

Is Financial Development Supply-leading or demand-following? Time-series Evidence from Barbados

Alton Best^a and Brian M. Francis^{b,*}

^aDepartment of Economics, University of the West Indies, Cave Hill Campus, P.O. Box 64, St. Michael, Barbados.

^bDepartment of Economics, University of the West Indies, Cave Hill Campus, P.O. Box 64, St. Michael, Barbados.

*Corresponding Author: Email briangrenada@hotmail.com; brian.francis@cavehill.uwi.edu; Tel: (246) 417-4279;
Fax: (246) 438-9104.

October 2015

Abstract

The paper empirically examines the question of whether financial development is supply-leading or demand-following for Barbados. A Granger causality approach is employed within a multivariate framework. Cointegration is used to examine the short and long run relationships within the model. Innovative accounting techniques (impulse response function and variance decomposition) are also utilised to determine the out-of-sample relation between financial development and economic growth. The empirical analysis is conducted with annual data from 1980 to 2014. The empirical evidence supports the ‘demand-following’ hypothesis in the short run. The results of the innovation accounting techniques (impulse response function and the variance decomposition) support the findings reported earlier. The implication of the empirical findings of this paper is that Barbados should first concentrate on developing its real sector in order to stimulate higher levels of financial development.

Keywords: *Financial Development, Economic Growth, Supply-leading, Demand-following, Multivariate Framework, Cointegration, Innovative Accounting, Barbados.*

JEL: C10; C22; C53; O40

1. INTRODUCTION

The relationship between financial development and economic growth has been extensively studied in the last few decades¹. It is well established from these studies that there is a strong association between financial development and economic growth. However, most of these studies concluded without attributing any specific direction of causality and, in other cases, the direction of causality is not without ambiguity.

Though the empirical examination of the relationship between financial development and economic growth is not new, it remains an important area of inquiry for developing countries, including those in the Caribbean². This view reflects the facts that since the 1980s developing countries have shifted towards financial development and have increasingly liberalized their financial sectors in the belief that this would lead to economic growth and development.

According to Greenidge and Milner (2007), many developing countries over the last two or three decades have liberalized their financial systems to varying degrees, under the expectation of faster economic growth; however, results have not been consistent with expectations. Indeed, liberalization led to many cases of financial fragility and crises in Latin America and East Asia, which undermined economic growth. The Caribbean was no exception (Greenidge and Milner 2007).

Barbados implemented financial reforms at different stages and suffered similar consequences to countries in Latin America and East Asia (Greenidge and Milner 2007). Financial reform was a gradual process, which began in 1980. The economy also suffered from fluctuating trends in economic growth rates and experienced a major currency scare in the early 1990s when pressure was brought by the International Monetary Fund to devalue the local currency. Of course, the Government resisted that pressure, choosing instead to implement several policy initiatives on both the fiscal and monetary sides.

Barbados' experience with financial reforms clearly raises questions about the empirical relationship between financial development and economic growth in a small, open economy. These questions relate to whether financial development leads growth, whether economic growth leads financial development, whether the relationship between financial development and economic growth is bi-directional, or whether in fact there is no relationship whatsoever between financial

¹ See Schumpeter (1911), Gurley and Shaw (1955), Goldsmith (1969), McKinnon (1973), and Shaw (1973), Rachdi and Mcbarek 2011, Stolbov 2015, amongst others.

² Caribbean refers to the following CARICOM Countries: Antigua and Barbuda, the Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago.

development and economic growth. The economic literature is replete with empirical studies designed to address these very questions. However, several weaknesses can be identified in the various empirical methodologies employed.

First, most empirical studies (for example, King and Levine 1993a,b; De Gregorio and Guidotti 1995) used cross-section analysis to link financial development and economic growth. According to (Barro 1991), the evidence emerging from cross-section growth regressions (also known as cross-country studies) provides pooled estimates of the effects of financial development on economic growth, and disregards country-specific factors. Furthermore, these cross-section regressions are not able to capture the dynamics of the relationship between financial development and economic growth. Another pitfall of cross-countries studies is that when economic growth is regressed on a wide spectrum of variables, researchers tend to interpret a significant coefficient of the measure of financial development as a confirmation of causality from financial development to economic growth.

Additionally, Barro (1991) also points out that a significant coefficient of the financial measure in such a regression can be equally compatible with causality running from financial development to economic growth, or vice versa, or with bidirectional causality between the two variables. Thus, the cross-country analysis is a static model that provides an inadequate assessment in regards to unraveling the causality relationship between of financial development and economic growth.

Second, most of the inferences on the relationship between financial development and economic growth are based on studies in relation to developed countries. Exceptions are Wood (1993), Odedokun (1996), Craigwell et al. (2001), Demetriades and Hussein (1996), Iyare et al. (2005), and Skeete (2006).

Third, a large number of previous studies were conducted using a bivariate vector autoregression (VAR) framework. Odhiambo (2007), for example, states that bivariate models usually suffer from omission of variables. According to Luintel and Khan (1999), it is believed that bivariate VAR studies of the finance and growth relationship should include the capital stock (K) and real interest rate (r) to avoid misspecification. A bivariate analysis does not allow one to discern other channels of causation.

Fourth, tests for causality between financial development and economic growth were conducted within sample (Stolbov 2015; Rachdi and Mcbarek 2011). However, they failed to extend the analysis beyond the sample period.

Fifth, only a single measure was used to capture financial development. But, financial development is a multifaceted concept that involves the interaction of many activities and institutions. Therefore it cannot be captured by the use of a single measure.

Therefore, the quest for a deeper understanding of the financial development-economic growth nexus in Caribbean countries remains a major research and policy issue. While the theoretical underpinning of this relationship is crucial, adequate policy responses require some understanding of the empirics involved. This research paper therefore seeks to shed light on this matter in relation to Barbados. The main contribution of this paper to the empirical literature is that it investigates whether the relationship between financial development and economic growth in Barbados (if any relationship exists), extends beyond the sample period.

Against the backdrop of the previous discussion, the purpose of this research paper is to empirically investigate the relationship between financial development and economic growth in Barbados. In so doing, many of the shortcomings in the literature documented in the preceding Section will be addressed.

To accomplish this broad objective, the rest of the paper proceeds as follows. Section two provides a brief overview of the economic performance of the country before and after financial reform. The idea behind this Section is to offer anecdotal evidence of any possible relationship between the two variables, prior to conducting the formal empirical investigation. Section three explains the econometric methodology used in the paper. Section four addresses data source and measurement of variables. Section five presents the empirical results and analysis. The final Section contains concluding remarks, policy implications and limitations of the paper.

2. OVERVIEW OF BARBADOS' ECONOMIC PERFORMANCE

During the 1960s and 1970s Barbados experienced steady economic development and diversification with an average annual economic growth rate of 5 percent. The labour intensive economy made a strategic economic shift from one dependent on agriculture and sugar exports to new key industries including tourism, light manufacturing and offshore financial and banking services. By late 1980s early 1990s, Barbados was elevated from the rank of a low-income country to that of a middle-income country, primarily based on this economic shift similar to the growing pattern within many Caribbean countries.

It was during the period of the 1980s that the process of financial sector liberalization began in Barbados. In this financial repressed economy the key components of the process included

elimination of credit controls, deregulation of interest rates and liberalization of international capital flows. Although these measures were implemented into the Barbados economy, the government of Barbados taught it best to still maintain the minimum deposit interest rate and a sequential approach to capital account liberalization. However the 1980s in contrast to the lengthy history of economic development, recorded little or no real growth in the economy.

Furthermore, Barbados was affected by the Global recession in the early 1980s, which plunder its GDP from a 3.5 percent to 0.3 percent growth in 1985 because Barbados' leading exports all performed poorly. In part the fluctuations were a result of the innate characteristics of small Caribbean economies, which include a limited resource base, and heavy dependence on external markets.

In spite of the economic downturn in the early 1980s, the economy began to improve significantly in the mid-1980s, which was reflected in an annual growth rate of 5 percent. This improvement was primarily the result of enhanced performance by tourism, manufacturing, and agriculture, the three main foreign exchange sectors. Equally in these three sectors, the external factors were also improved due to the depreciation of the United States dollar in 1984. For example, Tourism for the first three-quarters of 1986 increased 3.2 percent; the manufacturing sector recorded a 9 percent increase in production over the same period. Thus the Barbados' aggregate economic performance in mid 1980s strongly reflected its high dependence on external markets.

Given Barbados' vulnerability to external shocks, the appreciation of the United States Dollar (USD), severely affected the Barbados economy in the early 1990's triggering a foreign exchange currency crisis. This crisis was the resultant effect of the United States dollar being tied to the Barbados dollar at a fixed exchange rate³. The impact of the appreciation of the USD especially in the year 1995 to 2000 resulted in dramatic declines in the Barbados international competitiveness.

Following this, in year 2001, Barbados finally entered a recession mirrored by the economic development within the United States. Moreover, within the year 2008, Barbados experience a further economic contraction due to the offshore banking services industry being on the OECD's list of non-cooperative tax havens. Thus in the aftermath of these crises, the government began a series of fiscal disciplines to restore economic reform.

Overall, the impact of financial development of the Barbados economy has allowed it to have one of the highest per capita incomes in the region, except after Trinidad and Tobago (see Table 2.1). Additionally Barbados compares favorably on a wide range of social, political and competitiveness

³ The Barbadian dollar (BBD) was valued at a level of 2 BBD to 1 USD as it has since July5, 1975 reflecting the exchange peg to the USD.

indicators (see Table 2.1) and these factors made Barbados a prime location for high-end tourism and offshore financial services (IMF 2008). Another prime factor that made Barbados such a prime location was Barbados investment grade rating of a lower medium grade prior to 2012. Subsequently, however, Barbados has suffered three economic downgrades by economic rating agencies. Barbados was downgraded by Moody's and S&P in 2012, followed by two notches (to Ba3 and BB- respectively) in 2013, and finally by three notches (to B3- and B- respectively) early in 2014 (see table 2.1).

According to Moody's, the three-notch downgrade reflects the high concern of the following economic drivers in the Barbados economy: the first driver is the widening of the government fiscal deficit which exceeded 11 percent of GDP in FY 2013/14; the second driver is its increasing government debt ratio projected at above 100% of GDP by FY 2014/15; coupled with elevated short term debt reliance and gross financing needs in excess of 30 percent of GDP in 2014 and 2015; the third driver is the expected continuation of the decline in international reserves; and the fourth driver is the increased pressure on the currency peg to the US dollar due to the country's central bank financing part of the increase in the government short-term debt.

Table 2.1: Selected Caribbean Countries Key Economic, Social and Political Indicators

Economic Indicators	Barbados
GDP per Capita	15,598
S&P sovereign rating (forex long-term debt)	B-
Moody sovereign rating (forex long-term debt)	B3-
Social Indicators	
Human Development Index (UNDP, rank)	59
Health & Primary Education Index (WEF, rank)	20
Business Climate 1/	
Global Competitiveness Index (WEF, rank)	47
Business Competitiveness Index (WEF, rank)	46
Regulatory Quality (WB, percentile)	65.55
Political Indicators	
Corruption Perception Index (TI, rank)	17
Political Stability (WB, percentile)	93
Rule of Law (WB, percentile)	82

Source: IMF World Economic Outlook, World Bank Governance Indicators World economic Forum Indices, Transparency International, and UNDP.

3. ECONOMETRIC METHODOLOGY

The present paper utilizes a Granger approach to causality testing within the framework of cointegration and error correction modeling. The use of time-series allows us to capture the country specific factors in developing countries such as economic structure, political environment and institutional framework (Greenidge and Milner 2007).

To overcome the possible bias associated with bivariate VARs, a multivariate VAR system is employed so that other channels through which the relationship between financial development and economic growth can be examined.

In addition to causality testing, innovation accounting techniques will be employed. These techniques will allow the relationship between financial development and economic growth to be investigated outside the sample.

Finally to address the complexity of the financial development variable, the present paper employs three proxies of financial development. These diverse set of financial variables allows us to gain a better understanding of the causal relationship between financial development and economic growth since, as alluded to earlier, financial development is a multifaceted concept with no clear meaning in the literature.

3.1 Unit Root Tests

In the first step the variables are tested to verify the order of integration. A series is said to be integrated of order d , denoted by $I(d)$, if it has to be difference d times before it becomes stationary. If the series, by itself, is stationary without having to be first differenced, then it is said to be $I(0)$. The order of integration is tested using Augmented Dickey-Fuller (ADF), (Dickey and Fuller 1972), Phillips Peron (PP), (Phillips and Perron 1988) and the Kwiatkowski, Phillips, Schmidt and Shin (KPSS) (Kwiatkowski et al. 1992) unit root tests. Unit root tests are conducted to verify the stationarity properties (i.e. absence of a trend and long run mean reversion) of the time series data in order to avoid spurious regression. A series is said to be stationary (weakly or covariance) if the mean and the autocovariances of the series do not depend on time. Any series that is not stationary is said to be non-stationary.

The following models (constant and trend; constant and no trend; no constant or trend) by Dickey, Bell and Miller (1986) are examined for unit roots, using the ADF and the PP test and models (1) and (2) using the KPSS test:

$$\Delta X_t = \alpha_0 + \alpha_1 X_{t-1} + \sum_{i=1}^k \lambda_i \Delta X_{t-1} + \beta t + \varepsilon_t \quad (1)$$

$$\Delta X_t = \alpha_0 + \alpha_1 X_{t-1} + \sum_{i=1}^k \lambda_i \Delta X_{t-1} + \varepsilon_t \quad (2)$$

$$\Delta X_t = \alpha_1 X_{t-1} + \sum_{i=1}^k \lambda_i \Delta X_{t-1} + \varepsilon_t \quad (3)$$

where X_t is the respective time series; α_0 is the intercept; t is the linear time trend; Δ is the first difference operator; and ε_t denotes the error process with zero mean and constant variance.

If the level of a variable is rejected for stationarity, then the first difference of that series is tested for stationarity. If the first difference is stationary, it is said to be integrated of order zero, $I(0)$, which implies that the level of the series is integrated of order one, $I(1)$, that is, the variable has a unit root. The testing procedure uses the student t-ratio to estimate α_1 . The hypothesis $H_0: \alpha_1 = 0$ is used to test that the series contains a unit root and is therefore non-stationary. If the t-statistic associated with the estimated coefficient α_1 is less than the critical values for the test, we reject the null hypothesis of a unit root in favour of stationarity.

In the case of the KPSS, we test the null hypothesis of stationarity and a unit root as the alternative hypothesis to confirm the conclusion about the unit roots. The null hypothesis of stationarity is rejected in favour of the unit root alternative hypothesis if the calculated test statistic exceeds the critical values. To put differently, the KPSS null hypothesis (i.e. series has no unit root) holds true, if the LM-statistic exceeds the asymptotic critical value. Conclusions on the degree of stationarity for each variable will only be reached if at least two of the three types of the unit root test agree (significant ADF and PP statistics and insignificant KPSS statistics imply stationarity).

3.2 Cointegration

The second step is to test for cointegration. The purpose of the cointegration test is to determine whether a group of non-stationary series is cointegrated or not. That is, cointegration examines if there is any long term equilibrium relationship between two or more variables, given that the linear combination μ_t is stationary (i.e. integrated of order zero). . For instance, if $x \sim I(d)$ and $y \sim I(d)$, and the linear combination is $d-1$ (i.e. there is low order integration), then the two variables are said to be cointegrated. This means that although the variables individually may wander randomly from each other, the existence of the long run relationship guarantees that the variables demonstrate no

inherent tendency to drift apart. Engle Granger (1987) points out that a linear combination of two or more non-stationary series may be stationary and if such a stationary linear combination exists the non-stationary time series are said to be cointegrated. If both series are integrated of different orders, it is safely possible to conclude non-cointegration and their relationship is spurious.

The maximum likelihood (ML) methods of Johansen and Juselius (1990) are used to examine the long-run equilibrium relationship among the variables on the level. The Johansen and Juselius multivariate test, investigates the null hypothesis that there is no r (i.e. r represents the rank of matrix) cointegrating vectors among the variables. To carry out this test the vector autoregressive (VAR) model is first formulated:

$$y_t = \tau_1(L)y_{t-1} + \tau_2(L)y_{t-1} + \dots + \tau_p(L)y_{t-1} + \varepsilon_{t-p} \quad (4)$$

where $y_t = [LY_t, LM2_Y_t, LDC_t, LBLR_t, LK_t, LR_t]$ is a column vector and with

$\tau_i(L)$ with $i = 1, \dots, p$ is a lag operator; LY_t represents economic growth; $LM2_Y_t, LDC_t, LBLR_t$ represents the proxies for financial development; ε is the white noise residual of zero mean and constant variance.⁴

An important criterion of the Johansen ML procedure is the determination of the lag length of the VAR. The lag length seeks to choose the best fitting model and it is achieved by minimizing the overall sum of squares (in essence, the information criterion function) or by maximizing the Likelihood ratio tests (LR). The importance of lag length determination is demonstrated by Braunn and Mitnik (1993) who indicates that estimates of a VAR are inconsistent when the lag length differs from the true lag length. Additionally, Lutkepohl (1993) indicates that mean-square forecast errors and autocorrelated errors are generated when the lag length is overfitted (i.e. selecting a higher order lag length than true lag length) or underfitted respectively. The two information criteria functions commonly used in practice are the Akaike information criterion (AIC) and the Schwarz Bayesian criterion (SBC).

In this research paper the criterion used to determine in advance the lag length (i.e. p-lag operator) of the VAR processes is the Schwarz Bayesian criterion (SBC). This criterion is employed because it is consistent (Quinn 1988) and it chooses the most parsimonious model (Morimune and

⁴ Suffice to mention here, that the multivariate model is restricted to testing the causality relationship between the financial development variables and economic growth variable. However it is believed that a time-series study in finance and growth relationship should include the capital stock (k) and real interest rate (r) to avoid misspecification (Luintel and Khan 1999). Furthermore bivariate models usually suffer from omission of variables (Odhiambo 2007).

Mantani 1995). Thus the lag length which is determined by the Schwarz Information Criteria in the VAR analysis ensures that the residual is white noise.

To test for cointegration rank, r , Johansen procedure uses two likelihood ratio tests: the Maximum Eigenvalue statistic ($\lambda \max$) and the Trace statistic. The rank of the matrix Π determines the number of cointegration vectors since the rank Π is equal to the number of independent cointegration vectors. In the bivariate VAR framework, the number of cointegration vectors is one and the null hypothesis is that there is no cointegration vector and the alternative is that we have only one cointegration vector. The trace test statistic, evaluates the null hypothesis that they are r or less cointegrating vectors against the alternative hypothesis that there is more than r . The equation (5) is shown below:

$$\tau_{trace} = -N \sum_{i=r+1}^M \ln[1 - (r_i^*)^2] \quad (5)$$

where N is the total number of observations, M is the number of variables and r_i^* is the i correlation between i -th pair of variables. τ_{trace} has a chi-square distribution with $M-r$ degrees of freedom. Large values of τ_{trace} give evidence against the hypothesis of r or fewer cointegration vectors.

The maximum eigenvalue test assesses the null hypothesis that there are exactly r cointegrating vector(s) against the alternative hypothesis that there is $r + 1$. The equation (6) is shown below:

$$\tau_{max} = -T \ln(1 - \lambda_{r+1}) \quad (6)$$

Even though Johansen and Juselius (1990) initially indicated that the maximum eigenvalue performs better, the Monte Carlo experiments reported by Cheung and Lai (1993, p.326) suggest that regarding non-normality, skewness in innovations has a statistically significant effect of the test sizes on both the trace and the maximum eigenvalue tests. However, Cheung and Lai states that between the two Johansen procedures to test for cointegration, the trace test shows more robustness to both the skewness and excess kurtosis in innovations than the maximum eigenvalue test. Since there is not complete agreement among econometricians, in this case we have preferred to be cautious and prudent, and report and rely on both sub-tests.

3.3 Error Correction Modeling

In this step the long-run relationship is examined empirically the cointegration relationship between the variables in the model. This test is based on the unrestricted Vector Autoregression (VAR) using the Error Correction Mechanism (ECM). One of the advantages of including the lagged ECM is that long-run information lost through differencing is reintroduced in a statistically acceptable way. Secondly, although cointegration indicates the presence of Granger causality, at least in one direction, it does not indicate the direction of causality between the variables. The direction of causality can only be detected through the ECM derived from the long-run cointegrating vectors. The ECM used in the current paper is based on the following equations:

$$\Delta LY_t = a_0 + \sum_{i=1}^m [\delta_i \Delta LFD_{t-1} + \alpha_i LK_{t-1} + \beta_i LR_{t-1} + \gamma_i \Delta LY_{t-1}] + \phi_i ECM_{t-1} + \mu_t \quad (7)$$

$$\Delta LFD_t = a_0 + \sum_{i=1}^m [\delta_i \Delta LFD_{t-1} + \alpha_i LK_{t-1} + \beta_i LR_{t-1} + \gamma_i \Delta LY_{t-1}] + \phi_i ECM_{t-1} + \varepsilon_t \quad (8)$$

where Δ represents the difference operator; LFD_t represents the four proxies of financial development: LM_2 represents money and quasi-money (M2) as a percentage of Gross domestic Product (GDP); LDC_t represents domestic credit provided to the private sector as a percentage of real GDP; $LBLR_t$ is the ratio of bank liquid reserves to bank assets, as a percentage; and LY_t represents Real GDP per Capita. ECM_{t-1} represents one period lagged error correction mechanism captured from the cointegration regression.

It is important to note that a significant coefficient in the error correction model implies that past equilibrium errors plays a role in determining the current outcomes. Additionally, at least one of the speed of the adjustment coefficients must be significant and non-zero; otherwise the long-run equilibrium relationship does not appear and the model is not one of error correction or cointegration. To put differently, the error correction model only represents a VAR in first difference if the coefficients are zero or insignificant. Secondly, the size of the coefficient shows the speed of adjustment to the long run equilibrium.

In addition to indicating the speed of adjustment, the error correction term enables us to distinguish between short-run and long-run Granger causality. Thus Granger (1986) suggests that the error correction mechanism approach should lead to better short run predictions, and also to integrate short run variation with the long-run equilibrium. For example, in equation 9, short run causality implies that financial development (LFD_t) ‘Granger causes’ economic growth (LY_t) as long as $\delta_i \neq 0 \forall_i$, But the significance of the lagged error correction term i.e. $\phi_i \neq 0$, denotes whether there

is long-run casual relationship. Likewise in equation 10, (LY_t) ‘Granger causes’ (LFD_t) is accepted as long as $\gamma_i \neq 0 \forall_i$.

3.4 Granger-Causality

Two or more variables are said to be cointegrated if they share a common trend. As long as the relevant variables have a common trend Granger causality must exist in at least one direction (Granger 1988). Therefore, the existence of cointegration implies unidirectional or bidirectional Granger Causality may exist. In this paper the Granger-causality method is used to estimate the short-run dynamics by means of the Granger Causality test.

The Granger Causality test method is chosen in this paper over other alternative techniques because of its favourable responses to both large and small samples. Guilkey and Salemi (1982), Geweke et al. (1983) and Odhiambo (2004b) for example, have all shown that Granger test out performs other methods in both large and small samples. The conventional Granger Causality test seeks to ascertain the null hypothesis that financial development (LFD_t) does not cause economic growth (LY_t) and vice versa, in the case for Barbados.

We outline this procedure for economic growth and financial development only as follows:

$$LY_t = a_0 + \sum_{i=1}^m [\delta_i LFD_t + \alpha_i LK_t + \beta_i LR_t + \gamma_i \Delta LY_{t-1}] + \mu_t \quad (9)$$

$$LFD_t = a_0 + \sum_{i=1}^m [\delta_i FD_t + \alpha_i LK_t + \beta_i LR_t + \gamma_i \Delta LY_t] + \varepsilon_t \quad (10)$$

where LY_t is the economic growth variable; LFD_t is the financial development variables; LK_t is capital stock variable; LR_t is the interest rate variable; μ_t and ε_t is the white noise error process; and m is the number of lagged variables. The null hypothesis that LFD_t does not Granger cause, LY_t is rejected if δ_i s are jointly significant (Granger 1969). Similarly, the null hypothesis that LY_t does not Granger cause, FD_t is rejected if γ_i s are jointly significant.

However the traditional Granger causality tests suffer from the following two methodological deficiencies. First, these standard tests do not examine the basic time series properties of the variables. If the variables are cointegrated, then these test incorporating different variables will be misspecified unless the lagged error correction term is included (Granger 1988). Secondly, the majority of these tests turns the series stationary mechanically by differencing the variables and

consequently eliminates the long-run information embodied in the original form of the variables. These deficiencies are corrected by the inclusion of the lagged error correction mechanism (ECM) in the cointegration equation.

3.5 Innovation Accounting

Innovative accounting (impulse response function and variance decomposition) allows us to estimate the short run dynamics of the variables in the VAR. The impulse response function (IRF) investigates the time path of the effects of the short run dynamic relationships that results from a ‘shock’ to the variables in the VAR. In other words, this approach determines how each variable shows response over time to initial “shocks” in that variable and to “shocks” in other variables.

In the present paper the impulse response function is use to trace how economic growth responds over time to a “shock” in financial development and compare this to responses to “shocks” from other variables. If the impulse response function shows a stronger and longer reaction of economic growth to a “shock” in financial development variables than “shocks” in other variables we would find support that financial development is demand following (i.e. economic growth leads to financial development). Conversely if the impulse response function shows a stronger and longer reaction of financial development variables to a “shock” in economic growth we would find support that financial development is supply leading (i.e. financial development leads to economic growth).

Variance decomposition (VDC) is another approach for analyzing the dynamics of the system. The forecast error variance decomposition allows for inferences to be made concerning the relative importance of each innovation towards explaining the behaviour of the endogenous variables. It is important to note that the error correction model can indicate Granger causality only in the sample period and does not allow us to gauge the relative strength of the Granger causality among the variables beyond the sample period. Thus, by proportioning the variance of the forecast error of a certain variable into proportions attributable to “shocks” in each variable in the system including itself, variance decomposition can provide an indication of Granger causality beyond the sample period. Since an innovative shock in each of the variable produces changes in their future values as well as the other variables, it is possible to break down forecast error variance of each variable in each future period, and determine the percentage of variance that each error variance explains.

In the context of this paper the variance decomposition is a way to ascertain ‘how much of the variance in forecast errors of future financial development variables can be attributed to innovations in economic growth or vice versa.’ Therefore this approach provides measurement of

strength of feedback between financial development variables and economic growth in Barbados. For example, if a “shock” in financial development variables leads subsequently to a large change in economic growth in the estimated VAR, but that “shock” in economic growth has only a small effect on the financial variables, then we would have found support that financial development “leads” to economic growth. Similarly, we would find support that economic growth leads to financial development if the economic growth variable explains more of the variance in the forecast errors for the financial development variables.

4. DATA SOURCES AND MEASUREMENT OF VARIABLES

4.1 Data Sources and Measurement of variables

The empirical analysis is based on annual data from 1980 to 2014. All the annual data was obtained from the World Bank’s World Development Indicators (WDI) online Database. The econometrics analysis was carried out using Eviews, version 7.0.

The following are the notations and definitions of variables used in this paper. Y_t represents economic growth variable and is proxied by Real GDP per capita in constant local currency (constant LCU). FD_t represents financial development variable and it is proxied by three variables. The first proxy of financial development is $M2_Y_t$ which represents the monetization variable or broad money stock and is defined by money and quasimoney (M2) as a percentage of GDP. The monetization variable is designed to show the real size of the financial sector of a growing economy. This variable is therefore expected to increase overtime if the financial sector develops faster than the real sector on one hand, and decrease if the financial sector develops slower than the real sector. According to other researchers, board money stock as a ratio of GDP is used as a typical indicator of the financial depth of the economy (see Goldsmith, 1969; King and Levine 1993a).

The second proxy of financial development is DC_t which is represented by domestic credit to the private sector as a percentage of GDP. This ratio is designed to highlight the impact of the private sector on the financial sector in the economy. It is assumed that credit provided to the private sector will generate larger increases in investment and productivity in contrast to credit provided to the public sector (see Kar and Pentecost, 2000).

The third proxy of the financial development is BLR_t which represents the ratio of bank liquid reserves to bank assets. This variable is used to give a rough measure of the level of banking development. It also measures the degree to which commercial banks or the central Banks is allocating society’s savings (see Beck et al. 2000).

R_t is the real interest rate variable. K_t is the capital stock variable and it is proxied by Gross Fixed Capital Formation as percentage of GDP. All the variables are in their natural logarithmic forms.

5. EMPIRICAL RESULTS AND ANALYSIS

The empirical investigation begins with the examination of each variable for the presence of a unit root. To test for unit roots, we used the Augmented Dickey Fuller (ADF) test; Phillips-Perron (PP) test; and the Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test. The results of these tests are reported in Table 5.1.

Table 5.1: Unit Root Test Results

	LY	LM2_Y	LBLR	LDC	LK	LR
ADF						
• Level	-0.267	-3.642	-3.685***	-1.555	-0.370	-0.296
• 1 st Diff.	-4.567***	-7.588***	N/A	-6.924***	-6.089***	-7.641***
PP						
• Level	-0.239	-3.583	-3.477***	-1.446	-1.237	-0.638
• 1 st Diff.	-4.550***	-7.082***	N/A	-8.464***	-6.310***	-10.128***
KPSS						
• Level	0.550**	0.676**	0.163***	0.178**	0.194	0.117
• 1 st Diff.	0.192	0.221	N/A	0.111	N/A	N/A

Note*** indicates significance at the 1% level; ** indicates significance at the 5% level; and * represents significance at the 10% significance level.

The results of the ADF, PP and KPSS statistics showed that in the levels, all the variables except log of ratio of Liquid Bank Reserves to bank assets (LBLR) are non-stationary. In the case of LBLR, the ADF and the PP tests rejected the null hypothesis of non-stationarity while the KPSS test did not reject the null hypothesis of stationarity (see Table 5.1). On the other hand, in the first differences, in the case of ADF and PP tests, all the remaining variables (except LBLR) in Table 5.1 rejected the null hypothesis which revealed stationarity. Therefore we can inference, that all the variables except LBRL are integrated of order one i.e. I(1).The variable LBLR was integrated of order I(0). To put it differently, the results presented in Table 5.1, indicate that the variables M2_Y and DC can be tested for cointegration because they are I(1), while BLR cannot be tested for cointegration because it is I(0).

Having confirmed the variables LM2_Y and LDC are integrated of order one, the next step is to independently test for existence of a cointegration relationship between each of these proxies for

financial development (i.e. LM2_Y and LDC) and real GDP per Capita (LY). It is important to note that each of the financial variables was tested individually in a multivariate series with real GDP, capital stock and real interest rate. However, before carrying out the cointegration test, the optimal lag length of the VAR system was determined using the Schwarz Bayesian Criterion (SBC). The criterion suggested a lag length of 1.

The results of the Johansen test are summarized in Tables 5.2 and 5.3, which compare the trace and maximum-eigenvalue statistics with the corresponding critical values. The results reported in Tables 5.2 and 5.3 fail to reject the null hypothesis of no cointegration, $r = 0$, at the 5% significance level for series M2_Y and LDC respectively. This indicates that there is no cointegrating vectors between the financial development indicators (M2_Y and LDC) and economic growth (Real GDP per Capita) for Barbados. Therefore based on the results we may conclude that these variables for Barbados exhibit no long-run relationship for the period 1980 to 2014.

Table 5.2: Johansen's Cointegration Test Results (with M2_Y)

Trace Test			
Null Hypothesis	Alternative	Test Statistic	P-Value
$r = 0$	$r > 0$	20.333	0.884
$r \leq 1$	$r \geq 1$	10.144	0.884
$r \leq 2$	$r \geq 2$	4.606	0.623
$r \leq 3$	$r \geq 3$	0.445	0.565
Maximum Eigenvalue Test			
Null Hypothesis	Alternative	Test Statistic	P-Value
$r = 0$	$r = 1$	10.189	0.906
$r = 1$	$r = 2$	5.536	0.928
$r = 2$	$r = 2$	4.161	0.603
$r = 3$	$r \equiv 3$	0.445	0.565

Table 5.3: Johansen's Cointegration Test Results (with LDC)

Trace Test

Null Hypothesis	Alternative	Test Statistic	P-Value
$r = 0$	$r > 0$	19.340	0.9179
$r \leq 1$	$r \geq 1$	9.195	0.900
$r \leq 2$	$r \geq 2$	2.333	0.922
$r \leq 3$	$r \geq 3$	0.062	0.838
Maximum Eigenvalue Test			
Null Hypothesis	Alternative	Test Statistic	P-Value
$r = 0$	$r = 1$	10.146	0.908
$r = 1$	$r = 2$	6.861	0.824
$r = 2$	$r = 2$	2.271	0.891
$r = 3$	$r \leq 3$	0.062	0.838

Since the variables under study for Barbados indicate the absence of cointegration, the first difference of the variables were found and the standard vector Autoregression (VAR) was used to test for Granger Causality between the three proxies of financial development (LM2_Y, LBLR, and LDC) and economic growth. The results are reported in Tables 5.4, 5.5 and 5.6.

Table 5.4: Granger Causality Test Results (with M2_Y)

Null	χ^2 -Statistic	Prob.	Conclusion
Y does not Granger-causes M2_Y	2.133	0.344	Y does not Granger-causes M2_Y
M2_Y does not Granger-causes Y	3.413	0.182	M2_Y does not Granger-causes Y

*** indicates significance at the 1% level; ** indicates significance at the 5% level; and * represents significance at the 10% significance level.

Table 5.5: Granger Causality Test Results (BLR)

Null	χ^2 -Statistic	Prob.	Conclusion
Y does not Granger-causes BLR	16.73***	0.002	Y Granger-causes BLR
BLR does not Granger-cause Y	0.377	0.828	BLR does not Granger-cause Y

*** indicates significance at the 1% level; ** indicates significance at the 5% level; and * represents significance at the 10% significance level.

Table 5.6: Granger Causality Test Results (with DC)

Null	χ^2 -Statistic	Prob.	Conclusion
Y does not Granger-causes DC	4.204*	0.120	Y Granger-causes DC
DC does not Granger-cause Y	1.144	0.564	DC does not Granger-causes Y

*** indicates significance at the 1% level; ** indicates significance at the 5% level; and * represents significance at the 10% significance level.

As reported in Table 5.4, there is no short run causality between the monetization variable (M2_Y) and economic growth. However, in Tables 5.5 and 5.6 the evidence indicates that economic growth

Granger cause the ratio of bank liquid reserves to bank assets; as well as economic growth Granger cause domestic credit to private sector as a percentage of GDP. This shows that there is short-run causality from economic growth to the financial variables. This confirms that when the ratio of bank liquid reserves to bank assets and domestic credit to private sector is used as a proxy for financial development, a uni-directional causality can be found in Barbados.

Thus, we may conclude from these foregoing results that in the short run a distinct ‘demand-following’ hypothesis exists for Barbados. The results are in contradiction to Wood (1993) who found bidirectional causality for Barbados, as well as Craigwell et al. (2001) who found unidirectional causality but “supply-leading”. The differences in results may have been due to the different proxies used for the financial development variable.

Based on these results from the present findings, one may infer that Barbados should first concentrate on developing its real sector in order to stimulate higher levels of financial development, since the evidence supports the demand-following hypothesis. This finding implies it is the real sector that drives financial development which leads in the process of economic development in Barbados. Another possible suggestion from the results seen, highlight that the more rapid the growth rate of the real sector the greater the demand for external funds by enterprises, which eventually leads to further financial intermediation. Thus, from a policy perspective it can be inferred that the continued development of the real sector in Barbados may lead to further deepening and widening of the financial markets, which in turn may lead to further financial sector development.

The results of the impulse response function and the variance decomposition provided an indication of Granger causality beyond the sample period. Tables 5.7, 5.8 and 5.9 show the forecast error findings to ‘shocks’ in LY and LM2_Y, LBLR and LDC which support the results of the Granger causality test. The evidence in Table 5.7 indicates that 1 year ahead, 100 % of the total forecast error variance of economic growth is explained by its own innovations. However 10 years ahead, the financial development variable money stock (M2_Y), explains approximately 44.17% of the forecast error variance of economic growth in comparison to 41.14% of its own innovations.

Similarly, in table 5.8, when the financial variable BLR is used as a proxy in the model, 1 year ahead, 100% of the total forecast error variance of economic growth is explained by its own innovations. However, 10 years ahead the bank liquid reserves ratio as a percentage of GDP (BLR) weakly explained approximately 2.90% of the forecast error variance of economic growth.

In comparison 10 years ahead, economic growth explains 26.05% of the total forecast error variance of bank liquid reserves as a percentage of GDP. Similarly, domestic credit to the private as a percentage of GDP (DC) when used as the proxy for the financial development variable in Table 5.9,

the evidence indicates that 10 years ahead, 6.05% of the total forecast error variance of economic growth is also weakly explained by domestic credit to the private sector. Therefore a very small percentage of the forecast error variance of economic growth is explained by BLR and DC. This suggests that as Barbados' economy grows, there is a greater demand for financial services, particularly in the banking sector.

In addition, the impulse response function further supports the results of the variance decomposition in Figure 5.1, 5.2 and 5.3. In Figure 5.1, economic growth (LY) responds to itself then the response dies out. Therefore economic growth is significant since the band of the confidence interval of 95 percent falls above the zero range. In Figure 5.1, there is a response but the shock is only responsive to itself as also in the case of money stock (M2_Y). Figure 5.2 and 5.3 gave similar findings which indicate that economic growth, ratio of bank liquid reserves to bank asset (BLR) and domestic credit to private sector (DC) all responded positively to a shock to itself. This further reinforces that there is no cointegration between the variables since all the figures indicate that causal relationship between growth and financial development variables appear to be relatively weak.

Table 5.7: Variance Decomposition Percentage of 10-period error variance (with LM2_Y)

Variance Decomposition of LY:					
Period	S.E.	LY	LM2_Y	LK	LR
1	0.034409	100.0000	0.000000	0.000000	0.000000
5	0.086969	58.18286	27.41348	4.061051	10.34261
10	0.112295	41.14245	44.17399	2.772436	11.91112
Variance Decomposition of LM2_Y:					
Period	S.E.	LY	LM2_Y	LK	LR
1	0.060766	1.526503	98.47350	0.000000	0.000000
5	0.155693	1.492752	96.23875	0.764901	1.503601
10	0.282065	3.099872	87.87847	1.243456	7.778204
Variance Decomposition of LK:					
Period	S.E.	LY	LM2_Y	LK	LR
1	0.149199	0.530692	3.519828	95.94948	0.000000
5	0.213570	7.597434	4.605777	62.32188	25.47491
10	0.243388	7.893639	5.040753	61.23842	25.82719
Variance Decomposition of LR:					
Period	S.E.	LY	LM2_Y	LK	LR
1	0.262406	24.66760	5.553514	3.860301	65.91858
5	0.472319	9.490169	23.49678	9.501336	57.51172
10	0.660268	5.932715	41.59116	11.80184	40.67429

Table 5.8: Variance Decomposition Percentage of 10-period error variance (with LBLR)

Variance Decomposition of LY:					
--------------------------------------	--	--	--	--	--

Period	S.E.	LY	LBLR	LK	LR
1	0.036410	100.0000	0.000000	0.000000	0.000000
5	0.086226	73.86125	3.037099	11.15189	11.94977
10	0.095154	71.63132	2.902876	14.48259	10.98322
Variance Decomposition of LBLR:					
Period	S.E.	LY	LBLR	LK	LR
1	0.243133	0.508744	99.49126	0.000000	0.000000
5	0.367231	18.06912	48.60215	1.410699	31.91803
10	0.416299	26.04938	39.10981	1.782785	33.05803
Variance Decomposition of LK:					
Period	S.E.	LY	LBLR	LK	LR
1	0.149368	0.047804	11.90022	88.05198	0.000000
5	0.212502	6.253303	7.932507	60.49992	25.31427
10	0.228955	8.352874	12.39752	54.14459	25.10502
Variance Decomposition of LR:					
Period	S.E.	LY	LBLR	LK	LR
1	0.263210	31.06440	0.380174	1.005211	67.55022
5	0.423950	17.04756	6.983411	7.761146	68.20788
10	0.439296	17.47718	7.959331	7.706675	66.85681

Table 5.9: Variance Decomposition Percentage of 10-period error variance (with LDC)

Variance Decomposition of LY:					
Period	S.E.	LY	LDC	LK	LR
1	0.035871	100.0000	0.000000	0.000000	0.000000
5	0.085740	74.48086	2.154244	12.50798	10.85692
10	0.096623	68.64378	6.049069	15.39613	9.911022
Variance Decomposition of LDC:					
Period	S.E.	LY	LDC	LK	LR
1	0.082401	0.000139	99.99986	0.000000	0.000000
5	0.175559	1.811546	90.86644	6.177586	1.144424
10	0.203713	1.416294	86.92786	10.37275	1.283099
Variance Decomposition of LK:					
Period	S.E.	LY	LDC	LK	LR
1	0.152199	0.000971	0.262633	99.73640	0.000000
5	0.212278	6.067401	0.318302	68.99963	24.61467
10	0.246456	5.081183	13.76088	56.81601	24.34192
Variance Decomposition of LR:					
Period	S.E.	LY	LDC	LK	LR
1	0.261540	33.75432	1.393757	2.127634	62.72429
5	0.434338	16.92719	14.18288	7.550328	61.33960
10	0.556810	13.11718	38.12571	6.295002	42.46210

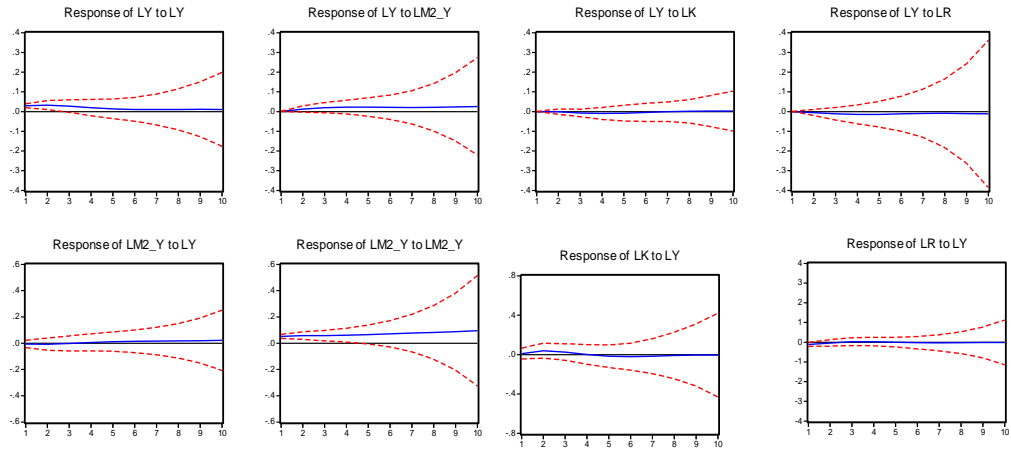


Figure 5.1: Impulse Response to Cholesky One S.D. Innovations (with M2_Y)

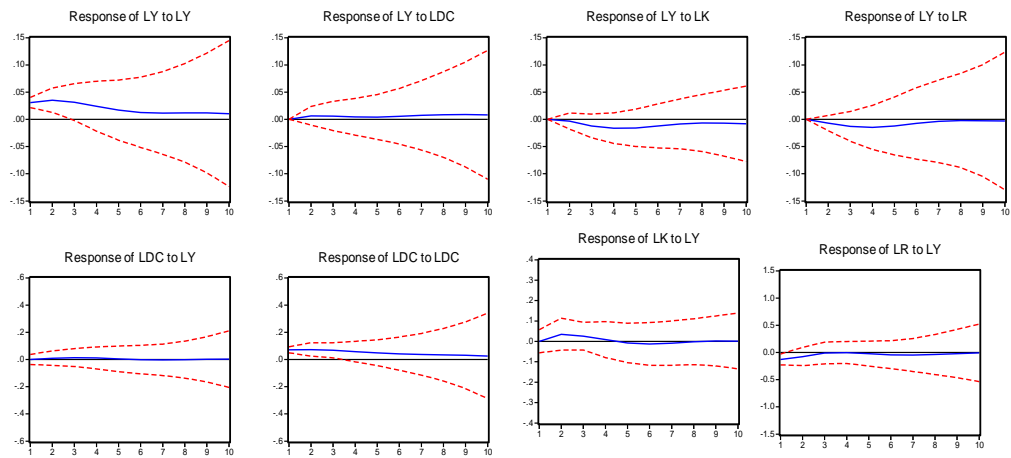


Figure 5.2: Impulse Response to Cholesky One S.D. Innovations (with LDC)

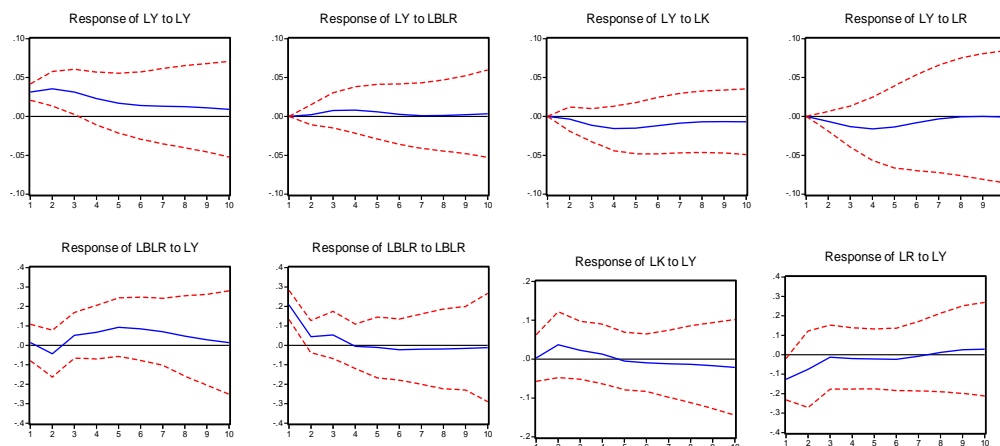


Figure 5.3: Response to Cholesky One S.D. Innovations (with LBLR)

6. CONCLUSION, POLICY IMPLICATIONS AND LIMITATION OF THE PAPER

6.1 Conclusion and Policy Implications

The direction of causality between financial development and economic growth has been an issue of contentious debate, among academics as well as policy makers. The thrust of this debate has been whether the policy makers should first pursue financial development in order to induce higher levels of economic growth or whether they should first concentrate on the development of the real sector in order to stimulate higher levels of financial development (Odhiambo 2005).

This paper empirically examined whether financial development is supply-leading or demand-following for Barbados. A Granger approach to causality testing within a multivariate framework of cointegration and error correction modeling were employed to examine the short run and long run relationship. Innovative accounting techniques (impulse response function and variance decomposition) were also utilized to examine the out-of-sample relation between financial development and economic growth. The empirical analysis was conducted with annual data from 1980 to 2014.

The empirical results for Barbados support the ‘demand-following’ hypothesis in the short run. The analysis suggests that the relationship between financial development and economic growth is unidirectional in the short run. Moreover, there is no long run relationship. It should be noted that the short run causality runs from economic growth to financial development when the financial development proxies—ratio of bank liquid reserves and

domestic credit to private sector as a percentage of GDP—are used. Hence according to the results, in the short run a distinct demand-following hypothesis exists for Barbados.

The results of the innovation accounting techniques (impulse response function and the variance decomposition) gave more robustness to the results as it further supports the uni-directional relationship. The results indicate that the variables all respond positively to themselves and that economic growth had greater impact on financial development variables.

Thus, from the foregoing results, one may suggest that Barbados should first concentrate on developing its real sector in order to stimulate higher levels of financial development.

6.2 Limitations and Further Research

The present paper on financial development and economic growth only focuses on one Caribbean country with a relatively high level of development. Hence the results in this paper indicate the vital role that country specific factors may have played in influencing the relationship between financial development and economic growth. Therefore, the findings in this paper cannot by itself be taken as a full representation of the relationships that may exist between economic growth and financial development in the Caribbean. In short, therefore, the findings in this paper are indicative rather than conclusive vis-à-vis the rest of the Caribbean. Further study is needed in regards to the country specific factors, ignoring them could result in misleading policy inferences.

It should also be pointed out that the present paper uses money stock, ratio of bank liquid reserves to bank assets and domestic credit to private sector as three broad indicators of financial development. However, since the financial structure appears to be very different across the Caribbean, it is not possible to claim in this present paper that there is a unique relationship between the financial structure and different levels of economic growth throughout the region. Further research is needed to investigate different Caribbean countries as well as other indicators of financial development to arrive at more robust result in regards to the causal relationship between financial development and economic growth.

LIST OF REFERENCES

- Arestis, P. and P.O. Demetriades. 1997. Financial development and economic growth: Assessing the evidence. *Economic Journal* 107:783-789
- Bank of Jamaica. 1999. *Statistical Digest*. Kingston, Jamaica: Bank of Jamaica.
- Barro, R.J. 1991. Economic growth in a cross-section of countries. *Quarterly Journal of Economics* 106(2):407-443
- Beck, T., R. Levine. and N. Loayza. 2000. Finance and source of growth. *Journal of Financial Economics* 58:261-300
- Bibao-Osorio, B. (2013): World Economic Forum (2013) Agenda, The Top 10 most competitive economies in Latin America and the Caribbean. <https://agenda.weforum.org/2014/09/top-10-competitive-economies-latin-america-caribbean/>
- Boulila, G. and M. Trabelsi. 2002. Financial Development and Long-run Growth: Granger causality in a bivariate VAR structure – Evidence from Tunisia (1962 – 1997). *Working Paper Faculte' des Sciences Economiques et de Gestion de Tunis*.
- Braunn, P.A. and S. Mitnik. 1993. Misspecifications in vector autoregression and their effects on impulse responses and variance decompositions. *Journal of Economics* 59:319-341
- Caderon, C. and L. Liu. nd. The Direction of Causality between Financial Development and Economic Growth. *Working Papers of Central Bank of Chile* No.184
- Central Bank of Barbados. <http://www.centralbank.org.bb/>
- Cheung, Y.W. and K. Lai. 1993. A fractional cointegration analysis of purchasing power parity. *Journal of Business Economics Statistics* 11:103-112
- Choe, C. and I.A. Moosa. 1999. Financial system and economic growth: the Korean experience. *World Development* 27(6):1069-1082
- Chuah, H.L., and V. Thai. 2004. Financial Development and Economic Growth: Evidence from Causality Test for the GCC Countries. *IMF Working Papers* WP/04
- Craigwell, R., D. Downes. and M. Howard. 2001. The finance-growth nexus: a multivariate analysis of a small open economy. *Saving and Development* 2:209-223
- Crichton, N. and C. DeSilva. 1989. Financial development and economic growth: Trinidad and Tobago 1973-1987. *Social and Economic Studies* 38(4):133-162

- Demetriades, P.O. and K. Hussein. 1996. Does financial development cause economic growth: time-series evidence from 16 countries. *Journal of Development Economics* 51:377-411
- De Gregorio, J. and P.E. Guidotti. 1995. Financial development and economic growth. *World Development* 23(3):433-448
- Diamond, D.W. 1984. Financial intermediation and delegated monitoring. *The Review of Economic Studies* 5(3):393-414
- Dickey, D.A. and D.A. Fuller. 1979. Distributions of the estimations for autoregressive time-series with a unit root. *Journal of American Statistical Association* 74:425-431
- Engle, R.F. and C.W.J. Granger. 1987. Cointegration and error correction: representation, estimation and testing. *Econometrica* 55(2):251-276
- Erdal, G., S.V. Okan. and T. Behiye. 2007. Financial development and economic growth: evidence from North Cyprus. *International Research Journal of Finance Economics Issue* 8.
- Eschenbach, F. 2004. Finance and growth: a survey of the theoretical and empirical literature. *Erasmus School of Economics. May.*
- Fritz, R.G. 1984. Time-series evidence on causal relationship between financial deepening and economic development. *Journal of Economic Development* 15:91-112
- Fry, M.J. 1978. Money and capital or financial deepening in economic development. *Journal of Money, Credit and Banking* 10:464-475
- , 1995. Money, interest and banking in economic development. *The John Hopkins University Press*
- Gerschenkron, A. 1962. Economic backwardness a historical perspective. *Harvard University Press.*
- Geweke, J., R. Masee. and W. Dent. 1983. Comparing alternative tests of causality in temporal systems: analytical results and experimental evidence. *Journal of Econometrics* 21:161-194
- Granger, C.W. 1969. Investigating causal relations by econometric models and cross spectral methods. *Econometrica* 37:424-438
- , 1986. Development in the study of cointegrated variables. *Oxford Bulletin of Economics and Statistics*, 213-228
- , 1988. Some recent developments in the concept of causality. *Journal of Econometrics* 39(1/2):199-211
- Guilkey, D.K. and M. Salemi. 1982. Small sample properties of three tests for Granger-causal ordering in a bivariate stochastic system. *Review of Economics and Statistics* 39:199-211

- Guidance (2015), Doing business in Trinidad and Tobago: Trinidad and Tobago trade and export guide. *UK Trade and Investment*.
<https://www.gov.uk/government/publications/exporting-to-trinidad-and-tobago/exporting-to-trinidad-and-tobago> (accessed August 2015).
- Green, P.M. 1999. Preserving the integrity of Jamaica financial system: the challenges. *Paper prepared for the Central Bank Responsibility for Financial Stability Workshop*.
- Greenidge, K. and C. Milner. 2007. Financial liberalization and economic growth in selected Caribbean countries. *Central Bank of Barbados, Working Papers 2007*
- Greenwood, J. and B. Jovanoic. 1990. Financial development, growth and the distribution of income. *Journal of Political Economy* 98(5):1076-1107
- Goldsmith, R.W. 1969. Financial structure and development. *Yale University Press*.
- Habibullah, M.S. and Y. Eng. 2006. Does financial development cause economic growth? a panel analysis for the Asian economies. *Journal of Asian Pacific Economy* 11(4):377-393
- Howard, M. 2001. Financial liberalization in Jamaica. *Savings and Development* 25:4
- Hsiao, C. 1979. Autoregressive regressive modeling of Canadian money and income data. *Journal of American Statistical Associations* 74:553-560
- IMF. 2006. Jamaica: 2006 Article IV Consultation-Staff Report; Staff Supplement; Staff Statement; and Public Information Notice on the Executive Board Discussion. *IMF Country Report No.08/199*
- 2007. Trinidad and Tobago: 2007 Article IV Consultation-Staff Report; Staff Supplement; Staff Statement; and Public Information Notice on the Executive Board Discussion. *IMF Country Report No.07/10*
- 2008. Barbados: 2008 Article IV Consultation-Staff Report; Staff Supplement; Staff Statement; and Public Information Notice on the Executive Board Discussion. *IMF Country Report No.08/295*
- International Monetary Fund (February 2013): Barbados: 2013 Article IV Consultation. *IMF Country Report No. 14/52*.
- 2013. Trinidad and Tobago: Staff Report for 2013 Article IV Consultation – Staff Report, Press Release; and Statement By The Executive Director for Trinidad and Tobago. *IMF Country Reports* 13/306.
- 2014. Trinidad and Tobago: 2014 Article IV Consultation – Staff Report, Press Release; and Statement By The Executive Director for Trinidad and Tobago. *IMF Country Reports* 14/271.

- , 2014. Jamaica: Staff Report for the 2014 / Article IV Consultation –, Fourth Review under the Extended Arrangement under the Extended Fund Facility and Request for Modification of Performance Criteria. *IMF Country Reports* 14/169
- , 2014. International Monetary Fund Executive Board Completes Seventh Review under IMF's Extended Fund Facility for Jamaica and Approves US\$ 39 Million Disbursement. *Press Release* No. 15/147
- , 2015. Jamaica: Third Review under the Extended Arrangement under the Extended Fund Facility and Request for Modification of Performance Criteria; Press Release and Statement by the Executive Director. *IMF Country Reports* 14/85.
- IMF, et.al (2004) Consumer Price Index Manual: Theory and Practice. http://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/presentation/wcms_331153.pdf
- Iyare, S., T. Lorde. and B.M. Francis. 2005. Financial development and economic growth in developing economies: empirical evidence from the Caribbean. *ForthComing Ekonomia* 8(2)
- Johansen, S. and K. Juselius. 1990. Maximum likelihood estimation and inference on cointegration with applications to demand for money. *Oxford Bulletin of Economics and Statistics* 52:169-211
- Jung, W.S. 1986. Financial development and economic growth: international evidence. *Economic Development and Cultural Change* 34:333-346
- Kamat, M.S. and M.M. Kamat. 2007. Does financial growth leads to economic performance in India? causality-cointegration using unrestricted vector error correction models. *MPRA Paper* No. 6154
- Kar, M. and E.J. Pentecost. 2000. Financial development and economic growth in Turkey: further evidence on the causality issue. *Economic Research Paper* No.00/27
- Keynes, J.M. 1936. The General Theory of Employment, Interest and Money. *Macmillan*
- King, R.G. and R. Levine. 1993a. Finance and growth: Schumpeter might be right. *Quarterly Journal of Economics* 108:717-737
- , 1993b. Finance entrepreneurship and growth: theory and evidence. *Journal of Monetary Economics* 32(3):513-542
- , 1993c. Financial intermediation and economic development. *Cambridge University Press* 156-189
- Kwiatkowski, D., P.C.B. Phillips., P. Schmidt. and Y. Shin. 1992. Testing the null hypothesis of stationarity against the alternative of a unit root. *Journal of Econometric* 54:159-178

- Law, S.H., W.N. Azman-saini. and P. Smith. Finance and growth in small open emerging markets. *Munich Personal REPEc Archive (MPRA)*
- Levine, R. 2004. Finance and Growth: Theory and evidence. *Carlson School of Management, University of Minnesota and the NBER* 321.
- , 1997. Financial development and economic growth: views and agenda. *Journal of Economics Literature* 35.
- Levine, R., N. Loayzo. and T. Beck. 2000. Financial intermediation and growth: causality and causes. *Journal of monetary Economics* 46:31-77
- Lim, G. 1991. Jamaica financial system: It's historical development. Paper presented at the Meeting of the Regional Programme of Monetary Studies
- Lucas, R.E. 1988. On the mechanics of economic development. *Journal of Monetary Economics* 22:3-42
- Luintel, K.B. and M. Khan. 1999. A quantitative reassessment of the finance-growth nexus: evidence from a multivariate VAR. *Journal of Development Economics* 60:381-405
- Lutkepohl, H. 1993. *Introduction to Multiple Time-Series Analysis*. Second Edition Springer-Verlag.
- Mankiw, G.N. 1986. The allocation of credit and financial collapse. *Quarterly Journal of Economics*. 3:455-470
- McBain, H. 1997. Factors influencing the growth of financial services in Jamaica. *Social and Economic Studies* 46(2 and 3)
- McKinnon, R. 1973. Money and capital in economic development. *Brookling Institution, Washington D.C.*
- Modeste, N. 1993. An empirical test of the McKinnon model of financial unrepression and economic growth: the experience of some Caribbean countries. *Social and Economic Studies* 42:81-93
- Moody's Investor Services (June 2014): Rating Action: Moody's downgrades Barbados government bond rating to B3 from Ba3; outlook remains negative. *Global Credit Research*. https://www.moody.com/research/Moodys-downgrades-Barbados-government-bond-rating-to-B3-from-Ba3--PR_299250 (accessed 15/7/2015)
- Morirune, K. and A. Motani. 1995. Estimating the rank of cointegration after estimating the order of a vector autoregression. *The Japanese Economic Review* 46(2):191-205
- Muhammad, S., A. Rehmat. and A. Liaqat. 2008. Bi-directional causality between foreign direct investment and savings: A case study of Pakistan. *Internal Research Journal of Finance and Economics*

- Patrick, H.T. 1966. Financial development and economic growth in the underdeveloped countries. *Economic Development and Cultural Change* 174-189
- Peart, K. 1995. Financial reform and the financial sector development in Jamaica. *Social Economic Studies* 44:1-22
- Odedokun, M.O. 1996. Alternative econometric approaches for analyzing the role of the financial sector in economic growth: time-series evidence from LDCs. *Journal of Development Economics* 50:119-146
- Odhiambo, N.M. 2004a. Financial liberalization and economic growth in Sub-Saharan African countries: dilemmas and prospects. PhD diss., University of Stellenbosch, South Africa.
- , 2004b. Is financial development a spur to economic growth? causal evidence from South Africa. *Saving and Development* 28(1):47-62
- , 2008. Financial depth, savings and economic growth in Kenya. a dynamic causal linkage economic modeling. *Saving and Development* 25(4):704-713
- Phillips, P. and P. Perron. 1998. Testing the unit root in time series regression. *Biometrika* 75:336-340
- Quin, B.G. 1998. A note on AIC order determination for multivariate autoregression. *Journal of Time-Series Analysis* 9:241-245
- Rajan, R. and L. Zingales. 1998. The influence of the financial revolution on the nature of firms. *American Economic Review*
- Rachdi, H and MCBarek, H. 2011. The causality between financial development and economic growth: Panel data cointegration and GMM systems approaches. *International Journal of Economics* vol. 3, no.1 February.
- Robinson, J. 1952. *The Generalization of the General Theory in the Rate of Interest and other Essays*. Macmillan 69-142
- Schumpeter, J.A. 1912. *The Theory of Economic Development*. Harvard University Press.
- Shan, J.Z., G. Allan. and F. Sun. 2001. Financial development and economic growth: an egg-and-chicken problem? *Review of International Economics* 9(3):443-454
- Shaw, E.S. 1973. *Financial Deepening and Economic Development*. Oxford University Press.
- Schwab, K. (2013): World Economic Forum (2013-14), The Global Competitiveness Report. *Full Data Edition*. http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2013-14.pdf (15/4/2015)

- Suleiman, A. and A. Abu-Qarn. 2005. Financial development and economic growth in Egypt: times-series evidence from Egypt. PhD diss., University of the Negev.
- , 2006. Financial development and economic growth: empirical evidence from Mena Countries. *MRPA Paper NO. 972*.
- Stiglitz, J.E. 1989. Financial markets and development. *Oxford Review of Economic Policy* 5(4):55-68
- Stiglitz, J.E. and A. Weiss. 1981. Credit rationing in the market with imperfect information. *American Economic Review* 71(3):393-410
- Skeete, S.D. 2006. Financial sector reform, financial development and economic growth in the Caribbean: evidence From Guyana, Jamaica and Trinidad and Tobago. MSc diss., Univ. of the West Indies, Cave Hill Campus.
- Stennett, R.R., P.M. Batchelor. and S. Camille. 1998. Stabilization and the Jamaica financial sector 1991-1997. Mimeo Bank of Jamaica.
- Stolbov, M. 2015. Causality between credit depth and economic growth: evidence from 24 OECD countries. Bank of Finland discussion papers 15/2015. *Institute for Economics in Transition*.
- Taylor, L. 1983. *Structural Macroeconomics: Applicable Models for the Third World*. New York: Basic Books.
- Tobin, J. 1965. Money and economic growth. *Econometrica* 33(4):671-684.
- Transparency International. "Corruption Perception Index." <http://www.transparency.org/research/cpi/overview> (15/4/2015).
- Van – Wijnbergen, S. 1982. Staflationary effects of monetary stabilization policies. a quantitative analysis of South Korea. *Journal of Development Economics* 10(2):133-169
- , 1983a. Interest rate management in LDCs. *Journal of Monetary Economics*. 12(3):433-452
- , 1983b. Credit policy, inflation and growth in a financially repressed economy. *Journal of Monetary Economics* 13(1-2):45-65
- Wan-Chun, L. and H. Chen-Min. 2006. The role of financial development in economic growth: the experiences of Taiwan, Korea and Japan. *Journal of Asian Economics* 17:667-690
- Wood. A. 1993. Financial development and economic growth in Barbados: causal evidence. *Savings and Development* 4:379-390
- , 1994. Improving the contribution of the finance to growth process in Barbados- is financial liberalization a desirable option? *Savings and Development*.

- World Bank (2015). World Development Indicators Online Database. <http://publications.WorldBank.org/WDI/> (15/7/2015). Washington, D.C.: World Bank.
- Worldwide Governance Indicators. <http://info.worldbank.org/governance/wgi/index.aspx#countryReports> (15/4/2015)
- Wu, C. and S. Tsai. 1999. Financial development and economic growth of developed vs. Asian developing countries: a pooling time-series and cross-country analysis. *Review of Specific Basin Financial Markets and Policies* 2(1):57-81.
- Zang, H. and Y.C. Kim. 2007. Does financial development precede economic growth? Robinson and Lucas might be right. *Applied Economic Letters* 14(1):15-19.