

# AN ECONOMETRIC ANALYSIS OF JAMAICA'S IMPORT DEMAND FUNCTION WITH THE US AND UK

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## ABSTRACT

*This paper investigates Jamaica's aggregate import demand function with the United States and the United Kingdom from January 1996 to September 2010 using cointegration analysis and error correction modeling techniques. Using real gross domestic product, relative price of imports, real foreign reserves and exchange rate volatility as our independent variables, evidence suggests a unique cointegrating relationship between imports and its regressors in both the US and UK models. We also examine the short-run and long run elasticities in both models. In the case of Jamaica-US trade, we find that income has a lower and negative elasticity in the short run compared with the long run. Relative prices are three times as elastic in the short run than in the long run. Volatility is negative in the long run, but positive in the short run. Foreign reserves behave the same irrespective of time. Overall, change takes place much faster in the long run than in the short run. In Jamaica-UK trade, GDP, and volatility are less elastic in the short run than in the long run, but real foreign reserves and relative price adjust much faster. Moreover, in contrast to the long run, real foreign reserves and volatility are both negative in the short run. Tight monetary policy has had a significant impact in the short run only in Jamaica's import demand function with the UK, but not with the US.*

**JEL:** F14, F31, F43, O54

**KEYWORDS:** import demand, exchange rates, open economy growth, Jamaica

## INTRODUCTION

Jamaica, an island economy, is one of the most trade-dependent countries in the world with total trade valuing 116.4 percent of GDP in 2006. Moreover, as a small, open economy with a narrow production base, it is technologically and structurally dependent on imports. In addition, because Jamaica, like most other developing countries, seeks to enhance its trade position in an interdependent globalized world, it is reasonable to study its import demand function. However, it is well understood that most empirical studies of aggregate import behavior have focused almost exclusively on developed countries, Latin America or Asia, while ignoring developing countries and island economies such as Jamaica. As such, the present study seeks to fill this gap in the literature.

The objective of this study is to estimate the import demand function for Jamaica with two of its top ten trading partners, namely, the US and UK for the period 1996 - 2010, for which reliable import data are available. The appropriate import demand function is estimated using the bounds testing approach to cointegration and the unrestricted error-correction model.

In the following sections, we begin with a brief history of Jamaica, after which we review the appropriate literature. Thereafter, we specify an import demand function for Jamaica. Subsequently we provide a description of the variables and data used for our model estimation. We then present and discuss our empirical results, after which the final section concludes the paper with policy recommendations.

## LITERATURE REVIEW

### Brief History of Jamaica

Jamaica is the third largest island of the Greater Antilles, and is the largest of the West Indian islands of the British Commonwealth Caribbean. It is situated in the middle of the Caribbean Sea on direct trade routes between North and South America and between Europe and Panama. Throughout the island's history, its location at the crossroads of the sea's communication routes has significantly influenced its history, political, economic, social, and professional development (Bakre, May 2008). Gaining independence from British colonialism in 1962, its political, social, and economic affairs reflect many of the post-colonial dilemmas of the third world as a whole (Payne, 1995).

Jamaica is classified by the World Bank as an upper-middle income developing country with real Gross Domestic Product (GDP) per capita of \$5,906 in 2010 (The International Monetary Fund, 2011). Despite being a small open economy, Jamaica is highly developed compared to most Caribbean island economies. It has a vital financial sector with many international banks, a large skilled workforce, and a relatively broad-based economy (*All-Jamaica*, 2011). The island's economy, however, is beleaguered by serious long-term problems: a sizable trade deficit, inflation at 11.7%, unemployment rate of 13%, intense corruption, and a debt-to-GDP ratio that is currently estimated at 139.7 percent (IMF, 2011; World Bank, 2011). Jamaica's onerous debt burden, the fourth highest per capita, is the result of government bailouts to ailing sectors of the economy, most notably the financial sector during the 1990s (The Economy: Country Profile Jamaica, 2008). According to *Congressional Research Service* (2007), economic growth averaged 1.5% between 1990-2007, barely above the population growth rate. Major constraints for growth have included the country's vulnerability to external shocks and the large public debt burden (Brown, 2007; Sullivan, 2010).

According to Baker (2003), a significant portion of the economy is dependent on imported consumer goods and raw materials, and the propensity to import is high (Alleyne and Karagiannis, 2003). To finance the process the island is reliant upon foreign credit, foreign direct investments, and aid. Consequently, the last three decades have seen a downward trend in its external trade balance. For example, total imports in 2007 were valued at US\$6.9 billion, and increased dramatically to US\$8.4 billion in 2008 (Statistical Institute of Jamaica, 2011).

The United States is Jamaica's largest trading partner, accounting for approximately 50% of Jamaica's exports and 37% of its imports (Taylor, et. al, 2007; World Bank, 2010, Statistical Institute of Jamaica, 2011, Punke, 2011). Moreover, almost one million Jamaicans live in the US, and another million visit the US regularly. The UK, which hosts yet another million Jamaicans ranks in the top 10 of all Jamaica's imports, but most of this is in the form of consumer goods. The major commodities imported by Jamaica include food and other consumer goods, manufactured goods, industrial supplies, chemicals, fuel, parts and accessories of capital goods, machinery and transport equipment, and construction materials (Statistical Institute of Jamaica, 2011).

Given the importance of imports to the Jamaican economy's sustainability, it is imperative to understand its import demand function to inform appropriate public policy (Moore, Morris, & Simmons, 2009). However, international economic literature shows that many studies have investigated the import demand functions of developed countries, but not enough for developing island economies such as Jamaica. As such, this study attempts to understand the factors that influence the country's import demand through an empirical estimation of its determinants from the Q1:1996 to Q3:2010. The import demand function is estimated using the bounds testing approach to cointegration and the error correction model.

According to numerous scholars, including Modeste (2011), Thaver and Ekanayake (2010), Narayan and Narayan (2005), Tang (2002), Gafar (1995), Goldstein and Khan (1985), and Murray and Ginman (1976), traditional models estimate import demand as a function of relative prices and income (GDP), omitting changes in foreign reserves. Most of these models assume that macroeconomic variables are stationary, but evidence indicates the contrary, namely, that macroeconomic time series are typically non-stationary, exhibiting high serial correlation between successive observations. This implies that the  $t$  and  $F$  tests are incorrect and lead to false conclusions and spurious regression problems (portrayed by a high  $R^2$  value and a statistically significant Durbin-Watson statistic) (Dolado, Gonzalo, & Marmol, 1999; Dutta and Ahmed, 1999).

As a result, following recent studies to correct for “stationary” assumptions, a cointegration method, which focuses on the econometric implications of non-stationarity, is applied in the present study. This model has been applied by a host of other scholars, among them, Modeste (2011), Hye and Mashkoor (2010), Thaver and Ekanayake (2010), Ghorbani and Motalleb (2009), Rehman (2007), Narayan and Narayan (2005), Chang, Ho and Huang (2005), Dash (2005), Razafimahefa and Hamori (2005), Tang (2002, 2003), and Dutta and Ahmed (1999).

Modeste (2011) provides estimates of income and price elasticities of the disaggregated import demand in Guyana, Jamaica, and Trinidad and Tobago, using a bounds test for cointegration during the period of 1968-2006 for Guyana and Trinidad and Tobago, and 1970 – 2006 for Jamaica. Empirical results indicate the existence of a long-run relationship between the demand for imports and its determinants. The short-run dynamic coefficients reflect theoretically expected signs and are statistically significant at the 10% level. The long-run and short-run results indicate an inelastic but positive impact on import demand of an increase in consumption, investment, and/or exports. However, the import content value is highest for exports. The relative price elasticity of imports is an important determinant of import demand in all three countries. Our current study analyzes the aggregate import demand function of Jamaica, rather than its disaggregated function, thus adding to the literature.

Narayan and Narayan (2005) estimate the disaggregated import demand function for Fiji for the period 1970-2000. Employing the bounds testing procedure developed by Pesaran et al. (2001) within an autoregressive distributed lag framework (ARDL), they find that there exists a unique cointegration relationship among the variables when import demand is the dependent variable. Overall, this study reveals that total consumption, investment, and exports have inelastic and positive impacts on import demand, while an increase in relative price induces fewer imports.

Tang (2002) assesses the long-run aggregate import demand function for Hong Kong using a more robust estimation method for cointegration, based on the estimate of an Error Correction Model. Empirical results strongly revealed that the Hong Kong’s aggregate imports demand and its determinants, real income and relative prices are not cointegrated. In the short run, the volume of import demanded is only responsive to real income, with an estimated elasticity of 1.1.

Tang (2003) utilizes the method of cointegration to examine China's aggregate import demand function for the period 1970–1999. In addition to the traditional arrangement for the import demand function, the author includes additional factors believed to have an effect on domestic activity. These include national cash flow, and final expenditure components. Empirical results indicate a long-run equilibrium relationship between these measures of domestic activity and China's import demand. In general, domestic activity and relative prices are inelastic in the long run.

Dutta and Ahmed (1999) express skepticism about the validity of the empirical results of earlier studies on estimating and testing of an aggregate import demand function for Bangladesh. As such, their paper examines the existence of a long-run aggregate merchandise import demand function for Bangladesh

from 1974-94, using cointegration techniques developed by Engle and Granger (1987), Johansen (1988, 1991) and Johansen and Juselius (1990). In addition, the authors seek to estimate an error-correction model (ECM) to integrate the dynamics of short-run changes with long-run level processes. Empirical results confirm other studies of a unique long-run relationship among real quantities of imports, real import prices, real GDP, and real foreign exchange reserves.

Hye and Mashkoo (2010) estimate the aggregate import demand function for the Bangladesh economy using data from 1980-2008, utilizing the autoregressive distributed lag (ARDL) approach to cointegration. The empirical evidence confirms a long run relationship between imports, national income, and relative price. GDP is positive and slightly inelastic while relative price elasticity is negative in the long run.

Chang, Ho and Huang (2005) assess the aggregate import demand function for South Korea from 1980 to 2000. Results show that the volume of imports, income, and relative prices are all cointegrated. The estimated long-run (short-run) elasticities of import demand with respect to income and relative price are 1.86 (0.86) and -0.2 (-0.05), respectively.

Thaver and Ekanayake (2010) empirically analyze South Africa's aggregate import demand function for the period 1950 to 2008. They include foreign reserves as an independent variable in their model, unlike previous studies, because they argue that foreign reserves positively influence import demand. Their results suggest a long-run cointegrated relationship exists between import demand and its determinants. However, their study reveals that apartheid has had a significant short-run negative impact on import demand, but is insignificant in the long run. Furthermore, international sanctions affected import demand positively in the short-run, but negatively in the long run.

Dash (2005) investigates the behavior of the aggregate demand function for India using yearly time series data, carrying out the Johansen multivariate cointegration technique during the period 1975 - 2003. The results yielded from this study suggest that import demand is largely explained by price of domestically produced goods, GDP, lag of import and foreign exchange reserves.

Razafimahefa and Hamori (2005) determine the specific import demand function of each of two countries namely, Madagascar and Mauritius, by applying the 'bounds test' method of Pesaran et al. (2001). The study confirms the existence of a cointegration relationship and finds that the long-run income and price elasticities are, respectively, 0.855 and 20.487 for Madagascar and 0.671 and 20.644 for Mauritius. Both economies' imports respond similarly to relative prices.

Tang (2002) empirically investigates the long-run relationship between Indonesian aggregate import demand and its determinants, namely real income and relative import prices. In contrast to previous studies (Reinhart, 1995; and Senhadji, 1998), the result of the bounds test (Pesaran et al., 2001) reveals that import volume, real income, and relative import prices are cointegrated. This is an important finding from the viewpoint of the Indonesian economic policy. The estimated long-run elasticity of real income and relative price are 0.98 and -0.4 respectively, indicating that the imports are more responsive to the former than the latter.

Rehman (2007) investigates the aggregate import demand function for Pakistan by employing the Johansen multivariate cointegration technique on annual data for the period 1975-2005. He also utilizes the Augmented-Dickey Fuller (ADF) and Phillips-Parren (PP) tests to determine the order of integration. Results show that there is a long-run equilibrium relationship among variables and the stability tests indicate that import demand function remains stable over the sample period and hence the estimated results are appropriate for policy implications. The elasticities estimated indicate that changes in real income and import prices significantly affect import demand in the long run, but not in the short run. The long-run inelasticity of income implies that imports are considered necessary goods in Pakistan.

Ghorbani and Motalleb (2009) estimates Iran's import demand function for the period of 1960-2005. The determinant variables to determine the respective model include imports, GDP, partial productivity of labor, and the official exchange rate. The Pesaran et al. (2001) method, based on Auto Regressive Distributed Lag (ARDL) reveals that import demand is positive and elastic with respect to GDP.

This study, in line with previous studies, will investigate Jamaica's long-run import demand function and its associated short-run dynamics for the period 1996-2010 with the US and the UK. This import demand function is estimated using the bounds testing approach to cointegration and the unrestricted error-correction model. The dependent variable is real imports, and the regressors are real GDP, relative price of imports, real foreign reserves, and a dummy variable representing the period of tight monetary policy in Jamaica (2000-2010).

## MODEL SPECIFICATION AND METHODOLOGY

Because Jamaica is a price taker in international markets (Robinson, 2001), the world supply of imports to Jamaica is perfectly elastic, and therefore we consider using single equation techniques for estimating its aggregate import demand function. As in Thaver and Ekanayake (2010), we assume that only normal goods are imported, and that as a developing country, real imports, GDP, relative price, foreign reserves, and exchange rate volatility are crucial variables in our model because the effectiveness of import trade policy is heavily dependent upon the size of their respective elasticities. Jamaica in 2000 also implemented tight monetary policy that affected import demand, and we capture the impact of this policy on our model in the form of a dummy variable. Consequently, the long-run aggregate import demand function for Jamaica, in natural logs, is identified below:

$$\ln M_t = B_0 + B_1 \ln RGDP_t + B_2 \ln RP_t + B_3 \ln RFR_t + B_4 \ln VOL_t + B_5 D_t + \varepsilon_t \quad (1)$$

In Equation (1) in period  $t$ , the dependent variable  $M_t$  represents the real import volume, and the independent variables used to predict it include  $RGDP_t$ , the real GDP;  $RP_t$  is the relative price of imports;  $RFR_t$  is the real foreign reserves;  $VOL_t$  is the exchange rate volatility;  $D_t$  and  $\varepsilon_t$  represent the dummy variable the error term, respectively.

The first variable  $RGDP_t$  in the specified model measures the real GDP of Jamaica. Economic theory suggests that income of the importing country is a major determinant of a country's imports and has a positive impact. Thus, we expect that  $\beta_1 > 0$ . The second explanatory variable  $RP_t$ , measures the relative price of imports and is calculated as the ratio of import price to domestic price. Economic theory posits that an increase in the relative price of imports discourages imports so  $\beta_2$  is expected to be negative. The third explanatory variable,  $RFR_t$  measures the availability of foreign reserves, which can be used to Jamaica's ability to import. This variable does not appear in the traditional import demand function. However, it is an important determinant of imports for developing countries. Since higher real foreign reserves tend to encourage imports, we would expect that  $\beta_3 > 0$  (Thaver and Ekanayake, 2010). The fourth explanatory variable,  $VOL_t$  measures the standard deviation of real exchange rate between Jamaica and its trading partners. The volatility of exchange rates is the source of exchange-rate risk and has certain implications on the volume of international trade. As such, we do not have prior expectation of the sign of  $\beta_4$ . The expected signs of  $\beta_1$ ,  $\beta_2$ , and  $\beta_3$  are borne out in empirical results by numerous scholars, among them, Modeste (2011), Hye and Mashkooor (2010), Thaver and Ekanayake (2010), Ghorbani and Motalleb (2009), Rehman (2007), Narayan and Narayan (2005), Chang, Ho and Huang (2005), Dash (2005), Razafimahefa and Hamori (2005), Tang (2002, 2003), and Dutta and Ahmed (1999). The effects of tight monetary policy on import demand may be assumed to be negative and therefore we expect that  $\beta_5 < 0$ .

To distinguish the short-run effects from the long-run trend, Equation (1) must be specified in an error correction model (ECM) format following Pesaran, et al. (2001), which has been used in many recent studies, including Thaver & Ekanayake (2010), Chang, Ho, & Huang (2005), Tang (2002), and Dutta & Ahmed (1999). Equation (1) is therefore rewritten in an ECM format in Equation (2) below:

$$\Delta \ln M_t = \alpha_0 + \sum_{i=1}^n \beta_i \Delta \ln M_{t-i} + \sum_{i=0}^n \gamma_i \Delta \ln RGDP_{t-i} + \sum_{i=0}^n \delta_i \Delta \ln RP_{t-i} + \sum_{i=0}^n \eta_i \Delta \ln RFR_{t-i} + \sum_{i=0}^n \psi_i \Delta \ln VOL_{t-i} \quad (2)$$

$$+ \alpha_1 D_{1t} + \lambda_1 \ln M_{t-1} + \lambda_2 \ln RGDP_{t-1} + \lambda_3 \ln RP_{t-1} + \lambda_4 \ln RFR_{t-1} + \lambda_5 \ln VOL_{t-1} + \omega_t$$

All variables are defined as before, except the first difference operator, which is  $\Delta$ . The bounds testing approach of Pesaran et al's (2001) is based on two distinctive routine steps. Step one involves using an F-test or Wald test to test for joint significance of no cointegration,  $H_0 : \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$ , against an alternative hypothesis of cointegration,  $H_1 : \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 = \lambda_5 \neq 0$ . This test is performed using Equation (2). Pesaran, et al. (2001) provides two sets of critical values for a given significance level with and without a time trend. As such, it is assumed that variables are I(0) and I(1). And if the calculated F-values surpasses the upper critical bounds value,  $H_0$  is rejected signifying cointegration among the independent variables; if the F-value falls below the critical bounds values, we consequently reject  $H_0$ , and lastly, if the F-statistic falls within the bounds, the result is inconclusive. Following evidence of cointegration, the next logical step involves estimating the short-run and long-run coefficients of the cointegrated model (Pesarin et. al., 2001).

## DATA SOURCES AND VARIABLES

Quarterly data for the period Q1:1996 to Q3:2010 are used in our model. The data on nominal imports, the import price index, real GDP, foreign exchange reserves series, GDP deflator, and domestic price index are taken from the International Monetary Fund's *International Financial Statistics Yearbook* (2011). Nominal imports measured in Jamaican Dollars (JMD) are deflated by the GDP deflator to derive the real import variable for Jamaica. The real GDP variable is computed in millions of 2005 constant JMD. The relative price of imports series is constructed as the ratio of the CPI of the exporting country (2005=100) to domestic CPI, as measured by the consumer price index (CPI: 2005=100). To obtain the real foreign reserves series, we deflate the nominal foreign reserves series by Jamaica's GDP deflator.

## EMPIRICAL RESULTS

### Cointegration among Variables

To determine if cointegration exists between the dependent and independent variables, a bounds test is executed. To establish the bounds test for cointegration between variables, the Wald test is carried out to determine the joint significance of the lagged level variables. This is done by comparing the computed  $F$ -statistics against its critical values set by Pesaran et al. (2001). These authors tabulate an upper bound critical value, assuming all variables to be I(1), and a lower bound critical value, assuming all variables to be I(0). As can be seen in Table 1, the calculated  $F$ -statistic for Jamaica-US is 6.613, and for Jamaica-UK, it is 16.413. Both these estimates are higher than the upper bound critical value of 5.06 at the 1 per cent level of significance. This result implies that the null hypothesis of no cointegration cannot be accepted for Jamaica in its trade with the US and the UK, and a unique cointegration relationship between imports and its determinants is observable.

Table 1: *F*-test Results for Cointegration: Jamaica-US and Jamaica-UK Trade

Critical value bounds of the F-statistic: intercept and no trend							
K	10 percent level			5 percent level		1 percent level	
	I(0)	I(1)		I(0)	I(1)	I(0)	I(1)
4	2.45	3.52		2.86	4.01	3.74	5.06
Calculated F-statistic:							
$F_M(M RGDP, RP, RFR, VOL)$				6.613***(US)	16.413***(UK)		

Note: This table shows the results of the ARDL bounds testing for cointegration. The Critical values are from Pesaran, Shin, and Smith (2001, Table CI (iii) Case III, p. 300). *k* is the number of regressors. \*\*\* indicates the statistical significance at the 1 percent level.

Long-Run and Short-Run Elasticities

After establishing the existence of a long-run cointegrated relationship between import demand and its determinants, we estimate the long- and short-run elasticities. These results are presented in Tables 2 & 3. Table 2 shows that aggregate imports are mainly determined by real GDP in the Jamaica-US trade relationship, with a 1% increase in GDP yielding a 5.84% increase in import demand. In the case of Jamaica-UK however, while the relationship is elastic (2.41), it is not significant in the long run.

Table 2: Long-run Elasticities for Jamaica's Import Demand Function with the US and UK

Dependent variable: LnM					
Explanatory Variables	United States			United Kingdom	
	Coefficient	<i>t</i> -statistic		Coefficient	<i>t</i> -statistic
Constant	64.853***	-4.240		-30.174	-1.621433
lnRGDP <sub>t</sub>	5.836***	4.361		2.407	1.562121
lnRP <sub>t</sub>	0.683**	3.005		0.931***	3.787455
lnRFR <sub>t</sub>	0.114	0.567		0.441**	2.211998
lnVOL <sub>t</sub>	-0.081	-0.972		0.106**	2.158203
D <sub>it</sub>	-0.217	-1.412		-0.131	-0.740401
Adjust. R-squared ( $\bar{R}^2$ )	0.516			0.618	

Note: This table shows Jamaica's long-run elasticities of the estimated import demand functions with the US and UK. \*\*\* and \*\* indicate statistical significance at the 1% and 5% level, respectively.

Relative price for both trading partners is highly significant, but has a positive effect on import demand, rather than the expected negative relationship. Import demand from the US, while inversely related to volatility is highly inelastic (-0.08) as expected, but not statistically significant in the long run. In the case of the UK, it is positive, inelastic (.106), and significant. Foreign reserves, while meeting theoretical expectations, also differs for the US (0.11, not significant) and the UK (.44, significant). Reasons for these differences point to the fact that Jamaica is import dependent on capital goods and raw materials (Baker, 2003; World Bank, 2010,2011; Statistical Institute of Jamaica, 2011), and since these come mostly from the US, a change in foreign reserves will not significantly affect imports from the US. This result also reinforces the fact that the US is Jamaica's largest trade partner, whereas the UK lingers around 6<sup>th</sup> and 7<sup>th</sup> (Taylor, et. al, 2007; Statistical Institute of Jamaica, 2011). Further, Jamaica is a beneficiary of the Caribbean Basin Initiative (CBI), a U.S. preferential trade agreement (Sullivan, 2010), but there is no such agreement with the UK, revealing that Jamaica is less flexible and therefore, more dependent on trade with the US than the UK.

The coefficient for D<sub>it</sub> in Table 2 for both countries is negative (-0.22, US; -0.13,UK) but insignificant, implying that the restrictive monetary policy of 2000 intended to curb the demand for imports has been ineffective in impacting Jamaica's import demand function in the long-run. In the long run model,

adjusted  $\bar{R}^2$  is sufficiently high for both countries indicating that the independent variables adequately explain the long-run elasticities in Jamaica's import demand with the US and UK.

Short-run elasticities are presented in Table 3. In the case of trade between Jamaica and the US, income has a lower elasticity in the short run and is negative (-4.99) in contrast to the long run (5.58). Relative prices are three times as elastic in the short run (2.07) than the long run (.68). Volatility has a much smaller effect on imports, but it is negative in the long run (-.08) and positive in the short run (.047), which conforms to other empirical studies. Foreign reserves behave the same irrespective of time. In Jamaica-UK trade, volatility is less elastic in the short run (-.088) than in the long run (.11); real foreign reserves and relative price adjust much faster in the short run than in the long run. Moreover, unlike the long run, real foreign reserves, and volatility are both negative in the short run.

Table 3: Error-Correction Model – Jamaica's Short Run Elasticities

Dependent variable: $\Delta \ln M$				
Explanatory Variables	United States		United Kingdom	
	Coefficient	t-statistic	Coefficient	t-statistic
Constant	0.000	0.000	0.000	0.000
$\Delta \ln \text{IMPt-}i$	0.354***(4)	3.365	0.126 (3)	1.421
$\Delta \ln \text{RGDPt-}i$	-4.990***(3)	-3.251	11.63*** (4)	2.809
$\Delta \ln \text{RPt-}i$	2.068**(3)	2.260	3.614 (2)	1.600
$\Delta \ln \text{FRt-}i$	0.161 (1)	1.476	-0.900*** (3)	-3.081
$\Delta \ln \text{VOLT-}i$	0.0467(1)	1.158	-0.0875 (3)	-1.526
Dt	-0.133***	-3.509	-0.168**	-2.057
ECMt-1	-0.610***	-6.024	-1.285***	-9.512

Note: This table shows the results of the short-run elasticities of the error-correction model. \*\*\*, \*\*, and \* indicate statistical significance at the 1% 5%, and 10% level, respectively. Number of lags is indicated in parenthesis.

$D_1$  in Table 3, in contrast to Table 2, is significant for Jamaica-UK, but remains insignificant for Jamaica-US. That is, tight monetary policy has had a significant impact on Jamaica's import demand function with the UK, but not with the US in the short run. Our earlier assertion that Jamaica is more dependent upon trade with the US than the UK has been reinforced by these results. The error correction term,  $\text{ECM}_{t-1}$ , is negative and statistically significant, making certain that the series is non-explosive, and that long-run equilibrium is attainable for both countries. However, once the model in Equation (2) is shocked, convergence to long run equilibrium after the shock is slower in Jamaica-US trade with only 61% of the adjustment occurring in the first year. In Jamaica-UK relations, the adjustment process is very fast at 128%, twice the rate of the US, meaning that it takes less than one period to completely adjust to a previous period's shock.

Table 4 shows the results of diagnostic tests that we ran on our short-run model. These tests include the Durbin Watson (DW) test, the Breusch-Godfrey test (BG), the RESET test for correct model specification, the Jarque Bera (JB) normality test for the error term, and lastly, the Augmented Dickey-Fuller test (ADF). The results are ambiguous. While our model representing Jamaica-US reveals that the model is overall well behaved, the Jamaica-UK model is less clear-cut, with the RESET and ADF tests showing significance at the 5% and 10% levels. Moreover, the adjusted  $R^2$  in both countries is large enough to indicate that the variation in import demand is explained by the variables in the model.



Table 4: Results of the Diagnostic Test for the Selected ARDL Model

Explanatory Variables	United States		United Kingdom	
	Coefficient	p-value	Coefficient	p-value
$R^2$	0.626		0.708	
$\bar{R}^2$	0.559		0.653	
Durbin Watson Test	2.224	p-value: 0.668	1.827	p-value: 0.216
Breusch-Godfrey Test	3.442	p-value: 0.016	1.793	p-value: 0.150
Reset Test	0.351	p-value: 0.706	3.786	p-value: 0.031
Jarque Bera Test	1.937	p-value: 0.380	3.988	p-value: 0.136
Augmented Dickey-Fuller Test	2.408	P-value: 0.537	-3.191	p-value: 0.098

## CONCLUSIONS, LIMITATIONS, AND SUGGESTIONS FOR FUTURE RESEARCH

This study estimates an aggregate import demand function for Jamaica for the US and the UK from January 1996 to September 2010, utilizing the bounds testing approach to cointegration. Evidence suggests that a unique cointegration relationship between imports and its regressors, real GDP, relative price of imports, real foreign reserves, and exchange rate volatility, exists. In addition, the independent variables explain the model well in both countries as indicated by the adjusted  $R^2$  values.

In Jamaica-US trade, GDP affects imports negatively in the short run but positively in the long run. Imports are more responsive to changes in relative prices in the short run than the long run. Volatility has a greater impact on imports in the long run. Foreign reserves behave the same irrespective of time. In Jamaica-UK trade, GDP and volatility are less elastic in the short run than in the long run as expected, but real foreign reserves and relative price adjust much faster. Furthermore,  $D_1$  reveals that tight short-run monetary policy significantly influences Jamaica's import demand function with the UK but not with the US because of its greater dependence upon trade with the US.

From a policy perspective, it is necessary for Jamaica to adopt monetary and fiscal policies to reduce its imports of capital and intermediate goods, especially oil, while simultaneously focusing on diversifying its export base. Strengthening trade relations with other island countries such as Trinidad and Tobago will reduce its dependency on the US. Creating a regional currency with island trading partners could possibly reduce its dependence on imports from the US and UK through higher exchange rates, foreign reserves, and in turn, a better balance of payments.

This study is one of only three studies to focus on the import demand function for Jamaica, a developing island economy. Our results provide fodder for further research that could overcome the limitations of the present model. Since our diagnostic tests were not all according to theoretical expectations we would have to reconsider what independent variables would provide better explanatory value. In the case of Jamaica-US model, we may want to eliminate volatility and  $D_1$  since they are both not significant in the short and long run. In the case of Jamaica-UK, since GDP is not significant in the long run, and since mostly consumer goods are imported, disaggregating GDP into its component parts may yield better results. In addition, since Jamaica has been characterized by an increase in crime, which has affected its trade structure, future studies could include the crime rate as a dummy variable to capture its effect on import demand, allowing for possibly more robust results.

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