Consumer confidence and economic growth: case studies of Jamaica and Trinidad and Tobago

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Abstract

This study examined the causal link between consumer confidence[1] and GDP in Jamaica and Trinidad and Tobago in the context of the vector autoregression (VAR) methodology. The interest rate and exchange rate were also included in the model as control variables. In the case of Jamaica, remittances were included due to its importance in the economy. The study argued that consumer confidence indices can be useful in economic forecasting, policymaking and business planning in Jamaica and Trinidad and Tobago. This usefulness is, however, built on the assumption that the index leads (or causes) aggregate economic conditions.

For Jamaica, using quarterly data from October 2005 to March 2011, consumer confidence was not significant in predicting GDP but was significant in predicting remittances in the long run. Notwithstanding, a negative shock to consumer confidence had a negative impact on GDP. In the case of Trinidad and Tobago, using quarterly data from January 2002 to December 2010, consumer confidence was significant in predicting GDP in the short run and a negative shock to consumer confidence had a negative impact on GDP. The forecast variance decomposition of remittances indicated that consumer confidence explained a marginal amount of variation in remittances in Jamaica. In the case of Trinidad and Tobago the forecast variance decomposition of GDP suggested that consumer confidence accounted for a small proportion of the variation in GDP.

Given that consumer confidence indices can help to predict the trend in remittances and GDP, policymakers should create an environment in which consumer confidence is optimal. This requires the right mix of fiscal and monetary measures which would foster increased confidence. Fiscal and monetary policies should maintain macroeconomic stability and sustain economic growth. This will require effective management of fiscal resources and building resilience against negative external shocks. Secondly, maintaining low unemployment and increasing job security is paramount. This could be done via public-private partnership aimed at creating sustainable employment. Finally, monetary policies, should seek to control inflation to avoid a substantial erosion of purchasing power.

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[1] Consumer confidence is a measure of the degree of optimism consumers have about the performance of the economy expressed through savings and spending. Conventionally, consumer confidence is high when the unemployment rate is low and GDP growth is high.

I. Introduction

The publication of confidence indices has become an important source of information to business owners and policymakers. These indices, which are regularly reported on, are compiled from surveys which provide a barometer of the sentiments of consumers and business persons in respect to current and future economic conditions. Among other uses, confidence indices help to predict future changes in economic activity. This in turn, helps private and public sector entities to fashion appropriate strategies for the achievement of particular targets such as interest rates or sales. The indices are typically used by policymakers in central banks, government departments, financial institutions, marketing firms and other commercial enterprises as a means of gauging expectations in the economy.

There are two main types of sentiment indices: consumer confidence indices and business confidence indices. A consumer confidence index measures how consumers feel about several economic factors. The measure is based on several questions put by an interviewer to the consumer. The result, which is represented by a numerical value, speaks to consumers' evaluation of their own financial situation, employment chances, expenditure intentions and their opinion on general economic conditions. The index is based on a randomly selected sample of consumers that is representative of the country for which the index is constructed. The computation of the business confidence index essentially follows the same format except that it is the responses of business owners to business-focused questions. These indices may rise or fall from period to period or remain unchanged (Ramkissoon and Joefield, 2006).

The usefulness of consumer confidence indices as tools for forecasting economic performance emanated from the distinct literature of psychological consumption theory. While traditional economic theory advocates that consumer spending depends on economic variables such as income and prices, psychological consumption theory postulates that consumers spend in relation to their confidence about future personal finances (Katona, 1975). Some economists, such as Langer (1991), are of the view that consumer confidence can reliably predict future consumer spending and thus, economic growth, while others are more sceptical arguing that "consumers cannot spend confidence" Lieberman (1991).

One may ask the question, why is it necessary to forecast the behaviour of consumers? The answer lies in the fact that consumption spending is a major driver of economic activity in most economies and can range anywhere between 40% of GDP to 75% of GDP. Consumption spending can be the single major determinant of the level, growth and direction of economic activity of a country, and as such, it is strategic for policymakers and commercial enterprises to track and forecast consumption expenditure.

Consumer confidence indices are not perfect indicators. There may be instances where consumer sentiment runs counter to actual consumer spending. For instance, it was pointed out by Deloitte Research (2002) that after the September 11, 2001 terrorist attack on the United States of America, consumer sentiment declined, but consumption expenditure shot up in the following quarter. In addition, the index is a lagging indicator because consumer confidence either persists after a period of growth or remains depressed after a recession has ended. It takes some time for consumer sentiment to adjust to changes in the economic environment because consumers normally do not possess all the relevant economic information and may be sceptical of initial reports of transformations in the economy. Additionally, consumers cannot turn their economic habits around instantaneously. For instance, during periods of economic expansion many consumers increase their debt considerably, but are hardly in a position to pay them off quickly when the economy takes a turn for the worse.

Notwithstanding, these limitations, consumer confidence indices are useful indicators of consumer expenditure. Indices can add some science to marketing and policy formulation by providing additional data and perspectives on business and on consumer confidence that traditionally have not been available in the region.

In the Caribbean only two countries, Jamaica and Trinidad and Tobago, continuously measure business and consumer sentiment. In Jamaica, the Jamaica Chamber of Commerce Conference Board is responsible for both indices. In Trinidad and Tobago, Republic Bank Limited and Market Facts and Opinions produce the consumer confidence index, and the Arthur Lok Jack Graduate School of Business, University of the West Indies, produces the corporate confidence index.

This study provides insight into whether the consumer confidence index can be a useful tool in economic forecasting, policymaking and business planning by employing the Granger causality approach within the vector autoregression (VAR) framework. The first procedure determines whether there is causation between confidence and other variables while the second tries to determine impact of confidence on the other variables. The results indicate that consumer confidence is indeed significant in predicting GDP in Trinidad and Tobago while in Jamaica, consumer confidence helps predict remittances.

In what follows, chapter II provides a brief discussion of previous work done on the topic. Chapter III outlines the basics of the consumer confidence index. Chapter IV discusses the methodology, data and results. Policy implications and conclusions follow in chapter V.

II. Review of past literature

There has been a plethora of papers in recent years which sought to analyse consumer sentiment. The issue has received attention as a research topic in the United States and countries in Europe, Japan and Turkey. Some studies have found that there is a significant and strong relationship between consumer sentiment and consumption expenditures (Carroll and others, 1994). Studies such as Garner (1991) found that consumer indices are not reliable stand-alone indicators of consumer spending and rejected the validity of consumer confidence as a leading indicator. The approaches used by these studies include: the use of time series models to estimate the predictive ability of consumer confidence on household spending; the use of consumer expectations and changes in future consumer sales activity and the use of unconventional methodologies like analysing forecast errors of the consumer confidence index. However, despite these differences in findings and methodologies, most of these studies focused on the explanatory power of consumer confidence thus, restricting it to the role of an exogenous variable.

George Katona and his associates from the University of Michigan were the first to use surveys to measure consumer spending in the 1950s. These surveys were intended to reflect consumers changing attitudes about business conditions and job prospects which determine their future finances. Katona (1951) argued that, especially at turning points, since consumer behaviour may be unpredictable, survey measures of consumer sentiment could contribute greatly to both forecasts of consumer spending and an understanding of consumer behaviour. He further argued (Katona 1960 and 1968) that an increase in confidence should lead to a rise in consumption expenditure with some lag.

However, questions have been raised as to whether consumer confidence surveys predict consumption or more importantly if these surveys provide information about the future path of household spending that is not already contained in other popular economic indicators. Ludvigson (2004) found evidence that the most popular survey measures[2] contain some information about the future path of aggregate consumer expenditure growth and that measures of consumer confidence, taken alone, had important predictive power for quarterly consumer expenditure growth and by extension economic fluctuations. Garner (1991), however, found that consumer confidence indices were not important for predicting durable goods purchase[3] or consumer spending.

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[2]   Michigan Index of Consumer Sentiment and the Conference Board's Consumer Confidence Index.

[3]   His empirical analysis focused on durable goods because economic theory dictates that consumer confidence is likely to have its greatest effect on durable goods purchases.

Matsusaka and Sbordone (1995) investigated the link between consumer confidence and economic fluctuations for the United States using quarterly data from 1953 to 1988 by employing VAR. By observing consumer sentiment against recessions for the post war, they found a striking pattern in which recessions were preceded by a fall in confidence and significant falls in consumer sentiment were followed by a recession. They estimate a VAR which contained Cross national product (GNP), consumer sentiment, and other control variables such as government spending, money supply and components of leading economic indicators. They found that even after controlling for economic fundamentals and other good predictors of GNP that consumer sentiment have a statistically significant effect on output fluctuations. Thus, they found evidence of Granger causality running from consumer sentiment to GNP and that changes in consumer sentiment led to changes in GNP.

Afshar and others (2007) examined the link among the confidence measures of consumers, investors, business and economic fluctuations for the United States using quarterly data from 1980 to 2005. The results obtained reinforced the findings of Matsusaka and Sbordone (1995) in that the consumer confidence index, the stock price index and the purchasing managers' index Granger-caused GDP.

This paper follows the same methodology used by Matsusaka and Sbordone (1995) and Afshar and others (2007). By employing the Granger causality test, this study examined the relationship between consumer confidence and GDP for Jamaica and Trinidad and Tobago. It departed from these studies by also examining the response of GDP, the interest rate, the exchange rate and remittances to a shock to consumer confidence.

# III. Methodology of the Consumer Confidence Index (CCI)

The survey methodology applied in the construction of the Market Fact and Opinion-Republic Bank Limited consumer confidence index of Trinidad and Tobago and the Jamaica Chamber of Commerce Consumer Confidence Index is an exact replication of that used in the Surveys of Consumers conducted by the University of Michigan Survey Research Centre. The Michigan Index was formulated in the 1940s thus, making it the oldest and perhaps the most well known in the United States and indeed, globally.

Like the Michigan Index the survey used in formulating the MFO-Republic Bank Limited Consumer Confidence Index of Trinidad and Tobago and the Jamaica Chamber of Commerce Consumer Confidence Index consist of two main components: a present situation component, which assesses the present state of economic conditions and an expectation component which assesses expected changes in business conditions, job availability and income over the next six months. Thus, the MFO/Republic Bank Limited Consumer Confidence Index incorporate an Index of Current Consumption (ICC) and an Index of Consumption Expectation (ICE).

The survey is conducted door-to-door, with a randomly selected nationally representative sample i.e. the sample matches the distribution of the population with regard to key demographic variables such as ethnicity, location and socio economic status. The interviews are conducted with the aid of a questionnaire adapted from the University of Michigan's Consumer Confidence Index study. In Jamaica the interviews are executed by Market Research Services Ltd. and by Market Facts & Opinions (2000) Ltd. in Trinidad and Tobago.

The evolution of the Consumer Confidence Indices for the Jamaica and Trinidad and Tobago can be seen in figures 1 and 2, respectively. The Jamaica's CCI showed a steady increase up to the third quarter of 2007. This was followed by a sharp decline in the index through to 2008 after which the index exhibited greater volatility. For Trinidad and Tobago the index was more volatile, increasing and decreasing throughout the period. In 2010, the index increased sharply in the first half of the year, but declined sharply thereafter.

FIGURE 1
JAMAICA CONSUMER CONFIDENCE INDEX,
2005 -2011 (QUARTERLY)
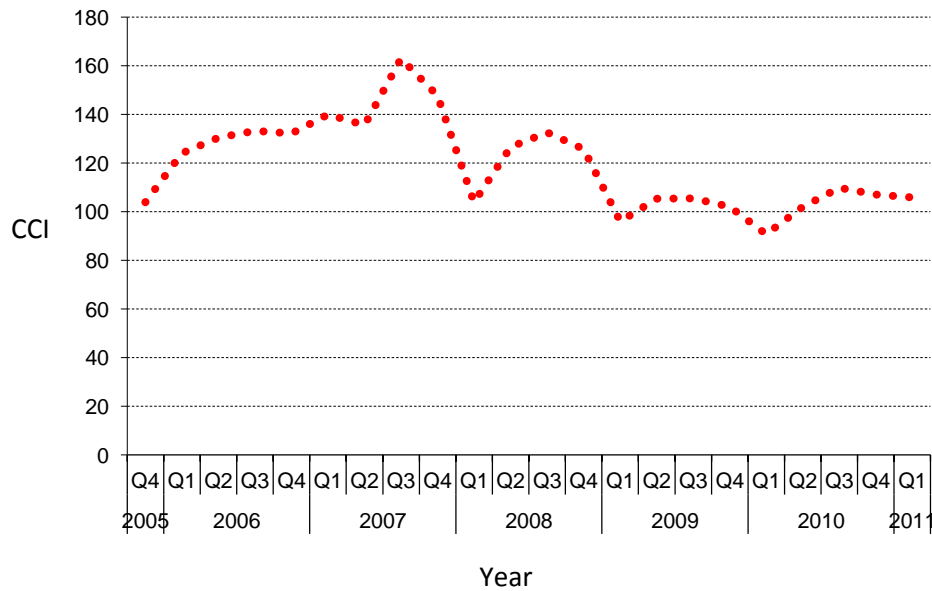
Source: Jamaica Chamber of Commerce Conference Board, [online],
http://www.jamaicachamber.org.jm/confidence_indices.asp, [Date accessed 02 September 2011].

FIGURE 2
TRINIDAD AND TOBAGO CONSUMER CONFIDENCE INDEX
2002-2010 (QUARTERLY)
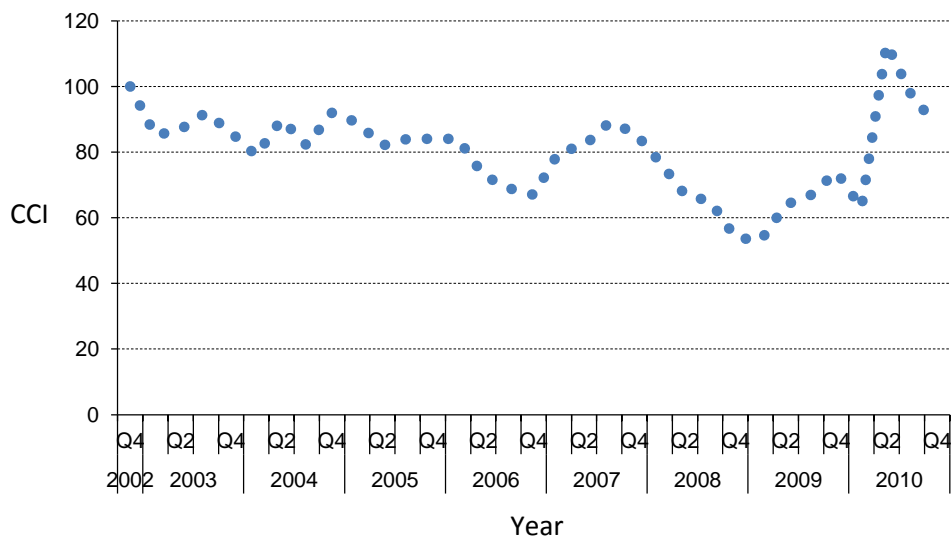
Source: Republic Bank Limited. Economic Commission for Latin America and the Caribbean on the
basis of data received from Republic Bank Limited

The methodology used in examining the causal link between consumer confidence and GDP, the
forecast variance decomposition and the impulse response function is given in annex 1.

IV. Data and empirical results

A. Jamaica

The Jamaica data were obtained from the Jamaica Chamber of Commerce Conference Board and Bank of Jamaica. The sample period runs from the last quarter of 2005 to the first quarter of 2011. The dataset included the following variables:

(a) LRGDP: Log of real GDP

(b) LCCI: Log of the consumer confidence index

(c) LREM: Log of remittances

(d) IR: Commercial bank prime lending rate

(e) ER: Domestic exchange rate to the United States Dollar

In order to rule out spurious correlations among the variables tests were done to make sure the variables were stationary. The tests results indicated that the variables in the model were non-stationary (see annex 2, table 1). Further tests indicated that a long run equilibrium relationship existed among the variables (see annex 2, table 2) and therefore, the causality test was carried out in the context of the Vector Error Correction (VEC) framework. This framework accounts for both long- and short-run relationships among the variables. Three different VEC models with one lag were estimated in order to establish whether the relationship obtained was robust while diagnostics tests revealed that the models were adequately specified. Firstly, a bivariate causality model using the variables LRGDP and LCCI was estimated. Secondly, a multivariate model was estimated using the variables; LRGDP, LREM and LCCI. Thirdly, another multivariate model was estimated using LRGDP, LREM, ER, IR, and LCCI. The results of the causality test for these three models indicated that consumer confidence does not help to predict GDP and GDP does not help to predict consumer confidence (see table 1)[4]. In each case the χ^2 value was less than the critical value at conventional levels of significance. It therefore, appears that there is to be no causal relationship between consumer confidence and GDP in Jamaica.

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[4]   The χ^2 statistic and probability values both indicate rejection of the hypotheses as the χ^2 statistic is too small and the p value is greater than 0.05 (5% level of significance)

TABLE 1
RESULTS FROM THE GRANGER CAUSATION TEST (RELATIONSHIP BETWEEN CONSUMER CONFIDENCE AND GDP), JAMAICA

Models	Hypothesis	χ^2 statistic	Probability
Model 1			
VEC (LRGDP, LCCI)	LCCI does not help to predict LRGDP	0.837	0.360
VEC (LRGDP, LCCI)	LRGDP does not help to predict LCCI	0.266	0.605
Model 2			
VEC (LRGDP, LREM, LCCI)	LCCI does not help to predict LRGDP	0.795	0.372
VEC (LRGDP, LREM, LCCI)	LRGDP does not help to predict LCCI	0.342	0.558
Model 3			
VEC (LRGDP, LREM, ER, IR, LCCI)	LCCI does not help to predict LRGDP	1.414	0.234
VEC (LRGDP, LREM, ER, IR, LCCI)	LRGDP does not help to predict LCCI	1.552	0.212

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of test results.

Given the relative importance of remittances to the Jamaican economy, the causal link between consumer confidence and remittances was also examined using the three different model specifications. The result of the bivariate model indicated that there was no causal relationship between remittances and consumer confidence in either direction (see table 2). The second model, however, indicated that there was a causal relationship between consumer confidence and remittances while in the third model there was causation but only at the 10% level of significance. These causal relationships observed in the second and third models, however, were only uni-directional indicating that the direction of causality was from consumer confidence to remittances and not vice versa. It can be argued that the transmission for causation occurred through the exchange rate since there was no causality in the bivariate model, but causality was found in the other two models. The results therefore, indicated that a change in consumer confidence will precede a change in remittances.

TABLE 2
RESULTS FROM THE GRANGER CAUSATION TEST (RELATIONSHIP BETWEEN CONSUMER CONFIDENCE AND REMITTANCES), JAMAICA

Models	Hypothesis	χ^2 statistic	Probability
Model 1			
VEC (LREM, LCCI)	LCCI does not help to predict LREM	0.456	0.499
VEC (LREM, LCCI)	LREM does not help to predict LCCI	0.313	0.575
Model 2			
VEC (LREM, ER, LCCI)	LCCI does not help to predict LREM	7.527	0.006
VEC (LREM, ER, LCCI)	LREM does not help to predict LCCI	0.524	0.468
Model 3			
VEC (LRGDP, LREM, ER, IR, LCCI)	LCCI does not help to predict LREM	3.327	0.068
VEC (LRGDP, LREM, ER, IR, LCCI)	LREM does not help to predict LCCI	0.669	0.413

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of test results

The analysis from the forecast variance decomposition, which determines the impact of a shock of one variable on the rest of variables in the system using model three, indicated that the variance in consumer confidence only marginally explained the forecast variance in remittances. The percentage contribution, though sensitive to the ordering of variables, remained marginal even after changing the ordering of the variables in the equation. The remittance decomposition, showed that the

variance of the CCI explained 6.7% of the second quarter ahead forecast variance of remittances, rising to 9.9% four quarters ahead. The second ordering explained even less variation (see annex 2, table 3). The result also indicated that in both orderings the percentage contribution of both remittances and the exchange rate to the overall variation was in excess of 60%. This was not surprising given the transmission role of the exchange rate. It also supported the result of the bivariate causality model, which excluded the exchange rate and showed no causation between remittances and consumer confidence.

Applying the generalized impulse response, a negative shock to consumer confidence will initially have a positive impact on remittances from the first to the third quarter after which remittances begin to decline (see annex 2, figure 1). This is an indication that remittances will not be immediately impacted by a change in consumer confidence. This was confirmed by the variance decomposition which showed a small proportion of the variation in remittances being explained by consumer confidence in the second quarter. With respect to the response of GDP, a negative shock to consumer confidence will result in a decline in real GDP with the most severe impact expected during the third to fourth quarters after which the impact lessens. There will also be a sharp depreciation in the exchange rate which would peak in third quarter. This will be compensated for by an increase in interest rates. Both the exchange rate and the interest will stabilize after the third quarter. It is important to note that a significant amount of variation in remittances is explained by the variation in the exchange rate, as much as 20% in the third quarter. This supports the hypothesis that consumer confidence impacts remittances through the exchange rate.

B. Trinidad and Tobago

The Trinidad and Tobago data were obtained from Republic Bank Limited, Central Bank of Trinidad and Tobago and the Central Statistical Office. The sample period runs from the last quarter of 2002 to the last quarter of 2010. The dataset included the following variables:

(a) LGDP: Log of the real GDP index.

(b) LCCI: Log of the consumer confidence index.

(c) IR: Commercial bank prime lending rate.

(d) ER: Domestic exchange rate to the United States Dollar.

Tests for stationarity indicated that the variables were non-stationary (see annex 2, table 4). However, there was no long run equilibrium relationship among the variables in the VAR model (see annex 2, table 5). This was most likely due to the presence of structural breaks in the time series which was observed by graphical inspection. The Granger-causality test was therefore carried out using a short run VAR model with one lag using the variables differenced once to make them stationary. Three models were also estimated for Trinidad and Tobago as a means of testing the robustness of the results while diagnostic tests indicated that the models were correctly specified. Firstly, a bivariate causality model using the variables LRGDP and LCCI was estimated. Secondly, a multivariate model was estimated using the variables; LRGDP, ER and LCCI. Thirdly, another multivariate model was estimated using LRGDP, ER, IR, and LCCI. In the three models it was found that consumer confidence Granger-cause GDP but GDP does not Granger-cause consumer confidence (see table 3). This meant that in Trinidad and Tobago a causal relationship existed from consumer confidence to GDP but not the other way around (uni-directional causality).

TABLE 3
RESULTS FROM THE GRANGER CAUSALITY TEST (RELATIONSHIP
BETWEEN CONSUMER CONFIDENCE AND GDP), TRINIDAD AND TOBAGO

Models	Hypothesis	χ^2 statistic	Probability
Model 1			
VAR (LRGDP, LCCI)	LCCI does not help to predict LRGDP	9.978	0.001
VAR (LRGDP, LCCI)	LRGDP does not help to predict LCCI	0.366	0.544
Model 2			
VAR (LRGDP, ER, LCCI)	LCCI does not help to predict LRGDP	10.09	0.001
VAR (LRGDP, ER, LCCI)	LRGDP does not help to predict LCCI	0.675	0.411
Model 3			
VAR (LRGDP, ER, IR, LCCI)	LCCI does not help to predict LRGDP	8.609	0.003
VAR (LRGDP, ER, IR, LCCI)	LRGDP does not help to predict LCCI	0.590	0.442

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of test results

The forecast variance decomposition of GDP indicated that the variance in consumer confidence explained approximately 1.35% to 1.64% of the second quarter ahead forecast variance of GDP (see annex 2, table 6). This minute percentage contribution observed in both orderings of the variables in the equation pointed to weak causality in the short-run. In fact, 90% of the forecast variation in GDP was explained by itself. Therefore, it seems reasonable to conclude that movements in consumer confidence are relatively insignificant in explaining GDP fluctuations in Trinidad and Tobago, despite the presence of a causal relationship. It also indicated that GDP to a large extent may be exogenous with respect to the variables in the model.

Applying the generalized impulse response, a negative shock to consumer confidence will result in a decline in real GDP with the most severe impact expected during the third quarter ahead after which GDP begins to improve (see annex 2, figure 2). The exchange rate will appreciate in the first three quarters while the interest rate will decline during that same period to offset the behaviour of the exchange rate. It is also critical to note that because the variables in the VAR are stationary that the shocks will die out and the series will revert to its mean. The results were in line with a priori expectations.

V. Policy implications and conclusion

Consumer confidence is an important factor in the overall economic development of an economy. In fact economic development is driven by consumer demand and not only on the basis of low inflation or macroeconomic stability. Therefore, the level of consumer confidence about future levels of income and job prospects determines the rate of savings, borrowing, spending and investing and also the level of tax revenue in the economy. An optimistic outlook for the economy increases consumer's confidence about their personal financial situation and hence increases their level of expenditure in the economy. This in turn leads to higher demand which spurs economic growth.

Although this paper did not focus on the factors which contribute to consumer confidence the findings are that consumer confidence helps to predict GDP and remittances.

Policymakers should try to create an environment in which consumer confidence is optimal. The right mix of fiscal and monetary policies to encourage investment and generate sustainable employment is critical. These policies should be cognizant of the following:

- The level of taxation – higher taxes reduces the amount of disposable income which in turn affects the level of spending.

- Adequate regulation and supervision of the financial sector to ensure stability in the banking system. This has implications for the level of savings and investment.

- The level of debt- unsustainable debt levels will influence future fiscal policy often leading to higher taxes and cuts in government expenditure. This is in turn will have a negative impact on economic growth.

- Inflation and interest rates- Inflation should be kept at a rate which does not significantly erode purchasing power while interest rates should not make the cost of borrowing too high which can dampen expenditure and investment.

In addition to these, there should be effective management of fiscal resources and measures should be put in place to mitigate external shocks and improve resilience. The paper concludes that despite the inclusion of macroeconomic control variables such as the interest rate and exchange rate, consumer confidence helps to predict remittances in Jamaica and GDP in Trinidad and Tobago. This is an important conclusion since it means that the confidence index can predict changes in GDP and remittances and therefore is a useful policy tool in economic forecasting or planning.

In Jamaica, a decline in consumer confidence will result in a drop in remittances. This will further be affected by a depreciating exchange rate which may further erode confidence and in the long run reduce GDP. In Trinidad and Tobago, the consumer confidence index is an important short-run policy variable which may give insight into the future performance of GDP. It is therefore, imperative to create a stable macroeconomic environment which encourages investment and employment.

Given the importance of the findings, a case can be made for the use of consumer confidence survey throughout the Caribbean to provide important insights into the impact of policies on consumer confidence and how such confidence in turn affects the economy.

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Annexes

Annex 1

Methodology

The first step in analysing the causal link between consumer confidence and GDP is to determine the stationarity properties of the variables in the model. This is important in order to rule out spurious correlations among the variables[5]. Test for stationarity was done using the Augmented Dicker-Fuller (ADF)[6] test. This test consists of two steps. The first step is to test the null hypothesis that the variables in levels are non-stationary (integrated of order one, I (1)) against the alternative hypothesis of stationarity, I (0). The second step is to determine the order of integration by testing the null hypothesis that the variables in their first differenced form are stationary[7]. The optimal lag length for the ADF test procedure was determined by the Akaike Information Criterion and the Schwarz Criterion[8].

The results of the ADF test points to two possibilities. This first is that the variables may be stationary in which case standard time series methods can be used for estimation. Secondly, the variables may be non-stationary, which would give rise to inconsistent and biased estimates. However, non stationarity could lead to the presence of a long run equilibrium relationship among the variables or co-integration[9]. A necessary condition for co-integration is that data series must be non stationary or integrated of the same order. In other words, if two or more series are non stationary I (1) a linear combination of them may be stationary, I (0). The stationary linear combination is known as the co-integrating equation and is interpreted as a long-run equilibrium relationship among the variables[10].

The test for co-integration was performed using the Johansen (1991) Approach[11]. If the variables were not co-integrated, then the standard Granger causality test in the context of a short run VAR model was employed to examine the relationship, with the variables placed in the following order, LRGDP, ER, IR and LCCI. This was the case for Trinidad and Tobago. If the variables were co-integrated, the Granger causality test was done in the framework of a vector error correction model (VECM) [12] with the variables arranged in this order; LRGDP, LREM, ER, IR and LCCI, which was the case for Jamaica.

The Granger causality test was then used to determine whether changes in a variable will have an impact on changes in another variable at some point in the future. According to the Granger causality approach, a variable X_t Granger causes Y_t if Y_t can be better predicted using the past values of both X_t and Y_t than it can using the past values of Y_t alone.

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[5]   A time series is covariance stationary when the mean, variance and covariance are constant over time. Stationarity is important because if the series is non-stationary then the results of the classical regression analysis are not valid (spurious regression).

[6]   It must be noted that standard unit root test such as the ADF may fail to account for structural breaks in the time series.

[7]   To induce stationarity, the raw data has to be de-trended by differencing. For example the first difference is found by this equation: $\Delta Y_t = Y_t - Y_{t-1}$.

[8]   Smaller values of the information criterion are preferred.

[9]   Granger (1981) introduced the concept of co-integration which is a link between non-stationary processes and the concept of long-run equilibrium. This concept was further developed and formalized by Engle and Granger (1987).

[10]   If there is no co-integration the results obtain will be spurious, but if the variables are co-integrated then ordinary least squares regression will yield consistent estimates.

[11]   The Johansen approach uses two Maximum Likelihood test statistics; the Trace test statistics and Maximum Eigenvalue test statistics to determine the number of co-integrating vectors.

[12]   An advantage of the VEC model is that it resolves the problem of spurious regression because of the fact that the disequilibrium error term is a stationary variable. The adjustment process prevents the errors in the long run relationship from becoming larger and larger.

In the absence of co-integration the standard Granger causality[13] test was estimated by a multivariate version of the following VAR model.

$$(1) \qquad \Delta Y_t = a_1 \; + \sum_{i=1}^{n} \beta_i \Delta X_{t-i} + \sum_{j=i}^{m} \delta_j \Delta Y_{t-j} + \varepsilon_{1t}$$

$$(2) \qquad \Delta X_t = a_2 \; + \sum_{i=1}^{n} \theta_i \Delta X_{t-i} + \sum_{j=i}^{m} \gamma_j \Delta Y_{t-j} + \varepsilon_{2t}$$

Where it is assumed that both ε_{1t} and ε_{2t} are uncorrelated white noise error terms, Δ is the first difference operators and ΔY and ΔX are stationary time series.

In the presence of co-integration, the long run causality is captured by the following vector error correction model

$$(3) \qquad \Delta Y_t = a_1 \; + \sum_{i=1}^{n} \beta_i \Delta X_{t-i} + \sum_{j=i}^{m} \delta_j \Delta Y_{t-j} + \lambda EY_{t-1} + \varepsilon_t$$

$$(4) \qquad \Delta X_t = a_2 \; + \sum_{i=1}^{n} \theta_i \Delta X_{t-i} + \sum_{j=i}^{m} \gamma_j \Delta Y_{t-j} + \varphi EX_{t-1} + \mu_t$$

Where ΔY and ΔX are first differenced stationary and co-integrated variables. EY_{t-1} and EX_{t-1} are the lagged values of the error correction terms. The null hypothesis that X_t does not Granger cause Y_t is rejected if the coefficients β_i and θ_i in the equations are jointly significant.

The results of these causality models may lead to three possibilities:

a) The lagged X_t terms may be statistically different from zero and the lagged Y_t not statistically different from zero. Hence, Y_t causes X_t which is uni-directional causality.

b) Both sets of X_t and Y_t are statistically different from zero and hence, there is a bi-directional causality.

c) Both sets of X_t and Y_t are not statistically different from zero which means that X_t and Y_t are both independent.

The optimal lag length of the VAR models was determined by inspection of the Akaike and Schwarz criteria while diagnostics tests for serial autocorrelation, heteroscedasticity and normality of the residuals determined the adequacy of the models. The Wald statistics, which is asymptotically equivalent and distributed as $\chi 2$ and the F statistic were used to formally test the direction of causality.

If Granger causality exists among the variables, the forecast variance decomposition is employed to assess the quantitative value of these variables. According to Sims (1982) the strength of causality can be measured by the variance decomposition. For instance, if a variable explains a small portion of the forecast error variance of another variable, this could mean a weak Granger causal relation. Hence, the variance decomposition provides information about the percentage contribution of the variance as a result of the impact of a shock from consumer confidence on the other variables in the VAR system. The overall impact of a 1% shock in one of the variables, on the other variables

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[13] Causality implies temporal precedence which means that if a variable causes the other, then a change in this variable will precede changes in other variables.

sums to 100%. The overall effect was determined by the sum of the percentage response in the variance of remittances and consumer confidence in the case of Jamaica and the variance of GDP and consumer confidence in the case of Trinidad and Tobago. Given that the variables were quarterly series, the results were calculated for one to four quarters.

Another important tool in empirical causal analysis is the impulse response function which tracks the impact of a one-time shock on other variables in the system. A shock to a variable not only directly affects itself but is also transmitted to all other endogenous variables through the lag structure of the VAR. In this paper, focus was placed on a shock to consumer confidence which transmitted the effects to itself and the other variables in the system[14].

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[14]   If the system of equations is stable (stationary) any shock should decline to zero or have temporary effects, but an unstable (non-stationary) system would produce an explosive time path in which shocks have protracted or permanent effects. Generalized impulses were used because it constructs an orthogonal set of innovations that does not depend on the VAR ordering as is done by the Cholesky Decomposition.

Annex 2

Econometric test results

TABLE 1
JAMAICA ADF TEST RESULT

Variable	Level	First Difference	Second Difference	Remarks
LRGDP	-2.641	-3.689	…	I (1)
LCCI	-3.584	-4.865	…	I (1)
LREM	-3.435	-4.862	…	I (1)
ER	-2.199	-2.620	-4.438	I (2)
IR	-2.213	-4.405	…	I (1)
5% critical Value	-3.645	-3.658	-3.691	

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of test results
Note: The ADF test was carried out with intercept only and intercept and trend. Only remittances had different results, 1 (0) with intercept only.

TABLE 2
JAMAICA COINTEGRATION TEST RESULTS

VAR Model : LRGDP, LREM, ER,IR, LCCI	Trace Statistics	Trace Critical Value (5%)	Max-Eigen Statistics	Max-Eigen Critical Value (5%)
H_0 = No co-integrating equation	87.07	69.81	39.34	33.88
H_1 = At most 1 co-integration equation	47.73	47.86	24.09	27.58

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of test results
Note: H_o indicates null hypothesis, H_1 indicates alternative hypothesis

TABLE 3
JAMAICA FORECAST VARIANCE DECOMPOSITION OF REMITTANCES
(PERCENTAGE OF FORECAST VARIANCE OF REMITTANCES EXPLAINED BY VARIANCE
OF CONSUMER CONFIDENCE)
Cholesky Ordering 1: LRGDP, LREM, ER, IR, LCCI

Period	S.E.	LRGDP	LREM	ER	IR	LCCI
1	0.093992	41.87990	58.12010	0.000000	0.000000	0.000000
2	0.110039	30.63775	55.15022	7.436642	0.040375	6.735012
3	0.127729	23.07629	43.96961	20.10497	0.751661	12.09747
4	0.150759	16.57781	44.50145	26.59619	2.474692	9.849861

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of test results

Cholesky Ordering 2: LCCI, ER, IR, LREM, LRGDP

Period	S.E.	LCCI	ER	IR	LREM	LRGDP
1	0.093992	0.651801	9.821879	31.64673	57.87958	0.000000
2	0.110039	1.692757	16.97014	24.10265	52.20840	5.026056
3	0.127729	2.217087	25.93086	24.40132	41.09321	6.357528
4	0.150759	1.869842	31.05558	20.36013	40.76713	5.947322

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of test results

TABLE 4
TRINIDAD AND TOBAGO ADF TEST RESULT

Variable	Level	First Difference	Second Difference	Remarks
LRGDP	-1.250	-6.287	…	I (1)
LCCI	-2.691	-7.083	…	I (1)
ER	-2.194	-6.055	…	I (1)
IR	-1.828	-2.763	7.798	I (2)
5% critical Value	-3.645	-3.658	-3.691	

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of test results

TABLE 5
TRINIDAD AND TOBAGO COINTEGRATION RESULTS

VAR Model: LRGDP, LREM, ER,IR, LCCI	Trace Statistics	Trace Critical Value (5%)	Max-Eigen Statistics	Max-Eigen Critical Value (5%)
Hypothesis: No co-integrating equation	30.16	47.85	15.38	27.58

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of test results

TABLE 6
TRINIDAD AND TOBAGO FORECAST VARIANCE DECOMPOSITION OF GDP
(PERCENTAGE OF FORECAST VARIANCE OF GDP EXPLAINED BY VARIANCE OF
CONSUMER CONFIDENCE)

Cholesky Ordering 1: DLGDP, DER, DIR, DLCCI

| Period	S.E.	DLGDP	DER	DIR	DLCCI
1	0.027276	100.0000	0.000000	0.000000	0.000000
2	0.028233	93.84781	4.742139	0.062525	1.347530
3	0.028371	93.41520	4.756182	0.184710	1.643912
4	0.028386	93.35894	4.795137	0.184911	1.661008

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of test results

Cholesky Ordering 2: DLCCI, DIR, DER, DLGDP

Period	S.E.	DLCCI	DIR	DER	DLGDP
1	0.027276	1.153962	1.405542	0.887420	96.55308
2	0.028233	1.638321	1.586112	6.014329	90.76124
3	0.028371	1.884604	1.885199	5.991724	90.23847
4	0.028386	1.921676	1.883539	6.023853	90.17093

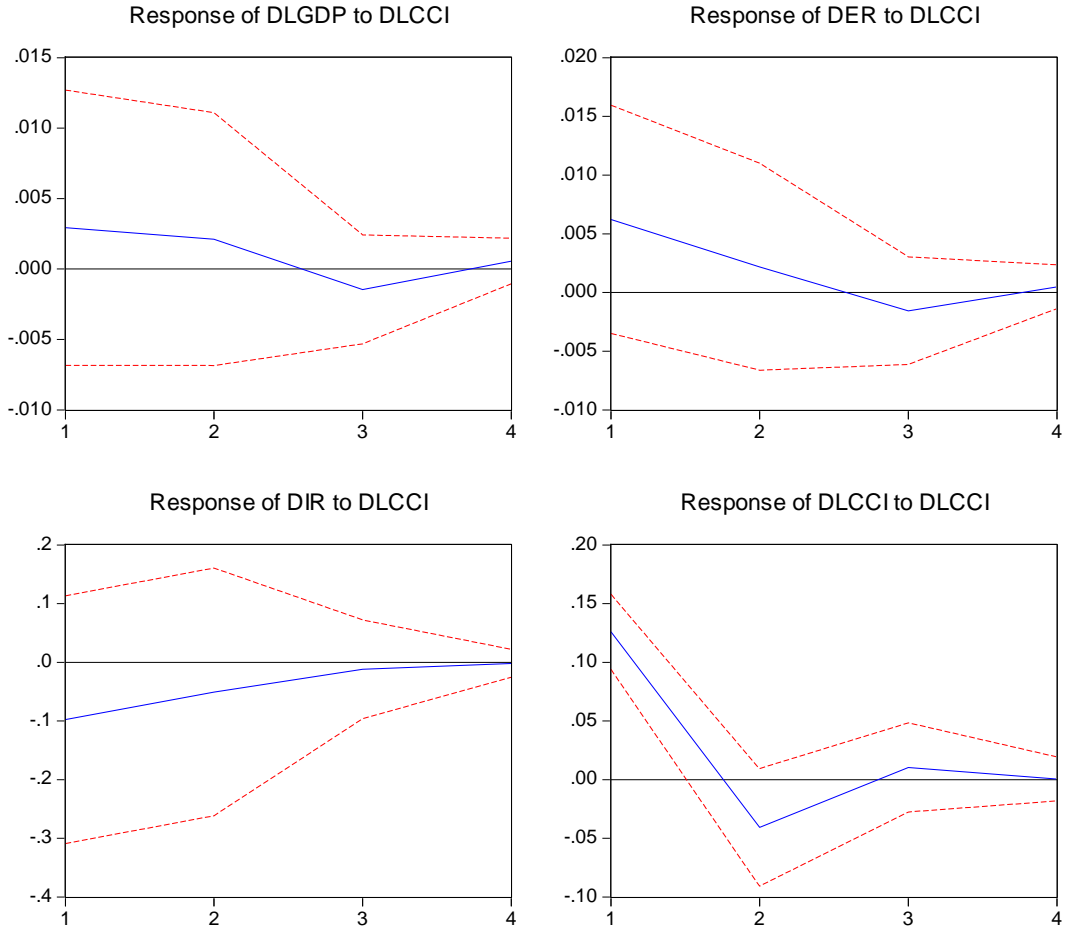Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of test results

FIGURE 1
IMPULSE RESPONSE FUNCTION
JAMAICA
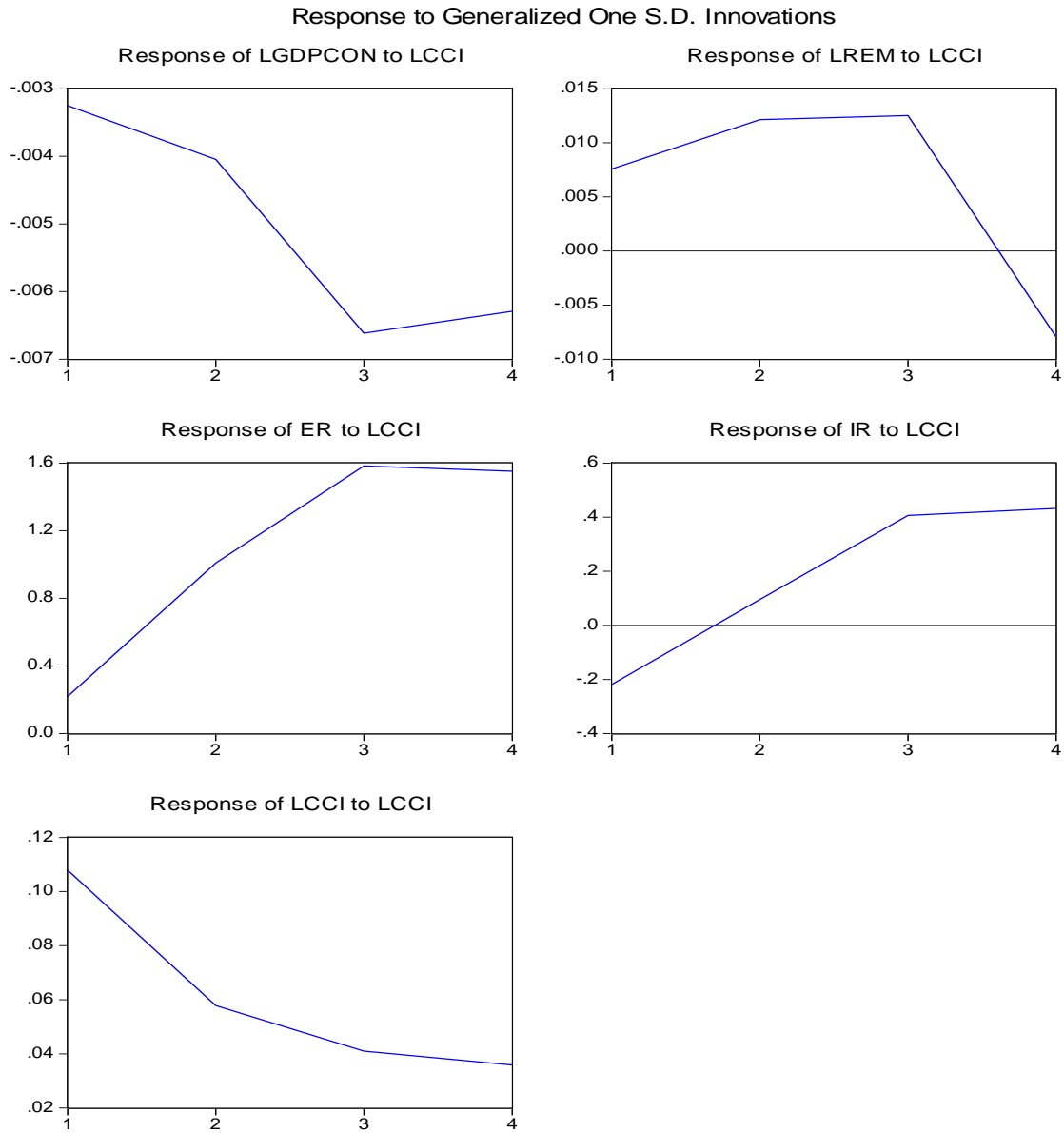
Response to Generalized One S.D. Innovations

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of test results.

FIGURE 2
IMPULSE RESPONSE FUNCTION
TRINIDAD AND TOBAGO

Response to Generalized One S.D. Innovations ± 2 S.E.

Source: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of test results.