern literature presents a different approach, where additional explanatory variables are included (see Bathalomew, 2010; Narayan and Narayan, 2005; Dutt and Ahmend, 2004; Anaman *et al.*, 2001; Butt and Mitchel, 2012; Modeste, 2011; Omoke, 2012, among others). The additional variables in this study include investment spending, consumer spending, government spending, exports of goods and services and a dummy variable for trade liberalisation policy. Literature suggests that these variables have different patterns, and different import contents (see Chani and Chaudhary, 2012). Also, a model that also incorporates different components of national income has better forecasting powers than the standard import demand models (Narayan and Narayan, 2005).

The importance of relative import price (RP) in determining import demand is justified in empirical and theoretical literature (Sinha, 1997; Egwakhide, 1999; Rijal *et al.*, 2000). In literature, this variable is measured through import price as a share of domestic price (see Rijal *et al.*, 2000; Mah, 2000). However, because the data for this variable is not readily available, the study follows Anaman and Buffong (2001), and employs real effective exchange rate as a proxy for relative import price. The coefficient of this variable is expected to be negative. National income in this study is measured through real growth rate of gross national income (GNI). This variable is widely used in empirical literature and the coefficient of this variable is expected to be positive (see Chimobi and Ogbonna, 2008; Chen, 2008; Hye and Mashkoor, 2010) among others. Investment spending (INV) is measured through gross fixed capital formation. This variable has been used in empirical studies such as Bathalomew (2010) and Modeste (2011), and has been found to have a significant and positive effect on import demand. Consumer spending (CE) and government spending (GE) are measured as total private

spending and total public spending, respectively. These variables have been used in studies such as Omoke (2012); Budha (2014) among others, and are expected to have a positive effect on import demand.

Exports of goods and services (EX) are measured through spending on exports of goods and services. Literature suggests that this variable is an important determinant of import demand (see Modeste, 2011; Budha, 2014) among others. EX is expected to have a positive effect on import demand.

Trade liberalisation policy is measured through a dummy, where 1 represents a period where there was an import policy change, while zero is used where there was no import policy change. The relationship between import demand and trade liberalisation policy change has been tested by many, and it has been found that the elimination of import policy distortion has a positive effect on import demand (see Santos-Paulino, 2002; Hoque and Yusop, 2010). The coefficient of trade liberalisation policy is therefore expected to be positive.

In this study, both the aggregate and disaggregated import demand functions for South Africa are estimated. Modelling only the aggregated demand function for imports can be misleading, as different types of imports may behave differently (Abrishami and Mehrara, 2002; Tennakoon, 2010). The disaggregated import demand function in this study is classified into three groups, namely, import demand for consumer goods, import demand for intermediate goods, and import demand for capital goods. Following Bartholomew (2010), Narayan and Narayan (2005), Modeste (2011), Yahia (2015), Dutt and Ahmend (2004), Anaman *et al.* (2001), and Butt and Mitchel (2012), the four models are specified as follows:

Model 1: Determinants of Aggregate Import Demand for Goods and Services

$$AIMD = f(GNI\ INV\ EX\ RP\ GE\ CE\ TL) \dots\dots\dots (2)$$

Model 2: Determinants of Import Demand for Consumer Goods and Services

$$IMDCON=f(GNI\ INV\ EX\ RP\ GE\ CE\ TL) \dots\dots\dots (3)$$

Model 3: Determinants of Import Demand for Intermediate Goods and Services

$$IMDINT=f(GNI\ INV\ EX\ RP\ GE\ CE\ TL) \dots\dots\dots (4)$$

Model 4: Determinants of Import Demand for Capital Goods and Services

$$IMDCP=f(GNI\ INV\ EX\ RP\ GE\ CE\ TL) \dots\dots\dots (5)$$

The econometric form of the model is expressed in a log form as:

Model 1: Determinants of Aggregate Import Demand for Goods and Services

$$LAIMD_t = \alpha_0 + \beta_1 LGNI_t + \beta_2 LINV_t + \beta_3 LEX_t + \beta_4 LRP_t + \beta_5 CE_t + \beta_6 GE_t + \beta_7 TL_t + \varepsilon_t \dots \dots \dots (7)$$

Model 2: Determinants of Import Demand for Consumer Goods and Services

$$LIMDCON_t = \alpha_0 + \beta_1 LGNI_t + \beta_2 LINV_t + \beta_3 LEX_t + \beta_4 LRP_t + \beta_5 CE_t + \beta_6 GE_t + \beta_7 TL_t + \varepsilon_t \dots \dots \dots (8)$$

Model 3: Determinants of Import Demand for Intermediate Goods and Services

$$LIMDINT_t = \alpha_0 + \beta_1 LGNI_t + \beta_2 LINV_t + \beta_3 LEX_t + \beta_4 LRP_t + \beta_5 CE_t + \beta_6 GE_t + \beta_7 TL_t + \varepsilon_t \dots \dots \dots (9)$$

Model 4: Determinants of Import Demand for Capital Goods and Services

$$LIMDCP_t = \alpha_0 + \beta_1 LGNI_t + \beta_2 LINV_t + \beta_3 LEX_t + \beta_4 LRP_t + \beta_5 CE_t + \beta_6 GE_t + \beta_7 TL_t + \varepsilon_t \dots \dots \dots (10)$$

Where AIMD is the aggregate import demand, IMDCON is the import demand for consumer goods, IMDINT is the import demand for intermediate goods, IMDCP is the import demand for capital goods, GNI is gross national income, INV is the investment expenditure, EX is the exports of goods and services, RP is the relative import price, CE is the consumer spending, GE is government spending, TL represents trade liberalisation policy dummy, *L* is the natural log and ε_t is white noise error term.

3.2. The Autoregressive Distributed Lag Bounds Testing Approach

To empirically examine the relationship between import demand and its determinants, the study employs the autoregressive distributed lag (ARDL) bounds testing approach. This approach is based on the error correction version of autoregressive distributed lag (ARDL) model (Shareef and Tran, 2007). It is preferred over the other commonly used co-integration techniques such as the Engle and Granger (1978) two-staged method and the Johansen and Juselius (1990) method for a number of reasons. Firstly, the ARDL model can be applied irrespective of the integration status of the underlying regressor, i.e. irrespective of whether the variable is integrated of order zero or one [I(0) or I(1)] (Pesaran, *et.al*, 2001). This allows statistical inference on long-run estimates that are not possible under other commonly used techniques (Lyskawa and Lomott, 2015). Secondly, it is applicable on variables with different optimal lags

and for small samples (Ozturk and Acaravci, 2011; Mah, 2000 cited in Tang, 2004). Thirdly, the model generally provides unbiased estimates of the long-run model and valid t-statistics even when some of the variables are endogenous (Lyskawa and Lomott, 2015). Lastly, the ARDL model employs only a single reduced form equation, while the conventional co-integration procedures estimate the long-run relationship within a context of system equations (Ozturk and Acaravci, 2011).

The models to be estimated in this study can be expressed in the ARDL form as follows:

Model 1: Determinants of Aggregate Import Demand for Goods and Services

$$\begin{aligned} \Delta LAIMD_t = & \beta_0 + \sum_{i=1}^n \beta_{1i} \Delta LAIMD_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta LGNI_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta LINV_{t-i} \\ & + \sum_{i=0}^n \beta_{4i} \Delta InEX_{t-i} + \sum_{i=0}^n \beta_{5i} \Delta InCE + \sum_{i=0}^n \beta_{6i} \Delta InGE_{t-i} + \sum_{i=0}^n \beta_{7i} \Delta InRP_{t-i} \\ & + \sum_{i=0}^n \beta_{8i} \Delta TL_{t-i} + \alpha_1 InIMDCON_{t-1} + \alpha_2 InGNI_{t-1} + \alpha_3 InINV_{t-1} \\ & + \alpha_4 InEX_{t-1} + \alpha_5 InCE_{t-1} + \alpha_6 InGE_{t-1} + \alpha_7 InRP_{t-1} + \alpha_8 TL_{t-1} \\ & + u_t \dots \dots \dots (11) \end{aligned}$$

Model 2: Determinants of Import Demand for Consumption Goods and Services

$$\begin{aligned} \Delta LIMDCON_t = & \beta_0 + \sum_{i=1}^n \beta_{1i} \Delta LIMDCON_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta LGNI_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta LINV_{t-i} \\ & + \sum_{i=0}^n \beta_{4i} \Delta InEX_{t-i} + \sum_{i=0}^n \beta_{5i} \Delta InCE + \sum_{i=0}^n \beta_{6i} \Delta InGE_{t-i} + \sum_{i=0}^n \beta_{7i} \Delta InRP_{t-i} \\ & + \sum_{i=0}^n \beta_{8i} \Delta TL_{t-i} + \alpha_1 InIMDCON_{t-1} + \alpha_2 InGNI_{t-1} + \alpha_3 InINV_{t-1} \\ & + \alpha_4 InEX_{t-1} + \alpha_5 InCE_{t-1} + \alpha_6 InGE_{t-1} + \alpha_7 InRP_{t-1} + \alpha_8 TL_{t-1} \\ & + u_t \dots \dots \dots (12) \end{aligned}$$

Model 3: Determinants of Import Demand for Intermediate Goods and Services

$$\begin{aligned}
 \Delta LIMDINT_t = & \beta_0 + \sum_{i=1}^n \beta_{1i} \Delta LIMDINT_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta LGNI_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta LINV_{t-i} \\
 & + \sum_{i=0}^n \beta_{4i} \Delta InEX_{t-i} + \sum_{i=0}^n \beta_{5i} \Delta InCE + \sum_{i=0}^n \beta_{6i} \Delta InGE_{t-i} + \sum_{i=0}^n \beta_{7i} \Delta InRP_{t-i} \\
 & + \sum_{i=0}^n \beta_{8i} \Delta TL_{t-i} + \alpha_1 InIMDCON_{t-1} + \alpha_2 InGNI_{t-1} + \alpha_3 InINV_{t-1} \\
 & + \alpha_4 InEX_{t-1} + \alpha_5 InCE_{t-1} + \alpha_6 InGE_{t-1} + \alpha_7 InRP_{t-1} + \alpha_8 TL_{t-1} \\
 & + u_t \dots \dots \dots (13)
 \end{aligned}$$

Model 4: Determinants of Import Demand for Capital Goods and Services

$$\begin{aligned}
 \Delta LIMDCP_t = & \beta_0 + \sum_{i=1}^n \beta_{1i} \Delta LIMDCP_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta LGNI_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta LINV_{t-i} \\
 & + \sum_{i=0}^n \beta_{4i} \Delta InEX_{t-i} + \sum_{i=0}^n \beta_{5i} \Delta InCE + \sum_{i=0}^n \beta_{6i} \Delta InGE_{t-i} + \sum_{i=0}^n \beta_{7i} \Delta InRP_{t-i} \\
 & + \sum_{i=0}^n \beta_{8i} \Delta TL_{t-i} + \alpha_1 InIMDCON_{t-1} + \alpha_2 InGNI_{t-1} + \alpha_3 InINV_{t-1} \\
 & + \alpha_4 InEX_{t-1} + \alpha_5 InCE_{t-1} + \alpha_6 InGE_{t-1} + \alpha_7 InRP_{t-1} + \alpha_8 TL_{t-1} \\
 & + u_t \dots \dots \dots (14)
 \end{aligned}$$

Where Δ is the first difference, L is the logarithm, i is the number of lags, u_t is the white noise error term, β_0 is the constant, $\alpha_1 - \alpha_8$ are the coefficient of the long-run ARDL model and $\beta_1 - \beta_8$ are the short-run dynamic coefficients.

The null hypothesis of no co-integration, expressed as:

$$H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 = \alpha_8 = 0$$

is tested against the alternative hypothesis of co-integration, specified as:

$$H_1: \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq \alpha_6 \neq \alpha_7 \neq \alpha_8 \neq 0$$

Under the null hypothesis, the asymptotic distribution of the F- statistic is non-standard. For all specified regressors, the co-integration test is provided by two critical bounds, namely, the upper bound and the lower bound (Evzen and Cerny *et al.*, 2015). This is based on the assumption that all the regressors are on the one hand purely I(1) and, on the other, purely I(0),

respectively (Pesaran, 2001). According to Pesaran (2001), if the computed F-statistic falls outside the critical value bounds, a conclusive inference can be drawn if the underlying regressors are co-integrated of order I(0) or I(1). However, if the F-statistic falls inside these bounds, an inference is inconclusive and the order of the integration for the underlying variables needs to be known before a conclusive inference can be made. If a long-run relationship exists between the variables under estimation, the second step is to run the regressions of the specified models to obtain the long-run and error-correction estimated. The ECM of models is specified as follows:

ECM for Model 1: Determinants of Aggregate Import Demand for Goods and Services

$$\begin{aligned} \Delta LAIMD_t = & \beta_0 + \sum_{i=1}^n \beta_{1i} \Delta LAIMD_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta LGNI_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta LINV_{t-i} \\ & + \sum_{i=0}^n \beta_{4i} \Delta LEX_{t-i} + \sum_{i=0}^n \beta_{5i} \Delta LCE_{t-i} + \sum_{i=0}^n \beta_{6i} \Delta LGE_{t-i} + \sum_{i=0}^n \beta_{7i} \Delta LRP_{t-i} \\ & + \sum_{i=0}^n \beta_{8i} \Delta LTL_{t-i} + \xi_1 ECM_{t-1} + u_t \dots \dots \dots (15) \end{aligned}$$

ECM for Model 2: Determinants of Import Demand for Consumer Goods and Services

$$\begin{aligned} \Delta LIMDCON_t = & \beta_0 + \sum_{i=1}^n \beta_{1i} \Delta LIMDCON_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta LGNI_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta LINV_{t-i} \\ & + \sum_{i=0}^n \beta_{4i} \Delta LEX_{t-i} + \sum_{i=0}^n \beta_{5i} \Delta LCE_{t-i} + \sum_{i=0}^n \beta_{6i} \Delta LGE_{t-i} + \sum_{i=0}^n \beta_{7i} \Delta LRP_{t-i} \\ & + \sum_{i=0}^n \beta_{8i} \Delta LTL_{t-i} + \xi_1 ECM_{t-1} + u_t \dots \dots \dots (16) \end{aligned}$$

ECM for Model 3: Determinants of Import Demand for Intermediate Goods and Services

$$\begin{aligned}
\Delta LIMDINT_t = & \beta_0 + \sum_{i=1}^n \beta_{1i} \Delta LIMDINT_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta LGNI_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta LINV_{t-i} \\
& + \sum_{i=0}^n \beta_{4i} \Delta LEX_{t-i} + \sum_{i=0}^n \beta_{5i} \Delta LCE_{t-i} + \sum_{i=0}^n \beta_{6i} \Delta LGE_{t-i} + \sum_{i=0}^n \beta_{7i} \Delta LRP_{t-i} \\
& + \sum_{i=0}^n \beta_{8i} \Delta LTL_{t-i} + \xi_1 ECM_{t-1} + u_t \dots \dots \dots (17)
\end{aligned}$$

ECM for Model 4: Determinants of Import Demand for Capital Goods and Services

$$\begin{aligned}
\Delta LIMDCP_t = & \beta_0 + \sum_{i=0}^n \beta_{1i} \Delta LIMDCP_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta LGNI_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta LINV_{t-i} \\
& + \sum_{i=0}^n \beta_{4i} \Delta LEX_{t-i} + \sum_{i=0}^n \beta_{5i} \Delta LCE_{t-i} + \sum_{i=0}^n \beta_{6i} \Delta LGE_{t-i} + \sum_{i=0}^n \beta_{7i} \Delta LRP_{t-i} \\
& + \sum_{i=0}^n \beta_{8i} \Delta LTL_{t-i} + \xi_1 ECM_{t-1} + u_t \dots \dots \dots (18)
\end{aligned}$$

Where, ECM is the error correction term and ξ_1 is the coefficient of the error correction term. After establishing the long-run and short-run coefficients, the study will proceed to diagnostic tests, which are used to examine the strength and weaknesses of estimated models.

3.3. Data Sources

The study employs annual time series data covering the period from 1985 to 2015. The data for aggregate import demand, total national income, investment spending and exports of goods and services was sourced from United Nations Conference on Trade and Development (UNCTAD) database while the data on import demand for consumer goods, intermediate goods and capital goods is sourced from Quantec easy data and the World Bank.

4. Empirical Results

4.1. Unit Root Test

The ARDL bounds testing method can be applied regardless of the integration status of the series under examination as long as none of the series is integrated of order 2 or higher. To ensure that this assumption is not violated, testing for unit root remains essential. The study employs three techniques the Dickey Fuller Generalised Square (DF-GLS), Phillips-Parron test

and the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test to test for stationarity. The unit root results are presented in Table 1.

Table 1: Unit Root Tests

Variable	Dickey Fuller Generalised Square				Phillips-Perron				Kwiatkowski, Phillips, Schmidt, and Shin			
	Stationarity at levels		Stationarity after first differencing		Stationarity at levels		Stationarity after first differencing		Stationarity at levels		Stationarity after first differencing	
	No Trend	Trend	No Trend	Trend	No Trend	Trend	No Trend	Trend	No Trend	Trend	No Trend	Trend
LGNI	1.455	-1.217	-4.031**	-4.607**	0.649	-1.772	-4.575**	-4.493**	0.378	0.1429	0.233**	0.220**
LINV	0.181	-1.515	-2.660**	-3.738**	0.354	-3.258	-5.502**	-5.211**	0.369	0.144	0.260**	0.165**
LEX	-0.454	-2.576	-4.103**	-5.538**	-0.757	-2.529	-8.157**	-13.737**	0.384	0.148	0.180**	0.165**
LCE	1.269	-3.486	-3.481**	-3.598**	0.028	-1.705	-3.411**	-3.266**	0.387	0.138**	0.155**	_
LGE	1.553	-1.113	-4.677**	-4.774**	0.143	-1.300	-4.811**	-4.668**	0.386	0.141**	0.1429**	_
LRP	-1.12	-2.737	-4.819**	-4.957**	-1.065	-2.118	-5.446**	-5.356**	0.359**	0.183**	_	_
LAIMD	0.053	-2.828	-3.714**	-4.412**	-0.716	-1.856	-6.074**	-6.892**	0.39488	0.210**	0.233**	_
LIMDINT	0.178	-2.23	-3.783**	-4.598**	-2.614	-1.077	-5.291**	-6.861**	0.316**	0.188**	_	_
LIMDCON	0.191	-1.343	-4.847**	-5.283**	-4.011**	-3.086	_	-5.732**	0.396	0.1615**	0.295**	_
LIMDCP	-1.018	-2.509	-4.817**	-5.436**	-4.010**	-3.086	_	-5.794**	0.416	0.155	0.299**	0.146**

*Note: **indicate statistical significance at the 5% levels, respectively.*

The DF_GLS results show that the tested variables are all not stationary in levels, and the null hypothesis cannot be rejected. After first differencing, the results show that all the tested variables are stationary at 5% level of significance. When the PP method is used, the results confirm that import demand for consumer goods and import demand for capital goods are stationary in level when no trend is included, while the rest of the variables are not stationary when no trend is included and when a trend is included. After first differencing, the results confirm that all the variables are stationary with and without a trend, and the null hypothesis is rejected. The results from the KPSS confirm that relative import price and import demand for intermediate goods are stationary in levels when a trend is included and when there is no trend, while aggregate import demand, import demand for consumer goods, consumer spending and government spending are stationary in levels only when a trend is included. The rest of the variables have been found to be stationary and integrated of order one [I(1)] after first differencing. The results from the three methods of unit root testing confirm that all the employed variables are stationary either in levels or after first differencing; and none of the employed variables are integrated of order 2 or higher. Having found this, the study proceeds to perform co-integration test using the ARDL bounds testing procedure.

4.2. The Autoregressive Distributed Lag (ARDL) Bounds Testing Approach to Co-Integration

The first step of the ARDL bounds test is to examine the evidence of co-integration between the import demand variable and the explanatory variables. This is tested by computing the F-statistics for each of the three countries and assess it against the respective critical values provided by Pesaran (2001) in Table CI (iii) case III at 5% and 1% significance levels. The co-integration results for all the models (Models 1-4) are reported in Table 2.

Table 2: ARDL Bound Test Results for Co-integration

Country	Estimated Model				F-statistics		Inference
Model1	AIMD = f(AIMD GNI INV EX CE GE RP TL)				4.442**		Co-integrated
Model2	IMDCON= f(IMDCON GNI INV EX CE GE RP TL)				3.444*		Co-integrated
Model3	IMDINT = f(IMDINT GNI INV EX CE GE RP TL)				4.371**		Co-integrated
Model4	IMDCP = f(IMDCP GNI INV EX CE GE RP TL)				3.627**		Co-integrated
Pesaran <i>et al.</i> (2001), p.300, Table CI(iii) Case III	Asymptotic Critical Values						
	1%		5%			10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	

	2.96	4.26	2.32	3.50	2.03	3.13
--	------	------	------	------	------	------

Note: ** and * indicate statistical significance at the 1% and 5% levels, respectively.

The results from the bounds test confirm the existence of a long-run relationship between import demand and its determinants across all the four models. As shown in Table 2, the F-statistics for Model 1, Model 2, Model 3 and Model 4 are 4.442, 3.444, 4.371 and 3.627, respectively. The computed F-tests for all the four models are higher than the upper-bound asymptotic critical values. Therefore, the null hypothesis of no co-integration is rejected for all the models. Having found that the import demand variable and the explanatory variables used in this study are co-integrated, the study proceeds to estimate the long-run and short-run relationships between import demand and its possible determinants with the appropriate lag length, across the three models.

4.3. Estimation of Long-Run and Short-Run Coefficients

This sub-section presents long-run and short-run results on the import demand models for aggregate imports (Model 1), imports of consumer goods (Model 2), intermediate goods (Model 3) and capital goods (Model 4) in South Africa. The appropriate lag length is selected based on Akaike Information Criterion (AIC) for aggregate import demand and own lag selection for import demand for consumer goods, import demand for intermediate goods and import demand for capital goods. The two methods are preferred in this study because they provide parsimonious models. The lag length for Models 1-4 are ARDL (1,0,0,0,1,1,0,1), ARDL (2,0,1,1,2,0,1,1), ARDL (2,0,1,2,1,0,1,0) and ARDL (1,1,1,1,0,1,1,1), respectively. The long-run and short-run results for these models are presented in Table 3.

Table 3: Estimation of Long-Run and Short-Run Results

Panel A: Estimated Long-Run Coefficients				
Regressor	Model 1	Model 2	Model 3	Model 4
LGNI	0.040(2.978)***	0.234(3.008)**	-0.024(-0.859)	0.298(3.082)**
LINV	0.622(3.127)***	0.050(0.075)	-0.366(-1.268)	-0.114(-0.15)
LEX	0.328(1.065)	0.509(0.346)	-0.078(-0.113)	-0.125(-0.08)
LGE	-0.066(-0.191)	1.934(1.426)	0.551(1.089)	0.839(0.62)
LCE	0.190(0.359)	-0.617(-0.390)	1.830(1.637)	1.779(0.70)
LRP	0.390(1.413)	-0.535(-0.380)	-0.822(-1.757)	-0.700(-0.73)
TL	0.210(2.770)**	0.956(2.577)**	0.257(2.492)**	0.586(2.09)*
INPT	-3.071(-1.556)	-16.033(-2.397)*	-13.189(-4.984)***	-19.246(-2.65)**

Panel B: Estimated Short-Run Coefficients				
dLIMDCON1	–	0.044(0.228)	–	–
dLIMDINT1	–	–	0.186(0.854)	–
dLGNI	0.031(3.290)***	0.146(4.190)***	-0.015(-0.996)	0.128(1.861)*
dLINV	0.478(2.761)**	-0.037(-0.094)	0.402(1.942)*	-1.324(-1.742)*
dLEX	0.252(2.761)	-0.572(-0.783)	-0.091(-0.307)	-0.035(-0.035)
dLEX1	–	–	-0.402(-2.008)*	–
dLGE	-0.727(2.761)*	-0.449(-0.517)	0.042(0.109)*	0.817(0.624)
dLGE1	–	-0.568(-0.702)	–	–
dLCE	1.152(2.353)**	-0.385(-0.371)	1.162(2.42)**	0.973(0.483)
dLRP	0.300(1.400)	0.104(0.144)	-0.571(-1.793)*	-0.694(-0.576)
dTL	-0.042(-0.798)	0.251(2.008)*	0.163(2.351)**	0.072(0.280)
ecm(-1)	-0.768(-5.988)***	-0.625(-2.710)**	-0.635(-2.832)**	-0.974(-5.164)***
R-Squared	0.889	0.832	0.787	0.791
DW-statistic	1.825	2.195	2.170	2.025
F-Stat.18.0099	18.009[0.000]	6.478[0.000]	5.176[0.001]	6.615[0.000]
Serial Correlation	0.079[0.778]	0.694[0.405]	0.487[0.485]	0.471[0.492]
Functional Form	0.046[0.995]	5.319[0.021]	3.321[0.068]	2.300[0.013]
Normality	0.947[0.623]	0.201[0.900]	0.724[0.696]	0.539[0.763]
Heteroscedasticity	1.387[0.239]	0.419[0.517]	0.509[0.475]	1.823[0.177]

*Note: ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.*

The empirical results for Model 1 are reported in second column of Table 3. It is found that gross national income (LGNI), investment spending (LINV), trade liberalisation policy (TL), and consumer spending (CE) are positive determinants of aggregate import demand (Model 1); while government spending (GE) is a negative determinant. The long-run coefficients presented in Panel A of this column confirm that LGNI, LINV and TL are positive determinants of aggregate import demand. The findings show that a 1% increase in these variables result in a 0.04%, 0.62% and 0.21% increase in aggregate import demand, respectively. The coefficients of these variables are statistically significant at either 1% or 5% level. The short-run results are presented in Panel B the same column, and are confirmed by the coefficients of DLGNI, DLINV, DLCE and DLGE. According to these results a 1% increase in these variables result in a 0.03%, 0.47% 1.15% increase and a 0.73% decrease in aggregate import demand, respectively. With the exception of DLGE, both the long-run and short-run coefficients have the expected signs and are consistent with theoretical expectations and other previous studies (see Agbola, 2009; Bathalomew, 2010) among others. Relative import price (LRP) and exports

of goods and services (EX) were found to have no significant effect on aggregate import demand in the study country, irrespective of whether the analysis is conducted in the long run or in the short run. Their coefficients, as reflected in Panels A and B of the second column of Table 3, were statistically insignificant. Although unexpected, the results are not unusual (see Constant *et al.*, 2010 among others).

The findings for Model 2 are shown in the third column of Table 3, and show that gross national income (LGNI) and trade liberalisation policy (TL) are positive determinants of import demand for consumer goods. The long-run and short-run coefficients of these variables are presented in the Panel A and Panel B of the same column, respectively. The results confirm that a 1% increase in LGNI and TL result in a 0.23% and 0.96% long-run increase and 0.15% and 0.25% short-run increase in import demand for consumer goods, respectively. The coefficients of these variables are positive and statistically significant at either 1% or 5%. The positive effect of these variables is consistent with theory and finds support in the work of Bathalomew (2010) and Khan *et al.* (2013), among others. Investment spending (LINV), exports of goods and services (LEX), relative import price (LRP), government spending (LGE) and consumer spending (LCE) have been found to have no significant effect on import demand.

The long-run and short -run results for Model 3 are reported in the fourth column of Table 3. The findings show that trade liberalisation policy (TL), investment spending (LINV), and first lagged values of consumer spending (LCE) are positive determinants of import demand for intermediate goods; while the first lagged values exports of goods and services (LEX1), and relative import price (LRP) are the negative determinants. The long-run coefficient of TL presented in Panel A of this column reveals that long-run changes in this variable have a positive and significant effect on import demand for intermediate goods at 5% level. According to these results, a 1% increase in TL leads to a 0.26% increase in import demand for intermediate goods. The coefficient of TL carries the correct sign and is consistent with theoretical expectations and the findings in Bartholomew (2010) among others. The results further show that short-run changes in LINV, LCE, TL LRP and LEX1 have a statistically significant effect on import demand for intermediate goods at either 5% or 10%. The short-run coefficients presented in Panel B of the same column show that a 1% increase in LINV, LCE, and TL result in a 0.40%, 1.16% and 0.16% increase in import demand for intermediate goods, respectively; while a 1% increase in LRP and LEX1 leads to a 0.57% and 0.40% decrease in import demand for intermediate goods, respectively. Although not as theoretically

expected, the negative effect of the exports of goods and services is consistent with some previous studies such as Bahmani-Oskooee and Bolhassani (2012), among others.

For Model 4, the long-run and short-run results are presented in the fifth column of Table 3. It is found that gross national income (LGNI) and trade liberalisation policy (TL) are positive determinants of import demand for capital goods, while investment spending (LINV) is a negative determinant. The long-run coefficients presented in Panel A of this column suggest that LGNI and TL are positive long-run determinants of import demand for capital goods. A 1% increase in the two variables leads to a 0.30% and 0.58% increase in import demand for capital goods, respectively. The coefficients of these variables have the expected signs. The short-run coefficients presented in Panel B of the same column, confirm that DLGNI and DLINV are respective positive and negative determinants of import demand for capital goods, respectively. A 1% increase in DLGNI and DLINV leads to a 1.13% increase and 1.32% decrease in import demand for capital goods, respectively. The coefficients of the long-run and short-run determinants are statistically significant at either 1% or 10%. The long-run and short-run results for Model 3 are consistent with the findings by Budha (2014) and Sinha and Sinha (2000).

Overall, the results reveal that in Models 1, 2 and 4 import demand is positively determined by gross national income both in the short-run and long-run. This variable appears to have no significant effect in Model 3. The results further confirm that trade liberalisation policy is a long-run determinant of import demand in Models 1-4 and a short-run determinant of import demand in Models 1-3. Investment spending is found to have a long-run and short-run effect in Model 1; while it only has a short-run effect in Models 3-4 and have no effect in Model 2. Relative import price appears to have only a short-run effect in Model 3 and have no effect in the rest of the models. The insignificance of this variable is an unusual finding; however, it finds support in the work of Rijal *et al.* (2000).

The coefficients of the error correction terms in Models 1-4 are negative and statistically significant at 1% level. This further confirms a co-integration between import demand and its determinants. The results from the diagnostic tests that are carried confirmed that the estimated models have no problems of serial correlation, normality and heteroscedasticity. The cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive

residuals (CUSUMQ) results presented in Figures 1-4 suggest that the estimated models are stable.

Figures 1-4. The Cumulative Sum (CUSUM) and Cumulative Sum of squares (CUSUMSQ) tests

Figure1: Aggregate Import Demand (Model 1)

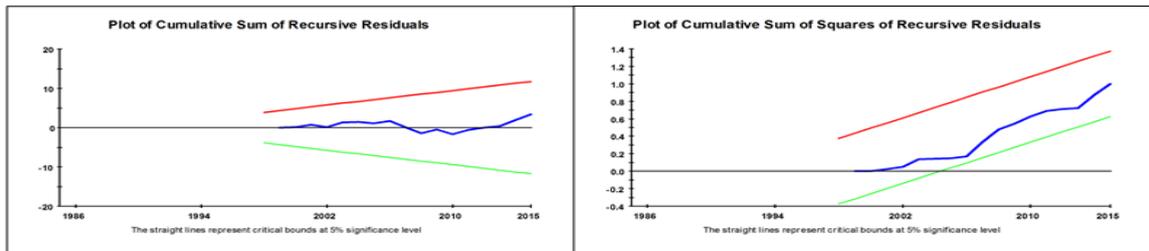


Figure 2: Import Demand of Consumer Goods (Model 2)

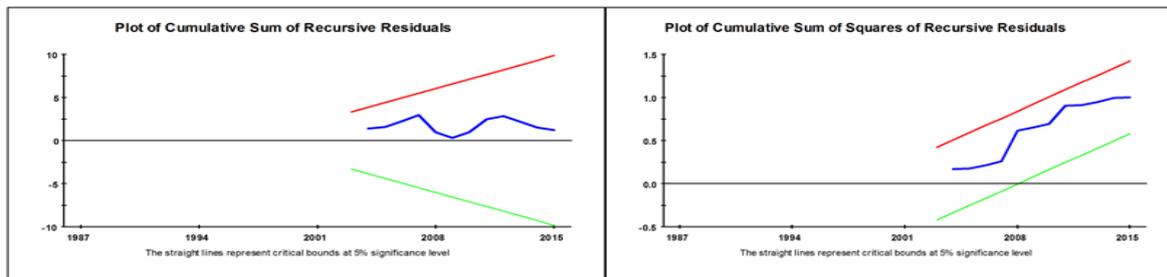


Figure3: Import Demand of Intermediate Goods (Model 3)

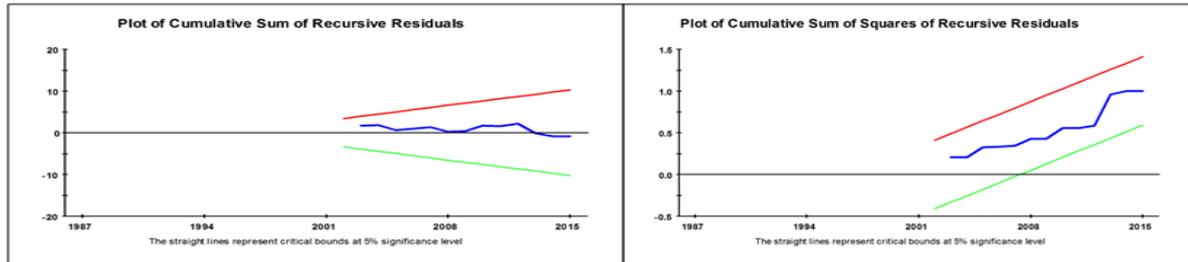
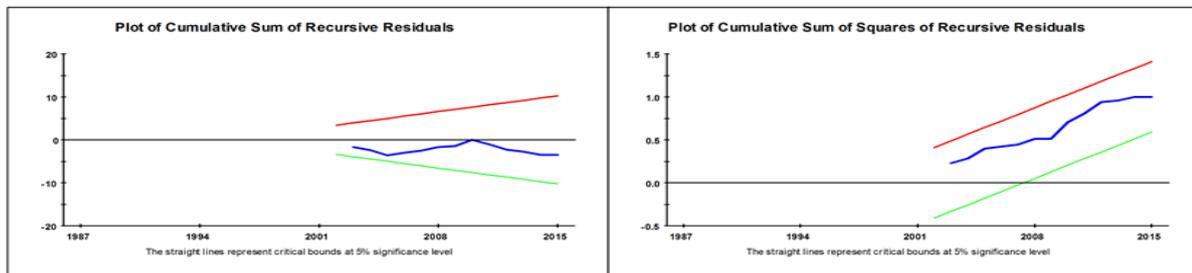


Figure 4: Import Demand of Capital Goods (Model 4)



5. Conclusion

In this study, we examined the determinants of import demand in South Africa from 1985 to 2015. The study uses the Autoregressive Distributed Lag (ARDL) bounds testing approach to

examine the impact of gross national income, consumer spending, government spending, exports of goods and services, investment spending, relative import price, and trade liberalisation policy on import demand. The study estimated four models, namely: aggregate import demand (Model 1), import demand for consumer goods (Model 2), import demand for intermediate goods (Model 3), and import demand for capital goods (Model 4). The results for Model 1 show that aggregate import demand is positively determined by gross national income and investment spending, both in the long run and in the short run. Trade liberalisation policy and consumer spending have been found to have a positive effect only in the long run and short run, respectively; while government spending is found to have a negative effect in the short run. For Model 2, the results show that import demand for consumer goods is positively determined by gross national income and trade liberalisation policy, both in the long run and in the short run. The results for Model 3 indicate that import demand for intermediate goods is positively determined by trade liberalisation policy, both in the long run and short run; and by investment spending and consumer spending in the short run. The results further confirm that the first lagged values of exports of goods and services and relative import price negatively influence import demand for intermediate goods in the short run. For Model 4, it is found that import demand for capital goods is positively associated with gross national income, both in the long run and in the short run; negatively associated with investment and trade liberalisation in the short run; and positively associated with trade liberalisation in the long run. In sum, the results show that the determinants of import demand in South Africa vary depending on the import category used as a dependent variable and the time span.

References

- Akpansung, OA. 2013. A Review of Empirical Literature on Balance of Payments as a monetary Phenomenon. *Journal of Emerging Trends in Economics and Management Sciences (JETEMS)*, 4(2), 124-132.
- Alexander, SS. 1952. The Effects of a Devaluation on a Trade Balance. International Monetary Fund (staff Papers), 2(2), 263-278.
- Anaman, KA. and Buffong, SM. 2001. Analysis of Determinants of Aggregate Import Demand in Brunei Darussalam for 1964 to 1997. *Asian economic Journal* 15(1), 61-70.
- Anaman, KA. and Buffong, SM. 2001. Analysis of Determinants of Aggregate Import Demand in Brunei Darussalam for 1964 to 1997. *Asian economic Journal* 15(1), 61-70.
- Bahmani-Oskooee, M. and Kara, O. 2003. Relative Responsiveness of Trade Flows to a Change in Prices and Exchange rate. *International Review of Applied Economics*, 17, 147-163.
- Bathalomew, D. 2010. An Econometric Estimation of the Aggregate Import Demand Function for Sierra Leone, *Journal of Monetary and Economic Integration*, 10 (4), 5-24.
- Brooks, C. 2002. *Introductory Econometrics for Finance*, Cambridge University Press, Cambridge.
- Budha, B. 2014. The Role of Expenditure Components in Nepal's Import from India. *South Asia Economic Journal*, 15(1), 37-54.
- Butt, CH. and Mitchell IS. 2011. An Empirical Analysis of Small Country Import Demand Function: The Case of Guyana. *Problems and Perspectives in Management*, 10(1), 105-121.
- Chimobi, OP. and Ogbonna, BBC. 2008. Estimating Aggregate Import-Demand Function in Nigeria: A Co-integration Approach. *Journal of Research in National Development*, 6(1), 170 – 182.
- Duasa, J. 2005. The Malaysian Balance of Payments: Keynesian Approach versus Monetary Approach.
- Dutta, D. and Ahmed, N. 2006. An Aggregate Import Demand Function for India: A Co-integration Analysis. *Applied Economic Letter*, 11(10), 607-613.
- Egwaikhide, F. 1999. Determinants of Import in Nigeria: A Dynamic Specification. *African Economic Research Consortium Research Paper*, Nairobi, 91.

- Englama, A., Oputa, NC., Sanni, GK., Yakub, MU., Adesanya, O., and Sani, Z. 2013. An Aggregate Import Demand Function for Nigeria: An Auto-Regressive Distributed Lag (ARDL) Approach. *Economic and Financial Review*.51 (3)
- Evzen, K. and Alexandra, C. 2015. Elements of Time Series Econometrics: An Applied Approach. Charles University in Prague.
- Gumede, V. 2000. Import Demand Elasticities for South Africa: A Co-integration Analysis. *Journal for Studies in Economics and Econometrics*, 24, 21-37.
- Hong, P. 1999. Import elasticities revisited. *Discussion Paper No. 10, Department of Economic and Social Affairs, United Nations*
- Mah, JS. 2000. An Empirical Examination of the Disaggregated Import Demand for Korea—the case of information technology products. *Journal of Asian Economics*, 11(2), 237–244.
- Mah, JS. 2000. An Empirical Examination of the Disaggregated Import Demand for Korea—the case of information technology products. *Journal of Asian Economics*, 11(2), 237–244.
- Modeste, N, C. 2011. An Empirical Analysis of the Demand for Imports in Three CARICOM Member Countries: An Application of the Bounds Test for Co-integration. *The Review of Black Political Economy*, 38 (1), 53-62.
- Narayan, S and Narayan, D. 2010. Estimating Import and Export Demand Elasticities for Mauritius and South Africa. *Australian Economic Papers*, 49(3), 241-252.
- Omoke, PC. 2012. Aggregate Import Demand and Expenditure Components in Nigeria. *AUDCE*, 8(1), 150-163.
- Ozturk, I. and Acaravci, A. 2011. Electricity Consumption and Real GDP Causality Nexus: Evidence from ARDL Bounds Testing Approach for 11 MENA countries. *Applied Energy*, 88(8), 2885-2892.
- Pattichis,CA. 1999. Price and Income Elasticities of Disaggregated Import Demand: Results from UECMs and An Application. *Applied Economics*, 31(9), 1061-1071.
- Pesaran, MH. Shin, Y. and Smith, RJ. 2001. Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289-326.
- Shareef, R and Tran V. 2007. An Aggregate Import Demand Function for Australia, Working Paper 0708, School of Accounting, Finance and Economics, Edith Cowan University Australia.

Sinha, D. and Sinha, T. 2000. An aggregate import demand function for Greece. *Atlantic Economic Journal*, 28(2), 196–209.

Tang, C. 2002. Aggregate Import Demand Behaviour for Indonesia: Evidence from Bounds Testing Approach. *IJUM Journal of Economics and Management*, 10(2), 1-21.

Tang, TC. 2004. A Reassessment of Aggregate Import Demand Function in the Asean-5: A Co-integration Analysis. *The International Trade Journal*, 18(3). 239-268.

Tennakeen, T. 2010. Price and Income Elasticities of Disaggregated Import Demand in Sri Lanka. *Sri Lanka Journals Online*, 40(1).

Yahia, AF. 2015. An Econometric Estimation and Evaluation of the Import Function in the Libyan Economy. *Journal of Economics, Business and Management*, 3(10), 994-998.

Russo, E., Spagnolo, F. and Mamon, R. 2007. An Empirical Investigation of the Unbiased Forward Exchange Rate Hypothesis in a Regime-Switching Market. In: *Hidden Markov Models in Finance* (eds.: Mamon, R.S. and Elliott, R.J.), Springer, 133-153.

Wooldridge, J.M. 2009. *Introductory Econometrics: A Modern Approach*, South-Western College Publishing.