Financial Development and Economic Growth in the CARICOM sub region

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ABSTRACT

The objective of this study is to determine if a relationship exists between financial development and economic growth for three CARICOM countries, Barbados, Jamaica and Trinidad and Tobago and, provided that a relationship is found, to determine the nature and extent of the relationship. The investigation is carried out within a VAR/VECM framework on three countries, Barbados, Jamaica and Trinidad and Tobago, over the period 1970 – 2002. Some evidence is found for causality in both directions - from financial development to economic growth, as well as from economic growth to financial development – but there is also evidence that the result may be perverse in that particular forms of financial development may result in lower growth rates. Policy recommendations are made.

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1. Introduction

The objective of this study is to determine if a relationship exists between financial development and economic growth in Barbados, Jamaica and Trinidad and Tobago, three of the four so-called More Developed Countries of the 14 country CARICOM grouping. Provided that a relationship is found, the study will also seek to establish the nature and extent of that relationship. We seek, in particular, to determine whether in these countries financial development is "supply-leading" or "demand-following", or some combination of both (Patrick, 1966), or no relationship at all.

The usefulness of this study is evident: if indeed there does exist a relationship between financial development and economic growth and the direction of causality is from financial development to economic growth, then these economies can achieve growth (and possibly development) by developing their financial systems even further. Previous studies have provided evidence of unidirectional and bidirectional causality, and some have shown that the direction of causality is from economic growth to financial development only (Levine, 1997).

The fundamental methodological tool in this exercise is a Vector Error Correction Model (VECM), which is used to examine the relationship between variables indicative of financial sector growth and economic growth, using quarterly data for periods ranging from 1970 to 2002. This is done in a series of steps, all of which shed some light on the nature of the relationship among the variables. A Vector Autoregression (VAR) model is set up and used, in the first instance, to conduct block causality tests[2]. These tests will be complemented by an analysis of the impulse responses and variance decompositions of the forecast errors. Using the chosen VAR, cointegration tests are carried out to determine the existence of long-run relationships between the variables and a Vector Error Correction Model derived if such cointegration is verified. This will be used to shed

[2] These are used in preference to classic Granger causality tests since conclusions drawn from the latter are likely to be based on biased results. This is because they assume only a bivariate specification while the models used in this paper involve three variables.

further light on the relationship between financial development and economic growth and, in particular, to determine the direction of causality.

Financial development is measured by two variables: the ratio of broad money, M_2, to GDP, and the ratio of domestic credit to the private sector and GDP. Economic growth is measured as the per capita growth in real GDP.

Previous studies examining the relationship between financial development and economic growth have involved a variety of methods. Some have employed cross country growth regressions (Berger, Hassan and Klapper, 2004; Dawson, 2003; Deidda, 2001; Khan and Senhadji, 2000; King and Levine, 1993; Lensink, 2001; Odedokun, 1996; Rajan and Zingales, 1998; Sala-i-Martin, 1997). Others have used a panel type framework (Calderon and Liu, 2003; Edison, Levine, Ricci and Slok, 2002; Manning, 2003), while yet others have used a mixture of both (Khan and Senhadji, 2001; Aziakpono, 2000; Rousseau and Sylla, 2001). More recent studies have used the Granger causality methods to examine the relationship between the level of financial development and economic growth in the economy (Arestis, Demetriades and Luintel, 2001; Bhattacharya and Sivasubramanian, 2003; Chang, 2002; Darrat, Abosedra and Aly, 2005; Demetriades and Hussein, 1996; Ghirmany, 2004; Luintel and Khan, 1999; Thangavelu and James, 2004; Shan and Morris, 2002).

The rest of the paper is organized as follows: in section 2, we discuss the model, data and methodology to be employed. We also establish some preliminary properties of the data and, in particular, conduct unit root tests on them. In section 3, the centerpiece of the paper, we estimate the various versions of the model and analyze the results obtained. Section 4 contains policy recommendations and section 5 concludes the paper.

2. Model, data and methodology

The basic relationship to be examined in this paper, for each country, is

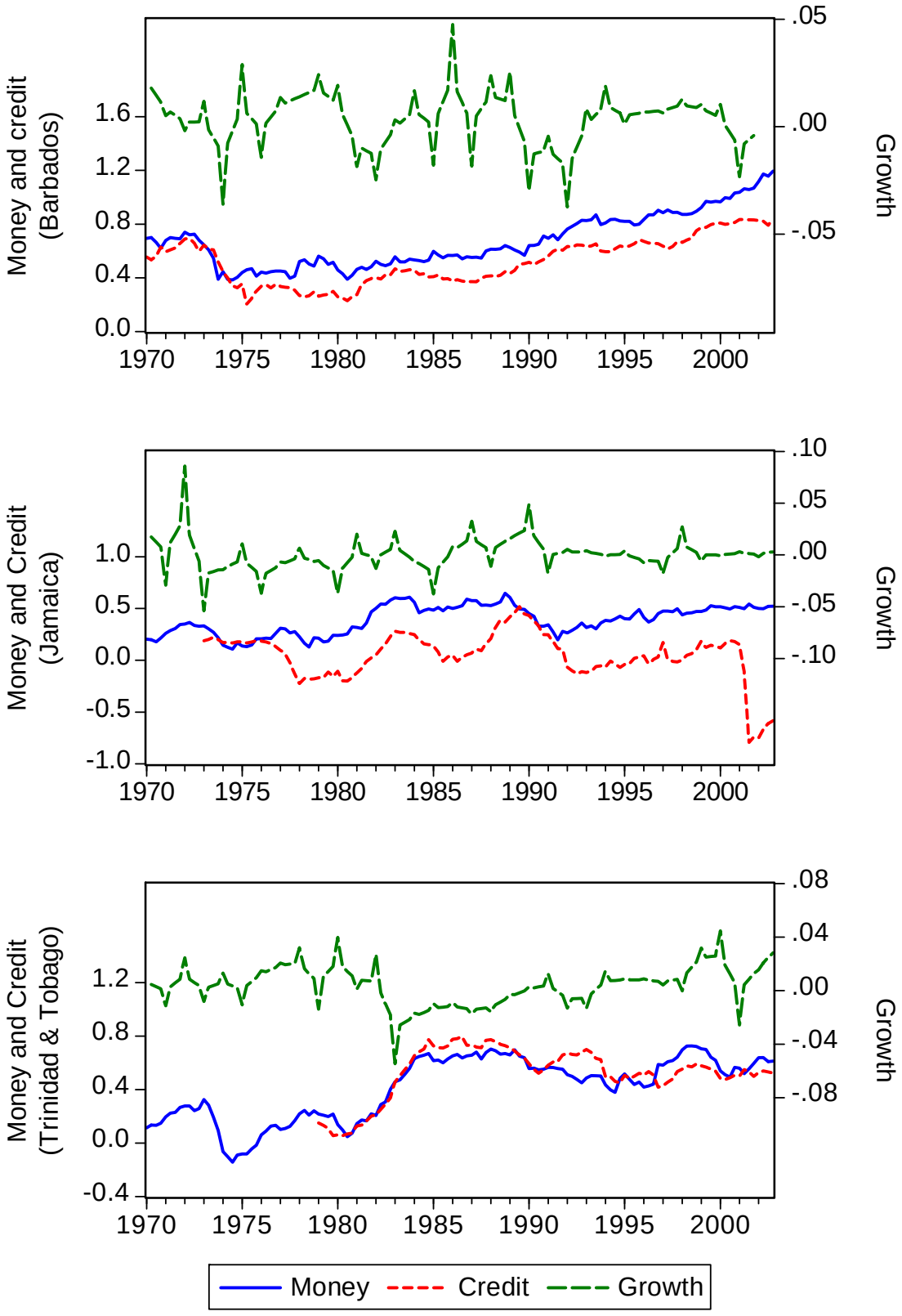
$$F(M_2/GDP, C/GDP, g, u) = 0$$

where M_2 is defined as broad money, GDP is the current value of the Gross Domestic Product in the economy, C is the amount of domestic credit to the private sector, g the per capita growth rate of real income and u a vector of error terms. Quarterly data for M_2 and C, and annual data for nominal and constant value GDP, are collected from the IFS online statistical data base. The annual GDP data are converted into quarterly data using a procedure proposed by Goldstein and Khan (1976). The data sets to be used for Barbados and Jamaica cover the period 1970, first quarter, to 2002, fourth quarter, while that for Trinidad & Tobago begins in 1979, first quarter, and ends in 2002, fourth quarter. All analysis will be done on the natural logarithms of M_2/GDP and C/GDP, which shall henceforth be called, respectively, the money and credit variables, and will be denoted, respectively, as m and c.

The money and credit variables are indicators of financial development. Alternative indicators have appeared in the literature, such as the ratio of liquid liabilities to GDP, the capitalization ratio (which shows the ratio of market capitalization to Nominal GDP and is a measure of stock market and bond market development), and the ratio of loans made by both banking and non banking financial intermediaries to the private sector as a proportion of the nominal GDP.

The evolution of the money, credit and growth variables for the 3 countries is shown in Figure 1 below.

Figure 1: Financial evolution and Growth



The two financial variables move very closely together in the case of Trinidad and Tobago and, if we ignore data beyond the first quarter of 2001, that statement applies also the case for Jamaica. Nothing in the plots suggests, however, that there is some obvious positive relationship between the financial variables and the growth variable. A study of the simple correlation coefficients between the variables, shown in Table 1 below, provides further information on these relationships.

Table 1
Simple Correlation Coefficients (%)

Variables	Barbados	Jamaica[a]	Trinidad & Tobago
Money and Credit	91.6	11.6 (40.1)	87.8
Money and Growth	-3.52	40.8 (40.7)	-20.2
Credit and Growth	-17.3	11.0 (20.1)	-41.5

a Values in parentheses are obtained when series beyond 2001, first quarter are excluded.

There is a very strong positive correlation between the financial variables in Jamaica and Trinidad & Tobago. It is only in the case of Jamaica, however, is the correlation between the financial variables and growth a positive one. Correlation, as is well known, is no indicator of causation. A more in-depth analysis, as will follow, is required to determine this. However, the negative sign is startling enough to elicit some possible explanation. It could very well be the case that at least one of the financial variables has a negative effect on economic growth in Barbados and Trinidad & Tobago. If this is the case, then because of the strong positive relationship between the two financial variables, the other will appear as having a negative correlation even though the causation, if it exists and it whatever direction it may exist, might be positive.

As a further preliminary step, all variables used are tested for unit roots using two procedures: the Augmented Dickey-Fuller (ADF) tests and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. The null in the former case is that the series is I(1), while in the latter case, the null is that it is I(0). The results obtained are displayed in Table 2 below, which also shows the conclusions drawn. Growth fluctuates and even declines while the financial variables are climbing.

Table 2
Tests for Unit Roots

Country	Variable	ADF	KPSS	Conclusion
Barbados	m	Level: -1.860 1st Diff: -11.50[A]	Level: 0.2938[A] 1st Diff: 0.5515[B]	Series I(1).
	c	Level: -1.676 1st diff: -10.38[A]	Level: 0.2548[A] 1st diff: 0.2738	Series I(1).
	g	Level: -3.071 1st Diff: -9.475[A]	Level: 0.0428 1st Diff:	Series I(1). based on ADF results.
Jamaica	m	Level: -1.9630 1st Diff: -9.8858[A]	Level: 0.1321[C] 1st Diff: 0.0532	Series I(1).
	c	Level: -2.199 1st diff: -8.3531[A]	Level: 0.1306[C] 1st diff: 0.1330	Series I(1).
	g	Level: -3.4771[B] 1st Diff: -8.553[A]	Level: 0.0979 1st Diff:	Series I(0)
Trinidad & Tobago	m	Level: -1.4347 1st Diff: -7.9842	Level: 0.1722[B] 1st Diff: 0.1388	Series I(1).
	c	Level: -1.7665 1st diff:- 6.9467[A]	Level: 0.2305[A] 1st diff: 0.2763	Series I(1).
	g	Level: -2.4798 1st Diff: -4.9215[A]	Level: 0.1647[B] 1st Diff: 0.0859	Series I(1).

Test equation for null in levels includes intercept and trend term and intercept term only for null in 1st differences.
A Null rejected at 1% or lower
B Null rejected between 1% and 5%
C Null rejected between 5% and 10%

There is convincing evidence that all the series are I(1), except for the growth rate in the Jamaican economy, which appears to be I(0). The methodology to be employed requires, in a first step, the establishment of a Vector Autoregression (VAR) model to be used, in the first instance, to conduct block causality tests[3]. These tests will be complemented by an analysis of the impulse responses and variance decompositions of the forecast errors. Using the chosen VAR, cointegration tests are carried out to determine the existence of long-run relationships between the variables and a Vector Error Correction Model derived if such cointegration is verified. This will be used to shed further light on the relationship between financial development and economic growth and, in particular, to determine the direction of causality.

[3] These are used in preference to classic Granger causality tests since conclusions drawn from the latter are likely to be based on biased results. This is because they assume only a bivariate specification while the models used in this paper involve three variables.

3. Analysis of results

The first step in the process is to choose the optimal lag length of the 3-variable VAR model for each of the countries. Various selection criteria are available, including the sequential modified Likelihood Ratio (LR) criterion, the Final Prediction Error (FPE) criterion, the Akaike Information Criterion (AIC), the Schwarz Bayesian Criterion (SIC) and the Hannan-Quinn Information (HQC) criterion. There is no unanimity among practionners about the best criterion (or set of criteria) to use, but Ivanov and Kilian (2005) establish on the basis of experimental evidence that "for quarterly VAR models, the Hannan-Quinn Criterion (HQC) appears to be the most accurate criterion with the exception of sample sizes smaller than 120, for which the Schwarz Information Criterion (SIC) is more accurate" and, furthermore, that "sequential Lagrange-multiplier and likelihood ratio tests cannot be recommended". In a very influential paper, Hamilton and Herrera (2004) argue strongly in favour of the sequential testing procedure, especially when there is some a priori knowledge (based on previous studies) about the lag length. We have no a priori knowledge of lag length so we will not use the LR criterion. For the cases of Barbados and Jamaica, we have sample sizes that just exceed 120. In these two cases, therefore we use both the HQC and the SIC. For the Trinidad & Tobago case, where our sample size is notably less than 120, we will use the SIC. The criteria used resulted in a choice of a lag of order 1 for all three cases[4].

Block causality tests are now carried out on the systems as established. The results obtained are summarized in Table 3 below[5]:

[4] The VAR for Barbados included a trend and a constant term, and that for Jamaica and for Trinidad & Tobago a constant term only.

[5] Blocks of one and two variables were tested. The results based on one variable alone are shown here since no block of two variables was shown to be significant unless at least one variable in that block was also significant.

Table 3
Results of Block Causality Tests

Country	Direction of causation	m	c	g
Barbados	m causes:		●	●
	c causes:	●		●
	g causes:		●	
Jamaica	m causes:			●
	c causes:			
	g causes:			
Trinidad & Tobago	m causes:		●	●
	c causes:			●
	g causes:	●	●	

● Significant at 5% or better.

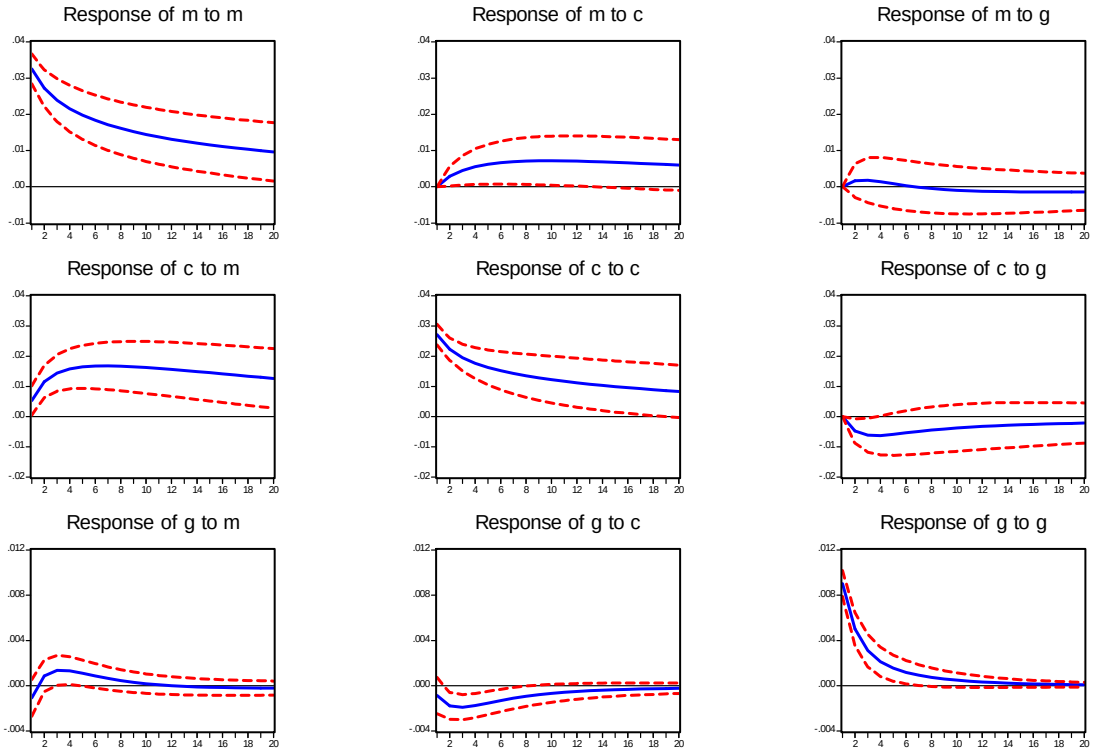
The case of Jamaica stands out because the private credit variable does not interact with any other in the system and could possibly be removed (if this is done, we are left with a 2-variable system, and the optimal lag is once again equal to 1). Furthermore, there is evidence of unidirectional causality only from the money to the growth variable i.e money is exogenous to growth in the Jamaican economy. In the cases of Barbados and Trinidad and Tobago, there seems to be a fairly rich interaction among the variables. There is in particular evidence of bidirectional causality between money and growth in the case of Barbados, and bidirectional causality between growth and the two financial variables in the case of Trinidad & Tobago. In both the Barbados and the Trinidad & Tobago cases, there is unidirectional causality from the money variable to the private credit variable.

The block causality tests provide some preliminary evidence that financial development leads to growth in all three CARICOM countries, while there is evidence in two of them (Barbados and Trinidad & Tobago) that growth Granger-causes financial development. How strong are these relationships and, in the case of bidirectional causation, in which direction do we have the stronger push? Given the negative correlations we have observed, does financial development cause the growth rate to increase or decrease? What is the pattern of the response from one quarter to the next, form one year to the next? Is there a stable relationship over the long run? These questions will be answered within the framework of impulse response analysis, analysis of the variance decomposition of the forecast errors, and the analysis of the cointegration of the variables related in the system.

The impulse responses[6] for the three jurisdictions are shown in Figure 2 below (95% confidence bands are also shown):

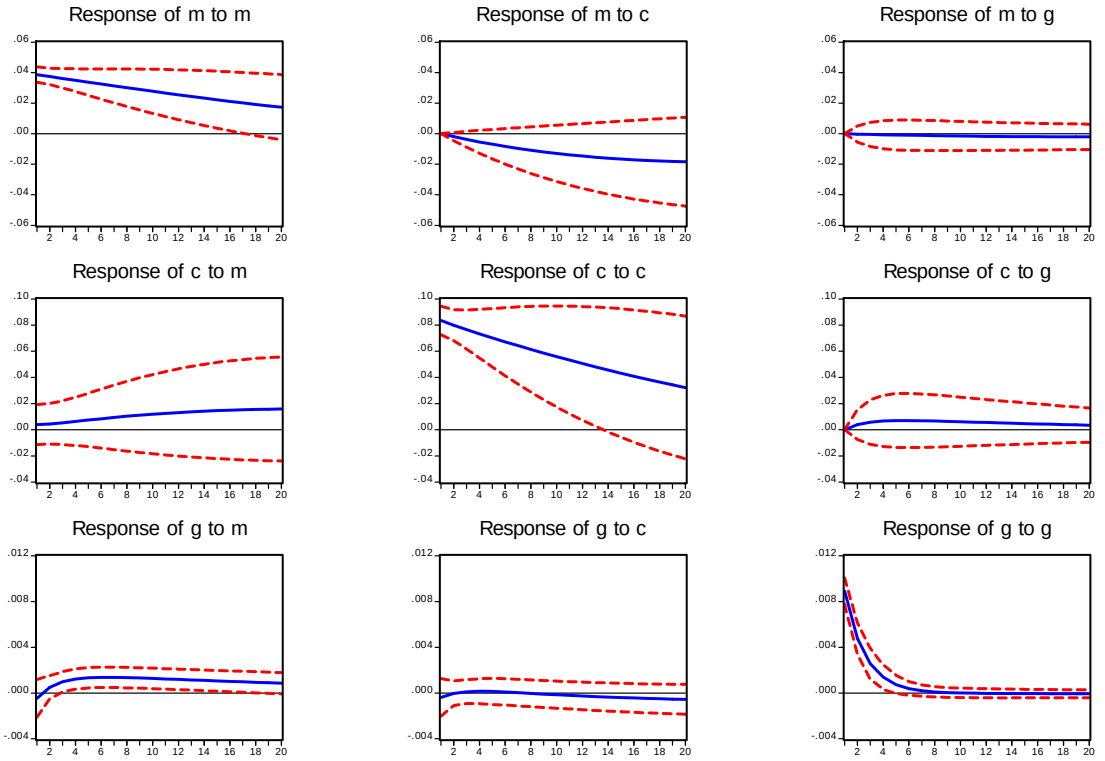
Figure 2 Impulse Responses

(a) Barbados

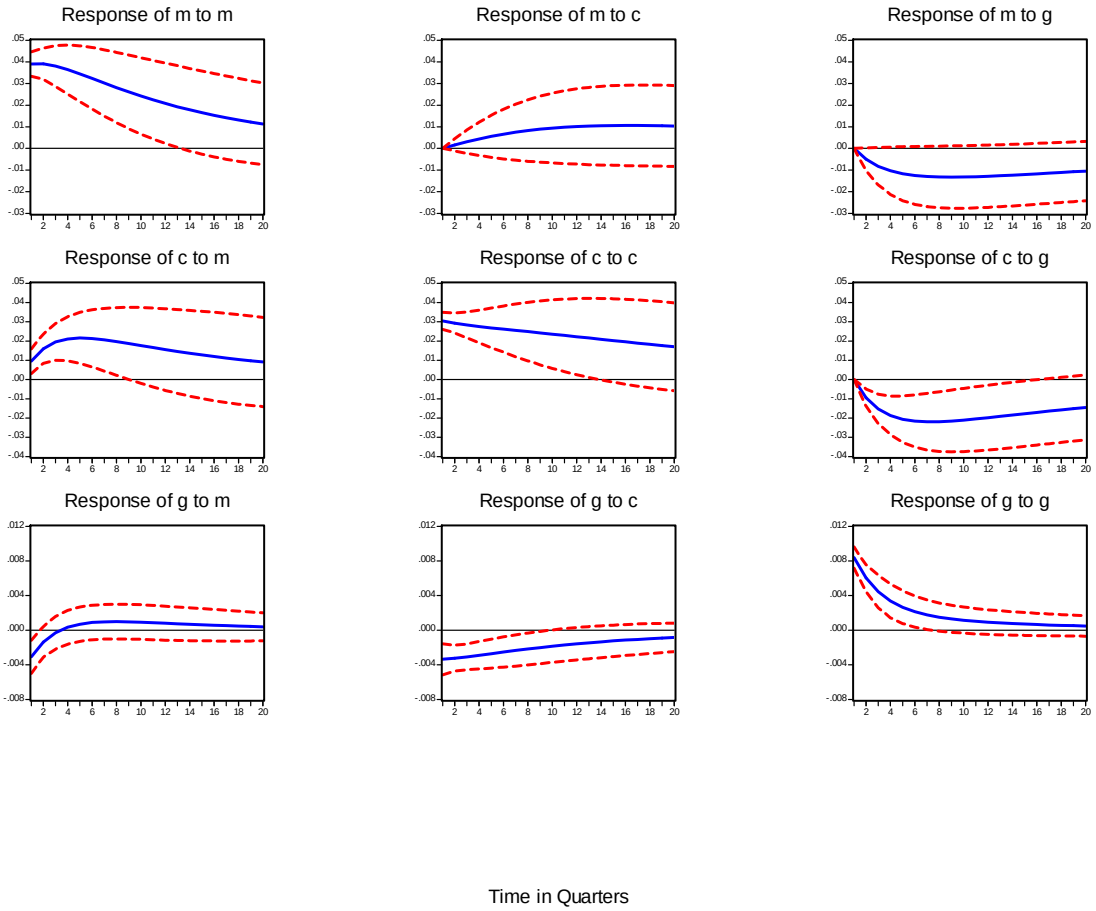


[6] The impulse responses and variance decompositions are based on the Choleski decomposition, with the ordering m, c, g. Changing in the ordering did not alter the substantive results shown.

(b) Jamaica


Response of m to m
Response of m to c
Response of m to g
Response of c to m
Response of c to c
Response of c to g
Response of g to m
Response of g to c
Response of g to g

(c) Trinidad & Tobago



There is evidence in the case of all three countries that a shock to the money variable impacts positively on growth in the economy, but this is attenuated by the fact that, in all 3 cases, lower growth seems to follow a shock to the second financial variable, private sector credit[7]. This is compounded by the fact that, whenever there is a shock to the money variable, the credit variable responds very positively. This means that any positive effect on economic growth that the money variable may have will be counterbalanced by the negative effect of the credit variable. If the latter is strong enough, it may wipe out the positive effects resulting from the money variable. Small wonder then that, within the 95% confidence bands associated with that shock, may be found growth rates lower than those that would prevail in the absence of such a shock. This clearly implies that lower growth may result from a shock to the money variable.

[7] In the case of Jamaica, this also has a negative effect on the money variable.

The reality is that there is sufficient ambiguity to cast some doubt on the hypothesized link between financial development and economic growth in the CARICOM countries. In the extreme case, financial deepening, especially if expressed through the form of increasing the credit variable, may have an adverse – even perverse - effect on growth.

Why should an increase in the credit variable result in a lowering of the growth rate? One possible explanation may be the high import propensities of the CARICOM countries. An autonomous increase in the credit variable may be used to finance imports, with no concomitant increase in exports, resulting in a drain on foreign exchange and a shrinking of the economy. It could also be that capital flight is a consequence of financial deepening due to the availability of more profitable investment opportunities abroad (including in financial assets), or due simply to the need to hedge against depreciation of the local currency.

Does the evidence lend greater credence to the competing so-called "demand-following" hypothesis that economic growth leads financial development? Again the evidence is lukewarm and, especially in the case of Trinidad & Tobago, perverse. Exogenously-led growth results, in Barbados and Trinidad & Tobago, in a lowering of the credit variable as well as in a lowering of the money variable (though it rises initially in Barbados). In the case of Jamaica, it leads to an increase in the credit variable but has little on no impact on the money variable, so that growth reverts rapidly to its pre-shock level. The reasons for this negative impact on the financial system on growth in the economy need be no different to the reasons already advanced.

Examination of the variance decomposition of the forecast errors sheds further light on these matters. The contribution of each variable to each other variable, after 5 years (20 quarters), is shown in Table 4 below:

Table 4
Forecast Variance Decomposition of Forecast Errors After 5 years (%)

Country	After 5 years, % of Decomposition due to → Variance decomposition of ↓	m	c	g
Barbados	m	87.7	11.7	0.44
	c	49.5	46.9	3.64
	g	5.50	12.4	82.1
Jamaica	m	82.1	17.6	0.24
	c	4.01	95.2	0.83
	g	17.8	1.41	80.8
Trinidad & Tobago	m	77.2	8.28	14.5
	c	22.8	48.8	28.4
	g	7.54	32.2	60.3

After 5 years, the credit variable accounts for 32.2% of the forecast error in the Trinidad & Tobago growth rate (and, as we have seen, this variable exercises a largely a dampening effect on the economy), 12.4% in the Barbados case, and a mere 1.4% in the Jamaica case. The corresponding figures for the money variable are 7.54%, 5.5% and 17.8%. Most of the error is accounted for by the growth variable itself (60% in the Trinidad & Tobago case, and over 80% in the other two cases). This is very little evidence of causation from the financial sector to growth. And what about evidence for reverse causation? After a similar time period, the Trinidad & Tobago growth rate accounts for 28.4% of the credit variable and 14.5 per cent of the money variable. The corresponding figures for Barbados and Jamaica are very small. There is some evidence of reverse causality – indeed bi-directional causality in the Trinidad & Tobago case – but almost none in the two other cases.

In summary, the preceding analysis provides some evidence for causality from financial development to growth, especially in the Trinidad & Tobago case, but this is largely as a consequence of increases in the money variable. In fact, there is evidence of a dampening effect resulting from the increase in the credit variable, and it is not negligible. There is also evidence of causality from growth to financial development, especially in the Trinidad & Tobago case, but it is even less convincing, and it may have a negative effect.

The final pieces of evidence will be provided by cointegration analysis, which anticipates the construction and testing of VECM models based on the VAR models established and analyzed above. The results of the Johansen tests for the existence of cointegrating equations are summarized in Table 5 below[8]:

Table 5
Tests for Cointegration Rank

Country	r=	0	1	2
Barbados	Eigenvalue	0.3318	0.1195	0.0670
Trend assumption: Linear deterministic trend (restricted)	Trace Statistic	75.56	24.77	8.731
	95% Quantile	42.92	25.87	12.52
	p-value*	0.0000	0.0682	0.1975
	Max Eig Statistic	50.80	16.03	8.731
	95% Quantile	25.82	19.39	12.52
	p-value*	0.0000	0.1438	0.1975
Jamaica	Eigenvalue	0.2906	0.0372	0.0184
Trend assumption: No deterministic trend (restricted constant)	Trace Statistic	47.58	6.715	2.209
	95% Quantile	35.19	20.26	9.165
	p-value*	0.0015	0.9144	0.7359
	Max Eig Statistic	40.86	4.507	2.209
	95% Quantile	22.30	15.89	9.165
	p-value*	0.000	0.9286	0.7359
Trinidad & Tobago	Eigenvalue	0.4428	0.0528	0.0265
Trend assumption: No deterministic trend (restricted constant)	Trace Statistic	63.23	7.703	2.555
	95% Quantile	35.19	20.26	9.165
	p-value*	0.000	0.8478	0.6666
	Max Eig Statistic	55.56	5.148	2.555
	95% Quantile	22.30	15.89	9.165
	p-value*	0.0000	0.8751	0.6666

* MacKinnon et al. (1999) p-values

There is strong evidence, in each case, of exactly one cointegrating equation. The normalized cointegrating equation, containing the error correction term for each country, as well as the corresponding VECM, is shown in Table 6 below:

[8] r is the cointegration rank associated with the null hypothesis of the test.

Table 6
Cointegrating Equations and VECM Models

BARBADOS:

$$g = -0.0204 - 0.0003\,T + 0.2058\,m - 0.1838\,c + \varepsilon_B$$
(3.418) (6.619) (6.827)

$$\Delta m = 0.0029 + 0.3610\,\varepsilon_{B-1}$$
(1.563)

$$\Delta c = 0.0023 - 0.7815\,\varepsilon_{B-1}$$
(4.068)

$$\Delta g = -0.0002 - 0.3609\,\varepsilon_{B-1}$$
(5.716)

JAMAICA:

$$g = -0.0158 + 0.0397\,m + \varepsilon_J$$
(2.982) (3.152)

$$\Delta m = -0.0677\,\varepsilon_{J-1}$$
(0.2300)

$$\Delta c = 0.4266\,\varepsilon_{J-1}$$
(0.6759)

$$\Delta g = -0.4603\,\varepsilon_{J-1}$$
(6.883)

TRINIDAD & TOBAGO:

$$g = 0.0184 + 0.0922\,m - 0.1171c + \varepsilon_{TT}$$
(3.572) (4.606) (6.762)

$$\Delta m = -0.5789\,\varepsilon_{TT-1}$$
(1.993)

$$\Delta c = -1.199\,\varepsilon_{TT-1}$$
(5.124)

$$\Delta g = -0.2592\,\varepsilon_{TT-1}$$
(3.689)

ε_B, ε_J and ε_{TT} are the error correction terms for, respectively, Barbados, Jamaica and Trinidad & Tobago. T-values are shown in parentheses.

The cointegrating equations are well established. The credit variable was not significant in the Jamaica case and was dropped[9]. All the coefficients retained are highly significant. The error correction term is highly significant and correctly signed in at least one equation in the VECM corresponding to it (in particular it is always significant in the growth equation), which is further evidence of the cointegrability of the variables in the system. All countries return fairly rapidly to the equilibrium growth path following an

[9] This "restriction" was tested and verified as correct: the corresponding χ^2 statistic was associated with a p-value of 0.588.

exogenous shock: it takes a little less than 3 quarters in the case of Barbados, a little more than 2 in the case of Jamaica and a little less than 2 in the case of Trinidad & Tobago.
It is interesting in the cointegrating equations to note the positive sign of the coefficient of the money variable, and the negative sign of the coefficient of the credit variable. This can only mean that, over the long-run, financial intermediation through the medium of the money variable will lead to economic growth, while similar intermediation using private sector credit will have a dampening effect. The relative strengths of the two pulls will determine whether, over time, financial development results in economic growth.

The fact that the adjustment coefficient associated with the error correction term is not significant in both the Δm and Δc equations Jamaica is further evidence that there is no reverse causality from growth to the financial sector in Jamaica. The evidence is mixed for Barbados where there is some evidence of bi-directional causality: the coefficient of the error correction term for the Δm equation is not significant, while it is highly significant for the Δc equation. The error correction term is also highly significant and correctly signed in the Δc equation for Trinidad & Tobago, and it is marginally significant in the case of the Δm equation. Trinidad & Tobago provides again the best evidence of reverse bi directional causality between the growth variable and the financial variables.

4. Policy recommendations

There is ample evidence that financial deepening may exert a positive influence on economic growth in all the countries, both in the short and in the long run. There is also evidence, in the Barbados and Trinidad and Tobago cases, of causality running in the other direction though that effect is largely perverse. Policy recommendations must take into account these considerations

The main policy issue must be the neutralization of the perverse effect that results as a result of movements in the credit variable. Further studies need to be carried out to determine the reason for the negative effect on growth of this variable. If it is related to the imbalance between imports and exports that results from the deepening of the

financial sector, then an immediate objective must be policies aimed at the improvement in the export competitiveness of the countries in question. It might be tempting to put restrictions on imports (like the negative lists of old), but such a measure will run counter to the trend of liberalization of the financial sector, so important for the development of this sector. If the negative effect is due to outflows to hedge against unfavourable movements in the exchange rate, then the monetary authorities must put in place the appropriate policies to allay such fears. If the problem is the absence of attractive investment opportunities, or an investment climate, then the appropriate monetary and fiscal policies (including incentives) must be put in place. These measures in themselves may lead to improved growth rates, but financial deepening will play a significant role as it is already showing the capacity to do so under adverse conditions.

Once the economy is immunized against the negative effects of financial deepening, then steps may be taken to deepen and widen the financial sector.

5. Conclusions

In this paper we set out to establish the relationship between financial sector development and economic growth in 3 CARICOM countries, to determine the direction of causality and the nature of the effects, if any. We did this within the framework of a VECM model, which we constructed on the basis of a VAR model, which itself was used to draw some interesting conclusions. There is evidence mainly of causality from financial sector development to growth, although some of this is quite negative. This means that growth may result from financial development, but appropriate policies must be put in place to ward off the negative effects of such development. Further studies should be carried out to determine the reasons for this negative impact, and these used to formulate appropriate policies. The paper suggested what some of these reasons might be and the corresponding policy measures that may be taken to deal with them.

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