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Financial deepening, private sector, institutions and economic growth in Guyana: a cointegration assessment

Abstract

There is wide acceptance that pursuit of financial deepening that promotes the role of the private sector is good for developing countries. This paper applies alternative time series techniques, Engle-Granger two-step method and the Hendry's GETS method to estimate the long-run relationship between real per capita GDP, and a set of financial deepening indicators in Guyana over the period of 1960-2012. All techniques determine that there is a long-run equilibrium relationship in which a long-run positive and significant relationship exists between credit to private sector and per capita income growth; and a significant but mixed one for official development assistance. If sustainable per capita income growth is desired, measures to enhance institutional and organizational reforms in the socio-economic and political sectors of Guyana must be encouraged.

Keywords: private sector, institutions-organization-based influence, financial deepening, legitimacy, official development assistance, compliant developing nation

JEL Classification: E36, E51, O43, P260

Introduction

In this paper I pursue my interest in financial development-growth nexus for developing countries with an intertwining of two perspectives within the dimensions of a general-equilibrium model – the private sector and the institution-organization-based (IOB) perspectives. In the private sector perspective, the private sector is seen as the engine of economic growth (Fantino, 2013) if macro-economic policies support enabling environments that facilitate the development of strong financial systems (for example McKinnon, 1973; Shaw, 1973). In the IOB perspective institutions and organizations are structured and functioning in compliance with strong formal rules and supportive pillars to shape the development of sound financial systems. Essentially, the matter of how well a financial system functions is critical for long-term economic growth (Demirgüç-Kunt and Levine, 2004).

If the mechanism of the exchange economy is to operate with near precision both perspectives would require actors to be in compliance with rules that are characteristic of strong institutions and organizations and pillared with agreements in the global economic system (GES) (North, 1990; Williamson, 1985). Instead, another perspective (Shaw, 1973; and McKinnon, 1973) advanced the private sector as a better “apparatus” than government to facilitate the accumulation of society's resources and their efficient allocation – loans to residents regardless of the institutional or organizational or cultural persuasions using “rational profit-

maximizing objective under market conditions” (Rajan, 1994). International institutions and organizations (IIOs), financial and aid-oriented, support private sector development in a global environment that promotes sustainable market forces in developing economies (Fantino, 2013; WBR, 2012) aimed at general equilibrium within the GES.

Indeed the GES, comprising interdependent characteristics of countries, requires the compliance of developing countries with the formal and informal culture of related IIOs. Wearing the brand of a “compliant developing nation” is fundamental to a country's legitimacy. These countries' institutional and organizational practices require the approval (tacit or other) of international financial institutions (IFIs) and bilateral development agencies (BDAs) of powerful governments suggesting that their dominant practices are compatible in form and structure; and could be trusted (Scott, 1995; North, 1990) to facilitate collectively “enabling environments” for business and investment (Ibid, 1990) – a business practice settings with need for little or no modification for compatibility.

The demand for IOB changes in financial institutions and regulatory organizations (FIROs) was not muted in many developing countries in the latter 70s and throughout the 1980s and early 1990s to end “financial repression” in return for the International Monetary Fund (IMF), World Bank Group (WBG), and the Bank for International Settlement (BIS) support. Accordingly, policies to influence IOB changes to develop liberal financial systems of developing countries were framed according to the “Washington Consensus”. It is in this regard that the attitudes of IFIs and BDAs toward institutional and organizational strengthening are reflected in the monetary and technical resources they

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placed at the disposal of developing nations in the form of aid.

Yet, a lack of interest in assessing economic growth performance based on a quantification of collective efforts of IFIs and BDAs appears in the empirical literature, even though they represent the major element of the SAPs as dictated by the IFIs (Butts and Mitchell, 2012). Since the SAP packages, in the form of an economic recovery program (ERP) 1988, is applicable to Guyana, I believe that the time is appropriate to initial consciousness of the role of IOB influence of IFIs and BDAs and their protégé, the private sector in economic growth, with a case study of Guyana¹.

The purpose of this study is to examine empirically the relationship between economic growth and the private sector along with the moderating IOB influence on policy issues related to financial deepening in Guyana over the period of 1960-2012. The study, emphasizing private sector activities as financial deepening (depth) along with IOB influence, is the first undertaken for Guyana. As such, it augments the literature with country-specific evidence related to an interdependent relationship between economic growth and financial development via financial deepening – related to broad money, general bank credit, private sector credit and influence of IFIs and BDAs via ODA.

Specifically, the two-dimensional interest, private-sector and IOB perspectives, is demonstrable with two institutional facts – the prominence of the IFIs and BDAs collective influence and its relationship to the determination of action by Government of Guyana. First, the prominence of the influence triggered changes (1) in the practices of targeted institutions and organizations that were increasing transaction costs (North, 1990); (2) for the re-alignment of Guyana's political economy efforts to the current "political economy of international relations" (Gilpin, 1987); and (3) to guide the collective effort to establish and maintain an enabling environment as outlined in the 1998 ERP which Guyana negotiated with the IFIs and BDAs. Prior to the ERP giving private sector-oriented IFIs significant presence to promote "global-private-sector" development (Fantino, 2013; CIDA 2004; IFC, 2011; PSDU-CDB, 2012), IIOs were involved in the affairs of Guyana².

Accordingly, decisions on allocation and distribution of aid reflect IOB influence³ and agreement; and suggest that relevant Guyanese institutions and organizations are operating in harmony with the tenets of the IIOs. Consequently, ODA as the measure of IOB influence should relate positively to economic growth in Guyana.

Second, the IOB influence is verifiable empirically by the Government of Guyana's highlighted claim to economic growth because of its adoption of monetary policies and its regulation⁴ of the financial sector (Bank of Guyana Report-2012), which led to expansion of economic activities from increases in broad or quasi money and credit provided by private banks. These as elements of financial development are expected to have positive and significant relationships with economic growth. Consequently, the focus herein on credit to the private sector (CPS) or financial depth recognizes it results essentially from expanded banking operations consequential to the re-arranging of institutions and organizations to facilitate capital deepening in Guyana.

Though, it may be interesting to focus the trivariate relationship between economic growth and CPS and ODA, I estimate a fivefold relationship comprising economic growth, CPS; two auxiliary variables – credit provided by the banking sector (CBS), and broad or quasi money (BQM); and the moderating variable – ODA, to capture important institutional dynamics of the IIOs in the Guyanese economy (Butts and Mitchell, 2012). The fivefold relationship intends to offset concern for specification error and spurious regression (Granger and Newbold, 1974); and omitted variable bias within cointegration and error-correction methodological frameworks.

I address the concerns for unit root, test for cointegration or long-run equilibrium and Granger causality using (1) Engle-Granger (E-G) two-step approach to the error-correction modeling (ECM) and (2) the Hendry's general-to-specific (GETS) method with some extensions for comparative purposes. The latter includes the comparison of a restrictive ECM and an unrestricted (ADL) ECM in which I controlled for contemporaneous relationships. The Johansen Juselius (J-J) (1990) maximum likelihood method is used to complement the E-G two-step approach in determining the order and

¹ The core of the influence is to establish an efficient organization of the Guyana's domestic economy in line with trade international aid and foreign investment (Pearson Report, 1969).

² Specific periods relate to pre-independence political (1960-1964), independence (1965-67), oil shocks - (1973-74).and (1979-80). and (1990-91), ERP (1988) and onward with the provision of support through a variety of Standby financial arrangements, direct programmatic funding for infrastructure, organization and institution strengthen-

ing (public sector and private sector) that may increase global competitiveness of the private sector in Guyana (PSDU-CDB, 2012).

³ Institution-organization-based collective influence represents the implementation of policies that impact business paths, and business culture, for organizations and institutions in Guyana.

⁴ It must be noted that these have been kept in line with the ERP negotiated in 1988 between the Government of Guyana and the WBG, the IMF and the BIS.

number of cointegrating relationships amongst the variables. However, because of concerns for space discussion of the findings will be mainly on the three variables economic growth, CPS and ODA.

The rest of the paper will comprise a short literature review in section 1; model specification in section 2; data, methodological framework and estimation in Section 3; and summary and conclusion in the final section.

1. Literature review

The determinants of financial development and its effect on growth have been studied at length. The literature is vast and is not reviewed here, but rather I point the reader to Levine (1997) and Tsuru (2000) for a detailed, broad and deep review of it. Herein, I give a concise review that relates to the view that increase availability of capital and flow of credit to the private sector precedes economic growth. Indeed controversy remains from a theoretical standpoint if we are prepared to accept the possibility of non-isomorphic convergence of variables and such influence on the correlation and the direction of causality of these economic variables. For example, the studies by Butts (2009) for Latin America and the Caribbean; and Butts, Mitchell and Berkoh, (2012) for Thailand finding that economic growth preceded increases in short-term credit and financial crises were set off by Arcand, Berkes and Panizza (2012) findings that excessive credit growth and high economic volatility increased probability of financial crisis thereby suggesting misallocation of resources. However, I summarize the main findings from the related literature as they relate to the intertwining of IOB influence and CPS which are important to this study.

Jyaratne and Strahan (1996) using deregulation as a proxy for financial development found economic growth occurred in USA in the wake of deregulation. Levine and Zervos (1998) in a panel-study comprising forty three countries found, after controlling for economic and political factors, that stock-markets and banks that are functioning efficiently promoted long-run economic growth. Guiso, Sapienza and Zingales (2003) from political and regulatory perspectives found per capita GDP grew faster, and aided increases in startups in regions with financial development deeper than those with lesser financial-developed sectors in Italy. Claessens and Laeven (2003) found evidence consistent with the view that better property rights lead to higher growth. And Dehejia and Lleras-Muney (2003) found strong link between financial development and growth in USA – it could be positive if led by banking sector and negative is driven by institutions such as State sponsored credit. Rioja and Valev

(2004) found that the impact of financial development on growth is stronger for rich countries than for low-income countries. Demirgüç-Kunt and Levine (2004) research suggests how well financial systems function, strong legal rights for outside investors and the overall efficiency of contract enforcement matters for developing any financial sector and the economy.

Ardic and Damary (2006) found that poor regulation and unsupervised expansion of the banking sector resulted in a negative relationship between financial deepening and economic growth in Turkey. Hasan, Wachtel and Zhou (2006) found that economic growth was impacted positively in China because of institutional changes including the emergence and legalization for the market economy, property rights, private sector, development of financial sector institutions and markets, and the liberalization of political institutions. Recently, Ayadi, Ben-Naceur and De Groen (2013) found that weak financial regulation and supervision resulted in credit to the private sector and bank deposits associating negatively with economic growth in the Mediterranean region.

Ndako (2010), using multivariate vector autoregressive (VAR) technique found evidence of unidirectional causality from financial development (credit to private sector) to economic growth in Nigeria. Seydou (2010) using VECM cointegration test found long-run equilibrium relationship among the financial deepening variables and economic growth with credit to the private sector hindering economic growth in Niger. Barajas, Chami and Yousefi (2013) found from in study of more than 130 countries that financial deepening affected economic growth positively, even in presence of measurable heterogeneity in the regulatory characteristics and financial access for a given level of financial depth [deepening]. The mixed outcomes as reported above suggest the usefulness of continued empirical studies using a quantitative measure of collective “IOB-influence” as an explanatory variable in case study of Guyana.

2. Model Specification

A simple theoretical model to estimate for a relationship between economic growth and financial sector development is proposed. A linear approach, using the rational expectation, visualizes a positive and significant relationship between economic growth – measured as per capita income and (1) financial deepening – measured by credit provided by the banking sector and broad or quasi money growth; (2) increased business activity –

measured by credit to the private sector; and (3) effect of institution-organization-based influence of IIOs on the global system – measured by receipts of official development assistance. This is captured in the general model as:

$$PCI_t = \alpha_0 + \beta_1 CBS_{t-i} + \beta_2 CPS_{t-i} + \beta_3 BQM_{t-i} + \beta_4 ODA_{t-i} + \varepsilon_t, \quad (1)$$

where the independent variable PCI_t is real per capita income or GDP; and the dependent variables are: CBS_t is the credit provided by the banking sector/GDP, CPS_t is a measure of bank credit to private sector/GDP, BQM_t is a measure of broad money or quasi money/GDP, and ODA_t is a measure of the per capita official development assistance/GDP representing institution-organization-based influence, respectively; and ε_t ,

a random error, is i.i.d disturbances with mean = zero and variance = σ^2 . This model will satisfy the supply-leading hypotheses that financial deepening, in the guise of the increased role of the private activities (private credit) is related positively and significantly to economic growth. Therefore, I will test for the existence of a long-run equilibrium relationship postulated in Equation 1.

3. Data methodological framework, and estimation

3.1. Data. *3.1.1. Description of Data.* Using World Development Indicators (WDI 2013) as source, data were query for 53 years for Guyana. The variables are: CPS , CBS , BQM , ODA , real GDP and real PCI . All variables were transformed to their natural logarithms and will be called collectively the “variables”.

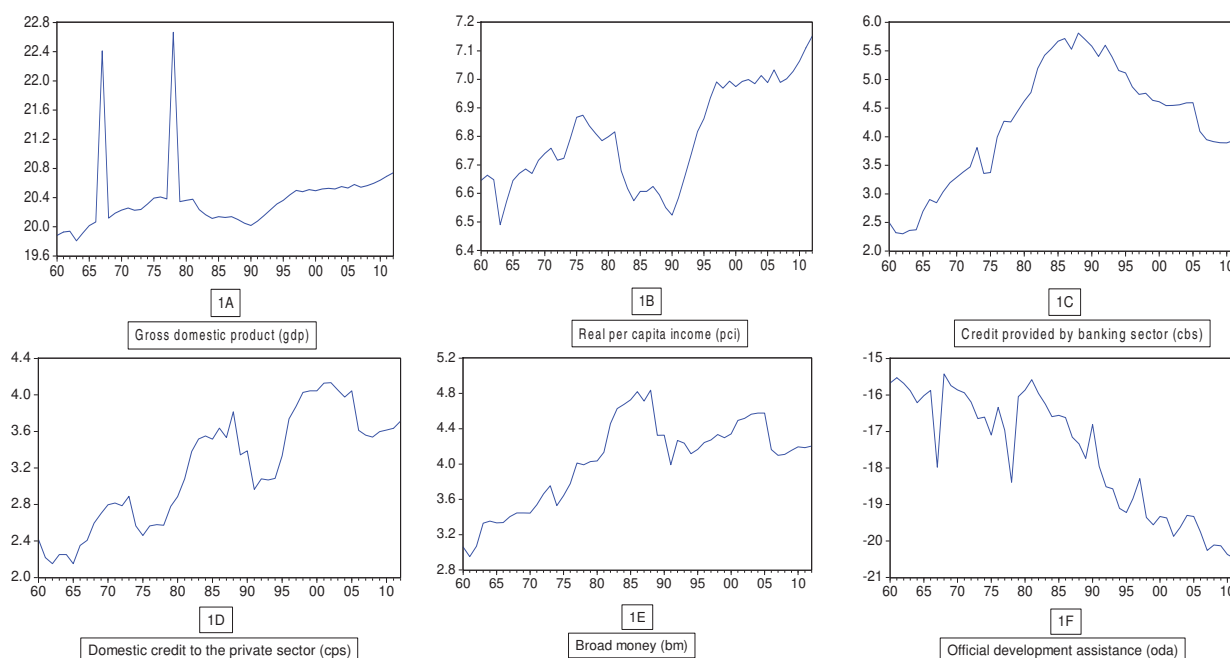


Fig 1. The graphs of log of GDP (1A), PCI (1B), CBS (1C), CPS (1D), BQM (1E), ODA (1F).

Figures 1A, 1B, 1C, 1D, 1E, and 1F depict graphs of GDP , PCI , CPS , CBS , BQM and ODA . Visual inspection suggests that the variables display structural breaks. Thus, any assumption is plausible that the transitory influences of these shocks may impact economic growth. In addition, each graph tells a different story. For example, in Figure 1B, GDP slopes upward, trending a modest growth rate over time. It has two peaks depicting two episodes of extreme growth in 1967 (the year after its independence) and 1975 (favorable commodity prices). Further, eight series of short-term cycles involving four episodes of reasonable growth and four episodes of decline are observed and worthy of mention.

Growth. The first period of growth occurred from 1964 to 1973 – suggesting a rigorous economy in

the face of major institutional changes in 1966 and 1970 related to (1) Guyana’s independence, (2) the Government adoption of socialist republican status and the institution of nationalization alongside reasonably favorable global attitude to a new nation. The second period of 1975-1978 occurred in an environment of favorable commodity prices for sugar and bauxite. The periods of 1992-2005 and 2007-2012, the third and fourth periods of growth, respectively, benefited from economic related support from IFIs and BDA as well as revival of foreign private investment inflows to Guyana and increases in migrant remittances.

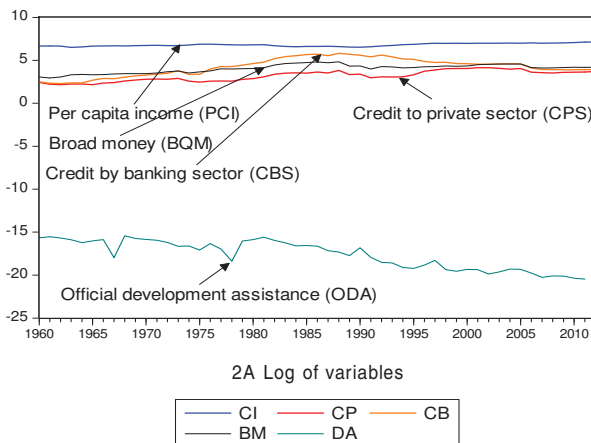
Decline. The first period of decline 1962-1963 occurred based on racial, and political acrimonies for reasons related to shifting political institutional and organizational fundamentals. The related

activities were initiated and sustained by both domestic and foreign organizations and institutions (see Ishmael, 2004)¹. The second decline, 1973-1974, manifests the 1973 oil shock. The third decline, 1981-1991² mirrors Guyana's expulsion from global market finances, cessation of financial support provided by IMF, WBG, and tacit withdrawal of major bilateral agencies. Fourth decline was in year 2005-2006 for reasons of unexpected flooding that devastated Guyana.

Likewise, I infer that Figure 1B that PCI_t , depicts an upward trend and several long-term trends, short-term cyclical movements and unexpected fluctuations. In Figure 1C, CBS_t is conical in shaped after rising unevenly from 1962 to 1981, peaked and declined to end of period under review. Figure 1D for CPS_t and Figure 1 E for BQM_t are similar. They depict a rising trend cutting across several short- and long-run business cycles. However in Figure 1F for ODA_t , depicts a negative long-term trend cutting several short-term cycles. They suggest the need that one tests for unit-root, level of integration, and structural breaks.

3.1.2. Descriptive statistics. These are reported partially because of space. The variables PCI_t , CBS_t , CPS_t , BQM_t and ODA_t do not depict any abnormalities and are considered to be distributed normally.

However, the Jarque-Bera coefficient of 438.708 and Kurtosis of 15.705 confirm that GDP_t is not distributed normally.



3.1.3. Correlation matrix. Not reported here because of space, suggests relatively weak association between the variables. As expected, cps_t is correlated highly with bqm_t (0.86 and oda_t (0.71); and moderately with CBS_t (0.67), respectively. However, for our interest PCI_t has the strongest correlation with ODA_t and CPS_t -0.77 and 0.55, respectively. These suggest negative relationship between ODA_t , and PCI_t ; and positive relationship between financial deepening, CPS_t and PCI_t .

3.1.4. Unit root testing. This is undertaken to avoid spurious correlation-stationarity of variables. It is unreasonable to assume stationarity of economic variable that are evolving, since the levels of stationary variables have a unique-equilibrium mean (Hendry and Juselius, 2005). Thus, an enquiry of the data generate process (DGP) is necessary. To meet the requirement of the traditional Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (P-P) for the inclusion of the deterministic terms, intercept or trend or both intercept and trend or none, I group the series without normalization, as in Figure 2A (varying maximum and minimum values) and normalization Figure 2B. Figure 2A does not indicate patterns of parallel movement but more drift. Figure 2B, confirms several structural breaks associated with shocks to Guyana economic system. Thus, it may be prudent to use trend and intercept in the unit root equation.

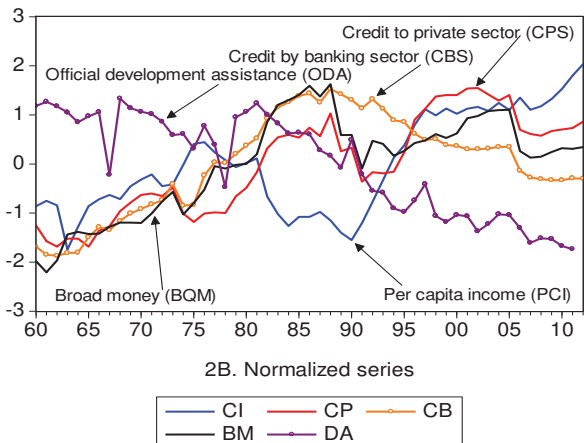


Fig.2. The log of variables (2A) and normalized series (2B)

¹ Odeen Ishmael (2004) as editor of GNI Publication states: "The PPP was again re-elected in August 1961, and it continued to press ahead with it[s] efforts to win independence for the country. However, by this time, the opposition forces, strengthened by the covert and overt support of the American and British Governments, and also from international anti-communist trade unions and groups, intensified their efforts to overthrow the PPP Government; and to block the movement towards political independence. http://www.guyana.org/govt/declassified_documents.html, and <http://www.guyana.org/govt/US-declassified-docu-ments-1964-1968.html>.

² A decision taken by the Seaboard Allied Milling of Shawnee Mission, Kansas, USA to refuse suddenly and abruptly to use letter of credit for wheat to its own mills in Guyana led to serious formal and informal institutional and organizational changes in Guyana. The Bank of Guyana being unable to support the new demand placed stricter controls on use of foreign exchange and imports. This is what I called the "Seaboard Allied" effect led to the development of institutions in the informal foreign exchange market, and barter and countertrade.

The results as reported in Table 1 for the hypothesis of unit root confirm that no variable is integrated $I(2)$ or higher.

Table 1. Unit root analysis

Variables	ADF-GLS with intercept		P-P with intercept	
	Level	Difference	Level	Differenced
PCI_t	-0.412	-5.315*	-0.166	-5.249*
CPS_t	-0.595	-2.451	-1.351	-6.985*
CBS_t	-0.707	-4.912**	-1.681	-5.882*
BM_t	-0.764	-3.471	-2.021	-7.238*
ODA_t	-0.900	-8.017*	-0.070	-9.030*

Note: * and ** represent significance at the 1% and 5% level of significance, respectively. *MacKinnon (2010)

3.2. Methodology and estimation. The methodological approach involves the use of two groups of testing for cointegration or long-run equilibrium relationship.

3.2.1. Cointegration. Two approaches are taken – the Engle-Granger (E-G), co-integrating relationship and the Johansen-Juselius (J-J), maximum likelihood estimation method (MLE) to determine co-integration. A long-run relationship between PCI_t and CPS_t , and other auxiliary variables is estimated using two uncomplicated methods – the EG test, and Hendry GETS method. The Engle-Granger (1987) test is a two-step method; while the Hendry test consists of eliminating non-significant variables to obtain a parsimonious model.

With dummy variables, I accommodated perceived structural breaks and concerns for IOB influence on policy for financial liberation in the ERP agreement. I do this also for the transitory influences related to distinct economic, socio-cultural and political characteristics to determine their propensity on the Guyanese economy. The equation to estimate this relationship starts with:

$$pci_t = \alpha_0 + \beta_1 CDS_{t-i} + \beta_2 CPS_{t-i} + \beta_3 BQM_{t-i} + \beta_4 ODA_{t-i} + DM + DV63 + DV67 + DV75 + DV81 + DV06 + \varepsilon_t, \quad (2)$$

where the variables are defined as in Equation (1) and a set of dummy variables: DM , $DV63$, $DV67$, $DV75$, $DV81$ and $DV06$ that represents the ERP 1988, racial and political acrimonies, after-independence momentum, favorable commodity prices, suspension of access to international finance and support of BDAs, and $DV06$ severe flooding of eastern coastlands, respectively, taking a value of one for the year of the phenomenon and zero otherwise¹. For reasons of space and interest I shall emphasize estimated coefficients for CPS , ODA , and DM mainly.

3.2.1.1. EG – two-step test. Equation (2) is estimated using OLS and the residuals tested for unit root. The results shown in Column (2), Table 2 and Figures 3A and 3B confirm the residuals are stationary and a long-term equilibrium relationship exists amongst the variables on basis of the $ADF_t = -4.605 > -4.434$ and significant at ten percent level of significance (Engle and Granger, 1987). Accordingly, the estimates are accepted as those of a long-run static OLS equation.

Table 2. Long-run static OLS: dependent variable PCI

Regressor(l)	Long-run equation (2)	General to specific OLS (3)
C	5.176 (20.613)*	5.115 (20.567)*
CPS_t	0.175 (2.849)*	0.203 (4.185)*
CBS_t	-0.038 (0.977)	–
BM_t	-0.137 (1.18)	-0.237 (-5.047)*
ODA_t	-0.104 (5.712)*	-0.118 (7.942)*
DM_t	-0.161 (2.447)**	-0.212 (4.361)*
$DV63$	-0.199 (2.62)**	-0.174 (2.108)**
$DV67$	-0.223 (2.557)**	-0.241 (2.785)**
$DV75$	0.094 (1.136)	–
$DV81$	0.214 (2.594)**	0.209 (2.52)**
$DV06$	-0.121 (1.1687)	-0.1267 (1.752)***
$ADF T_t$ - statistic	-4.6054***	-4.6362***
Adjusted R -squared	0.78	0.778
SER	0.079	0.079
F -statistic	19.102	23.372
Jarque-Bera statistic	10.83 (0.000)	6.0247 (0.04915)
Breusch-Godfrey (LM) test	7.352 (0.002)	5.949 (0.0054)
ARCH	1.869 (0.1777)	1.698 (0.1854)
RESET test	0.8995	0.8920

Note: *, **, and *** rejects null hypothesis at 1%, 5%, and 10% significance level – MacKinnon Test Critical values (2010). Numbers in parenthesis are t -statistic.

By these results PCI_t is influenced positively and significantly by both CPS_t and $DV81$. Conversely, PCI_t is influenced negatively and significantly by ODA_t , $DV63$, and $DV67$. Further, the adjusted- R^2 explains seventy-eight percent of the variation in PCI_t , while the residuals failed the tests for normality (2), serial correlation and homoscedasticity, respectively. However, though failing these tests the coefficients remain unbiased and consistent, though not efficient (Gujarati, 1979) but the model is still statistically meaningful.

3.2.1.2. GETS: Equation 3 is examined using the GETS method to eliminated non-significant variables to get a well-fitting model. The results are reported in Column 3 of Table 2 and Figures 4A and 4B; and indicate the model improved with the elimination of cps_t and $DV76$; and is stable according to Recursive Residual (Figure 4A) and CUSUM (Figures 4B). The model failed the tests for normality and serial correlation. Yet the model remains unbiased and consistent but inefficient (Gujarati, 1979). This is so especially since the residuals fell within the controlled band toward the end of the periods.

¹ It is necessary to point out that equation (2) was the outcome of several versions of equation (1) consisting of use of “other year” dummies, which were discarded because of failure of residuals to satisfy a battery of tests.

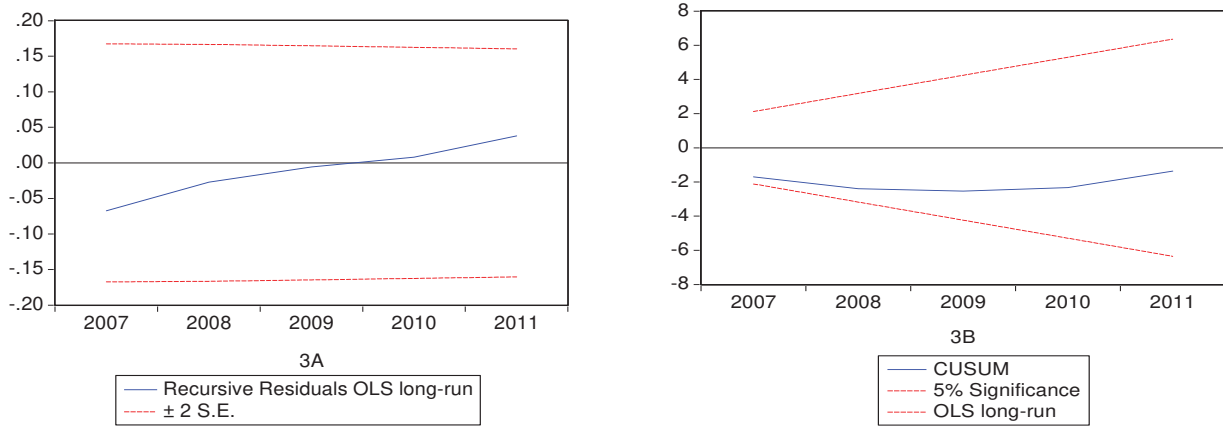


Fig. 3. The tests for stability using recursive residuals and cumulative sum of squares in long-run OLS

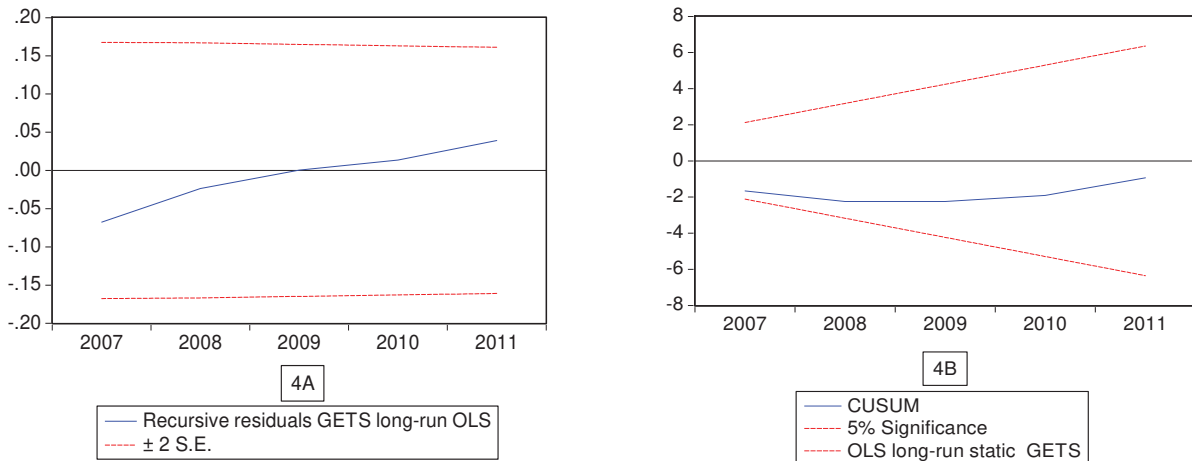


Fig. 4. The tests for stability using recursive residuals and cumulative sum of squares in general-to-specific method for long-run OLS

3.2.1.3. *J-J MLE method.* Finding co-integration does not tell us anything about the adjustment of variables and how many cointegrating relationships. For the latter the Johansen-Juselius (1990) co-integration test is used as a complement. The results

at one lag reported in Table 3 require that null hypothesis of no cointegration be rejected in favor of the alternative hypothesis that the variables are co-integrated; and confirm that there is one co-integrating relationship.

Table 3. Johansen’s unrestricted maximum eigenvalue test for cointegration

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen statistic	0.05 Critical value	Prob.**
None *	0.643	51.546	33.876	0.0002
At most 1	0.382	24.095	27.584	0.1314
At most 2	0.181	10.005	21.131	0.7442

Note: *The Johansen cointegration test procedure is applied to system of the five variables. Both the Trace and the Max-eigenvalue (reported above) test indicate 1 co-integrating equation at the 0.05 level of significance. ** Denotes rejection of the hypothesis at the 0.05 level.

3.3. Estimation and interpretation. 3.3.1. *Error-correction model:* Co-integration does not tell about the adjustment of the variables. This occurs if the Engle-Granger Representation Theorem (1987) holds.

The theorem suggests that any co-integrating equation has a corresponding relationship with an ECM. Accordingly, I estimated a restricted ECM or RECM after recasting Equation 2 as a RECM as follow:

$$\Delta pci_t = \alpha_0 + \xi ect_{t-1} + \alpha_1 \Delta cps_{t-i} + \alpha_2 \Delta cbs_{t-i} + \alpha_3 \Delta bqm_{t-i} + \alpha_4 \Delta oda_{t-i} + DM + DV63 + DV67 + DV75 + DV81 + DV06 + \varepsilon_t, \tag{3}$$

where Δ is the difference operator; and ECT_{t-1} is the error-correct-term, its coefficient, ξ , measures the speed of adjustment of PCI toward its long-run equilibrium the next period when it over- or under-shoots that equilibrium; $a_i = [a_i, 1, \dots, 4]$ are the

coefficients modelling the causal effect that occurs over time or the long-run effect that the i^{th} time series has on ΔPCI_t ; and ε_t is the error which is IID normal with mean 0 and variance δ^2 . The lag order selected by AIC and SC for estimation is one.

Table 4. Results of estimated dynamic models: dependent variable Δpci_t

Regressor (1)	RECM Eq (3) (2)	RECM eq (4) contemporaneous (3)	URECM eq (5) (4)	URECM eq (6) contemporaneous (5)	GTS eq (7) contemporaneous (6)
Constant	0.02 (1.52)	0.04 (2.22)**	1.896 (4.074)*	-1.692 (3.223)*	2.050 (6.775)*
Trend	-0.001(1.927)***	-0.002 (2.09)**	0.001 (0.551)	-0.001 (0.758)	–
ECT_{t-1}	-0.21 (1.94)***	-0.21 (1.82)***	–	–	–
ΔCPS_t	–	0.039 (0.57)	–	0.02 (0.32)	–
ΔCPS_{t-1}	-0.002 (-0.045)	-0.075 (-1.03)	0.003 (0.0688)	0.034 (0.480)	0.249 (2.526)**
ΔCB_t	–	-0.09 (-2.03)**	–	0.002 (0.055)	–
ΔCB_{t-1}	-0.041 (0.84)	-0.04 (0.86)	-0.013 (0.3483)	-0.009 (0.237)	–
ΔBM_t	–	-0.02 (-0.24)	–	-0.017 (0.196)	–
ΔBM_{t-1}	0.098 (1.208)	0.16 (1.96)***	0.106 (1.597)	0.042 (0.513)	0.101 (3.168)*
ΔDA_t	–	0.01 (1.06)	–	-0.027 (1.99)***	-0.014 (2.224)**
ΔDA_{t-1}	0.010 (1.121)	0.02 (1.73)***	0.028 (2.95)*	0.030 (3.050)*	0.030 (4.436)*
PCI_{t-1}	–	–	-0.352 (5.088)*	-0.38 (4.686)*	-0.382 (6.534)*
CPS_{t-1}	–	–	-0.022 (0.794)	0.034 (0.934)	0.032 (1.427)
CBS_{t-1}	–	–	0.018 (1.147)	0.022 (1.097)	0.023 (1.757)***
BM_{t-1}	–	–	-0.125(2.556)**	-0.121 (1.810)***	-0.135 (3.285)*
DA_{t-1}	–	–	-0.048 (3.596)*	0.0776 (3.4422)*	0.030 (4.436)*
DM	0.06 (2.213)**	0.05 (1.82)***	-0.036 (1.248)	-0.069 (1.874)***	-0.069 (3.276)**
$DV63$	-0.195 (4.08)*	-0.21 (4.22)*	-0.189 (5.189)*	-0.182 (4.566)*	-0.178 (5.952)*
$DV67$	0.007 (0.163)	0.03 (0.54)	0.031 (0.0529)	-0.063 (1.278)	–
$DV75$	0.082 (1.571)	0.07 (1.43)	0.093 (2.356)**	0.078 (1.861)***	0.079 (2.609)**
$DV81$	0.059 (1.253)	0.06 (1.29)	0.0781 (2.147)**	0.103 (2.639)**	0.095 (3.128)*
$DV06$	0.104 (1.949)***	0.07 (1.16)	0.0285 (0.6677)	-0.003 (0.0686)	–
Adjust- R^2	0.25	0.30	0.58	0.59	0.697
S.E.R.	0.043	0.042	0.032	0.032	0.0278
F-statistic	2.421	2.343	5.327	4.58	9.687
JB-statistic	11.52	0.765	0.818	0.93	0.3644
LM (2)	0.034	0.203	0.326	0.64	0.77
ARCH (2)	0.91	0.784	0.241	0.19	0.2246
RESET test	RESET (2) = 0.89	RESET (2) = 0.57	RESET(3) = .103	RESET (2) = 0.206	RESET (2) = 0.2226

Note: *, ** and *** rejects null hypothesis at 1%, 5% and 10% significance level. Numbers in parenthesis are t -values.

Table (4), Column (2) and Figures 5A and 5B report the regression results of equation (3), RECM, by OLS. The results are interesting. First the estimated coefficient of ΔPCI_{t-1} does not satisfy the theoretical expectations – it is negative and insignificant. Second, the estimated coefficients of ΔODA_{t-1} satisfies theoretical expectations – it is positive but not significant. Third, the estimated coefficient of ECT_{t-1} has the correct theoretical sign, negative; and is significant at the ten-percent level of significance. This result suggests a that (1) the variables in the equilibrium relationship are cointegrated; (2) short-run corrective changes occurred in ΔPCI_t where about twenty one percent of the deviation was corrected in the next period whenever ΔPCI_t overshoot (undershot) its long-run equilibrium values. I posit that the full adjustment to deviation was painfully slow in Guyana – as much as five years; and interpret this evidence as

long-run causality whereby the variables indirect Granger-caused jointly ΔPCI_t . The direction of causality runs interactively via ECT_{t-1} from these explanatory variables to ΔPCI_t , and no individual Granger causality is observed. Fourth, the coefficient of the impulse dummy variables DM , $DV63$, and $DV06$ are significant. Fifth, @trend is positive and significant suggesting ΔPCI_t is influenced also by “time”. Finally, though there are indications of a long-run relationships in the model, the model does not explain a significant proportion of the variation (Adjusted- $R^2 = 0.25$) of the dependent variable; and has failed a number of diagnostic tests including normality, serial correlation, and heteroscedasticity. Though the results are unbiased and consistent for most parts, they are inefficient, since one is not dealing with the least absolute deviations (Gujurati, 1978); and suggest the need for model improvement.

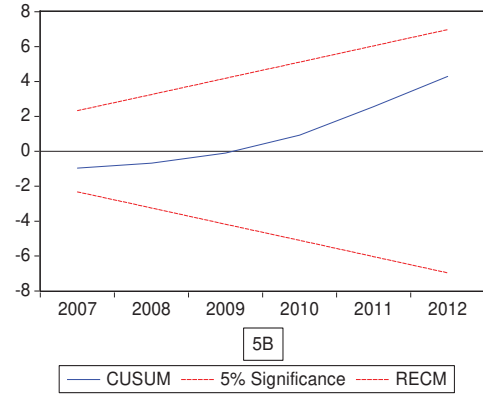
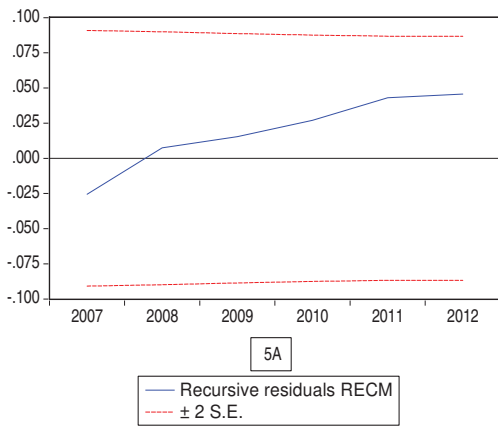


Fig. 5. The tests for stability using recursive residuals and cumulative sum of squares for RECM

3.3.1.1. Model improvement contemporaneous change. Inclusion of contemporaneous changes in equation (3) and reestimating is a logical way to explore improvement; and it comes with asking the question: Do changes in the independent variables have immediate effects (singularly or collectively) on the dependent variable: i.e. is there contemporaneous trade offs? Equation (3) is rewritten to accommodate this intent as equation (4):

$$\begin{aligned} \Delta pci_t = & \alpha_0 + \xi ECT_{t-1} + \alpha_1 \Delta CPS_{t-i} + \alpha_2 \Delta CBS_{t-i} \\ & + \alpha_3 \Delta BQM_{t-i} + \alpha_4 \Delta ODA_{t-i} + \delta_1 \Delta CPS_t + \delta_2 \Delta CBS_t + \\ & + \delta_3 \Delta BQM_t + \delta_4 \Delta ODA_t + DM + DV63 + DV67 + \\ & + DV75 + DV81 + DV06 + \varepsilon_t, \end{aligned} \quad (4)$$

where the variables take the meaning as in equation 3 with ΔCPS_t , ΔCBS_t , ΔBM_t and ΔODA_t representing contemporaneous changes in CPS, CBS, BQM and ODA, respectively; and δ_1 , δ_2 , δ_3 , and δ_4 are the coefficients to be estimated.

The results of the estimation of equation (4) are reported in Column (3), Table 4 and Figure 6a and 6b. Results are again very interesting and have obtained the improvement in the t -values and all residual testing. Several of the variables are now significant including the trend, ECT_{t-1} , and contemporaneous ΔCBS_t , ΔBQM_t and ΔODA_t . Second, the trend and ECT_{t-1} , variables maintained negative

and significant influences on ΔPCI_t at the five and ten percent level of significance, respectively. Third, the estimated coefficients ΔCPS_t (contemporaneous) and ΔCPS_{t-1} , (long-run) are positive and negative, respectively and are insignificant. This suggests no direct association between PCI growth and changes CPS; but in the long-run ΔCPS_{t-1} is important given that $t = 1.03 > 1$, and should be noted. Third, ΔODA_{t-1} has the right theoretical sign and is significant at ten percent level of significance. This suggests that in the long-run if ODA goes up by one percent PCI goes up by two percent. Fourth, the results indicate that ΔCBS_t has an instantaneous negative and significant effect on ΔPCI_t , at the five percent level. This suggests that expenditure resulting from increases in lending by domestic banks has an immediate negative influence on real PCI growth, perhaps in the form of inflation. Fifth, ΔBM_{t-1} has the correct theoretical sign and is significant at ten percent level of significance. This means that increase in supply of BQM increases PCI in the long-run. Sixth, the coefficient for ERP (DM) has the correct theoretical sign, it is positive and significant at ten percent level of significance. Fifth, the sign for the coefficient of racial and political instability ($DV63$) is negative and significant as in the previous estimation.

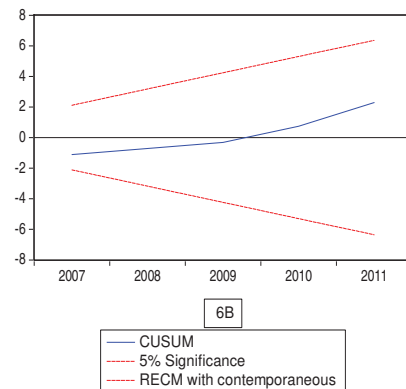
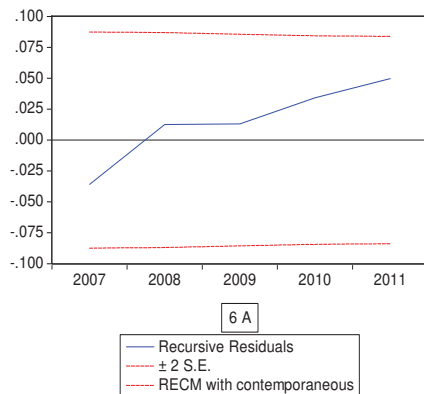
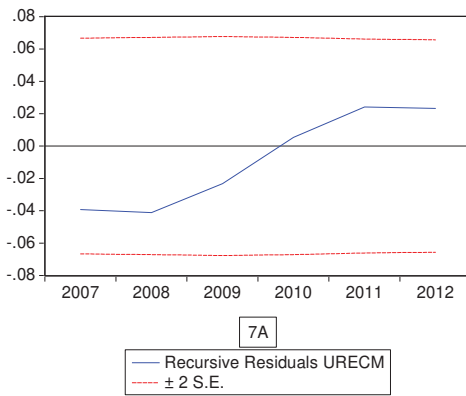


Fig. 6. The tests for stability using recursive residuals and Cumulative sum squares for RECM with contemporaneous change

Finally, the estimated coefficient for the error-correction term, ECT_{t-1} , has the correct theoretical sign, negative; and is significant at the ten percent level of significance; and (1) the equilibrium relationships are cointegrated; (2) short-run corrective changes occur in ΔPCI_t where in this instance about twenty one percent of the deviation was corrected in the next period whenever ΔPCI_t overshoot its long-run equilibrium values. I posit that the full adjustment to deviation is painfully slow in Guyana – as much as five years. I interpret the evidence as long-run causality whereby the variables indirect Granger-caused ΔPCI_t . The direction of causality runs interactively via ECT_{t-1} from these explanatory variables to Δpci_t , with specific long-run Granger-causal influence from ΔODA_{t-1} , ΔCBS_t , and ΔBQM_{t-1} to ΔPCI_t .

3.3.2. *Model Comparisons.* To enhance an understanding of financial development. Institution, private sector, and economic, I consider it useful to compare



models by estimating three other versions of cointegration and ECM that include (1) an unrestricted version of the error correction model (URECM) (2) an URECM with contemporaneous change; and the finding of best-fitting model using (2) for the Hendry GETS.

3.3.2.1. *URECM Version:* The URECM is estimated on the basis of replacing the error-correction term with the lagged level of the independent variables. The estimable model is written as equation (5)

$$\begin{aligned} \Delta pci_t = & \delta_0 + \delta_1 pci_{t-1} + \delta_2 CPS_{t-i} + \delta_3 CBS_{t-i} \\ & + \delta_4 BQM_{t-i} + \delta_5 ODA_{t-i} + \alpha_1 \Delta CPS_{t-i} + \alpha_2 \Delta CBS_{t-i} + \\ & + \alpha_3 \Delta BQM_{t-i} + \alpha_4 \Delta ODA_{t-i} + DM + DV63 + DV67 + \\ & + DV75 + DV81 + DV06 + \varepsilon_t. \end{aligned} \quad (5)$$

The results are reported in Column (4) of Table 4 and Figures 7A and 7B.

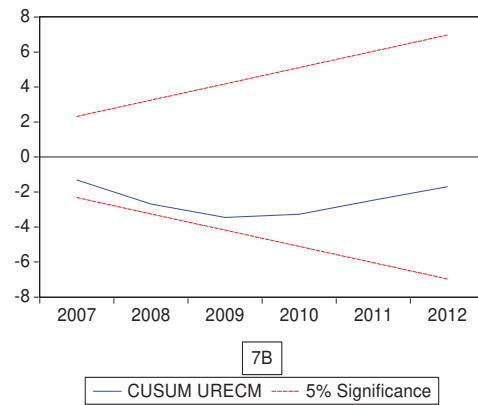


Fig.7.The tests for stability using recursive residuals and Cumulative sum squares for URECM

The results indicate that ΔPCI_t has long-run relationship with several variables. First, ΔODA_{t-1} , remains positive and is the only long-run variable that is significant at five percent level of significance indicating a Granger-causal influence from ΔODA_{t-1} to ΔPCI_t . Second, three level terms, had long-run influence on ΔPCI_t , including ΔPCI_{t-1} , BQM_t , and ODA_{t-1} . Specifically, the coefficient σ_1 on PCI_{t-1} is interpreted as the error-correction rate. It is negative and significant at the one percent level of significance. The coefficient for BQM_{t-1} , is negative and significant at five percent level of significance. This proposes that changes in the growth of broad money affect PCI negatively, and perhaps as inflation. Third, several dummy variables including DM $DV63$, $DV75$, and $DV81$ are significant. Fourth, the model satisfies the diagnostic tests. One concludes that the residuals are distributed normally, serially independent and dynamically stable, respectively.

3.3.2.2. *Comparison of Model 2. Unrestricted error correction model and contemporaneous change (URECMCC).* The interest in comparison

is extended to accommodate the presence of short-run contemporary changes in the model. Equation (5) is rewritten as equation (6) as follows:

$$\begin{aligned} \Delta pci_t = & \delta_0 + \delta_1 PCI_{t-1} + \delta_2 CPS_{t-1} + \delta_3 CBS_{t-1} + \\ & \delta_4 BQM_{t-1} + \delta_5 ODA_{t-1} + \alpha_1 \Delta CPS_{t-1} + \\ & + \alpha_2 \Delta CBS_{t-1} + \alpha_3 \Delta BQM_{t-1} + \alpha_4 \Delta ODA_{t-1} + \\ & + \beta_1 \Delta CPS_t + \beta_2 \Delta CBS_t + \beta_3 \Delta BQM_t + \beta_4 \Delta ODA_t + \\ & + DM + DV63 + DV67 + DV75 + DV81 + DV06 + \varepsilon_t, \end{aligned} \quad (6)$$

where the variables ΔCPS_t , ΔCBS_t , ΔBQM_t , and ΔODA_t are as defined before CPS_t , CPS_t , BQM_t and ODA_t are added as their contemporaneous changes; $\beta_i = 1, \dots, 4$, are the related coefficients to be estimated. Equation (6) could be view as a contemporaneous causality model.

The results are reported in Column 5 of Table 4 and Figures 8A and 8B. The model exposes 21 variables to be estimated. The results indicate ten or forty seven percent of the variables are statistically significant including ΔODA_t , ΔODA_{t-1} , PCI_{t-1} , BQM_{t-1} ,

$ODA_{t-1} DM, DV63$ and $DV81$. With an eye on model improvement, the goodness of fit of the specification, i.e. adjusted R^2 is explains fifty-nine percent (a decrease of about five percent) of variation of de-

pendent variable. The robustness of the model has been established by results of the diagnostic tests recorded in Column (5), Table (4) and in Figures 8A and 8B.

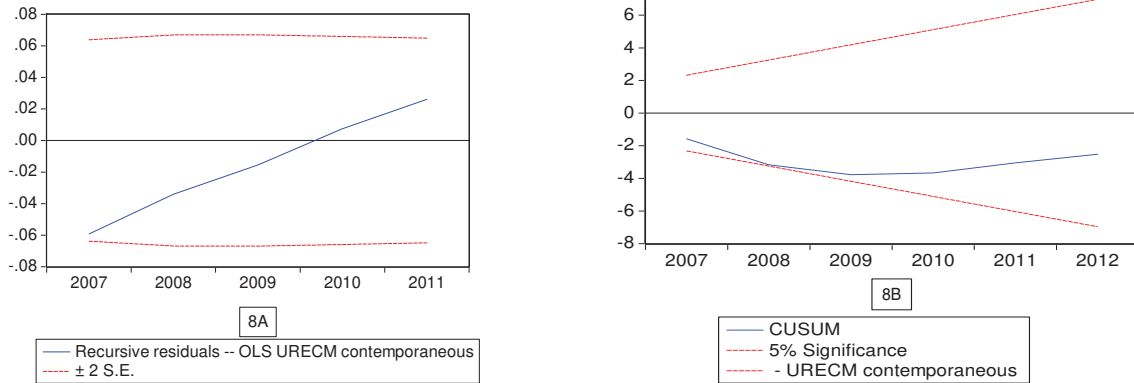


Fig. 8. The tests for stability using recursive residuals and cumulative of sum squares for URECM with contemporaneous change

These tests indicate collectively that the model has the econometric properties in function and behavior of residuals making the results valid for reliable interpretation. This supports the long-run relationship between ΔPCI_t and the variables. Based on the significance of the variables the report is as follows: First, ΔPCI_t is affected negatively by ΔODA_t in the short-run and positively by ΔODA_{t-1} in the long-run the ten- and one-percent level of significance, respectively. Second, PCI_{t-1} , has the correct theoretical sign to serve as an error-correction term. In the long-run it influences ΔPCI_t negatively at the one-percent level of significance. Third, ΔBQM_{t-1} influences ΔPCI_t negatively at the ten-percent level of significance in the long-run. Fourth, several dummy variables maintain transitory influence on the dependent variables including $DM, DV63, DV75,$ and $DV81$.

3.3.2.3. *Comparison of model 3. Hendry’s General-to-specific method.* With a view to establish a parsimonious model the CETS method was used to estimate equation (6). The model exposes twenty-one variables for estimation. The results reported in Column (6) of Table (4) indicate model improvement with twelve of or forty seven percent of the variables being significant including $\Delta CPS_{t-1}, \Delta BQM_{t-1}, \Delta ODA_t, \Delta ODA_{t-1}, PCI_{t-1}, CBS_{t-1}, BQM_{t-1}$ and $ODA_{t-1}, DM, DV63, DV75$ and $DV81$. The goodness of fit of the specification, i.e. adjusted R^2 explains sixty-eight percent of variation of dependent variable, ΔPCI_t . The model is robust as it satisfies all diagnostic tests recorded in Column (5), Table (4) and the dynamic stability tests are depicted in Figures 9A and 9B.

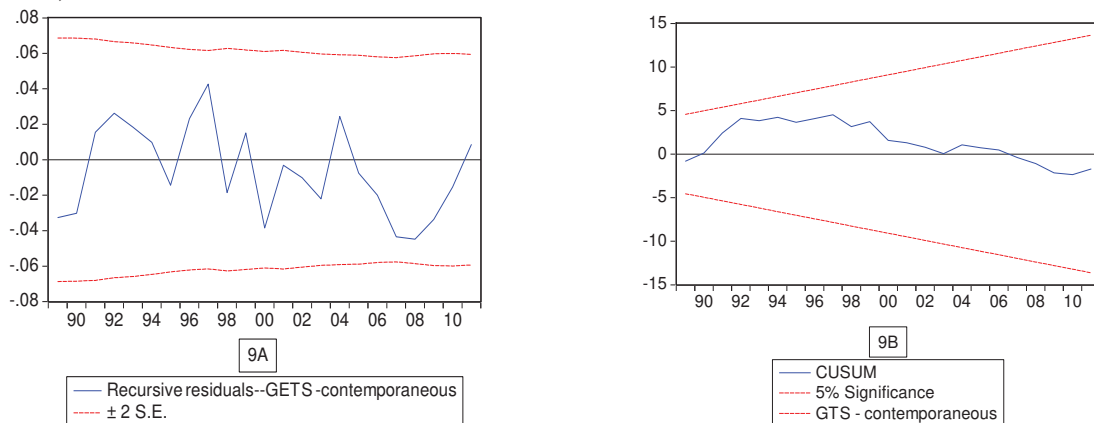


Fig. 9 The tests for stability using recursive residuals and Cumulative sum of squares for general-to-specific method with contemporaneous changes

Thus, these tests indicate collectively that the model has the econometric properties in function and behavior of residuals making the results valid for reliable interpretation. Again, a long-run relationship between ΔPCI_t and the variables exists with significant relationships as follows: First, ΔPCI_t is affected positively and significantly by ΔCPS_{t-1} in the

long-run at the one-percent level of significance. Second, ΔPCI_t is affected contemporaneously by ΔODA_t and in the long-run by ΔODA_{t-1} with influences at the five- and one-percent level of significance, respectively. Third, PCI_{t-1} , carries the correct theoretical sign to serve as the error correction function. It influences ΔPCI_t negatively at the one-

percent level of significance. Fourth, in the long run ΔBQM_{t-1} influences ΔPCI_t negatively at the one-percent level of significance. Fifth, some impulse dummy variables that maintained transitory influences include DM with negative influence on ΔPCI_t growth at the ten-percent level of significance; associated racial and political discords $DV63$ with negative influence on ΔPCI_t at the one-percent level of significance; favorable commodity prices $DV75$ with positive influence on ΔPCI_t at the five-percent level of significance; and suspension from IIOs support, $DV81$, with positive influence on ΔPCI_t at the one-percent level of significance.

Summary and conclusion

This paper explores the relationship between financial deepening, private sector, and economic growth as moderated by institution-organization based influences. Within the ECM and GETS frameworks the growth in real PCI to the growth in CPS , ODA , CBS , and BQM are estimated in the case of Guyana for the period of 1960-2012. Seven equations were estimated to discern both long-term and short-term relations. Specifically, the ADF-residual tests and J-J MLE tests confirmed one cointegrating relations. The three techniques determined a long-run equilibrium or cointegration relationship between real per capita income and the other variables. Controlling for both contemporaneous and long-run effects, the study shows that Guyana PCI is correlated significantly and positively with CPS in OLS static long-run estimates and short-run dynamics, while it is strongly negative for lagged levels. The results also show that: (1) the organization-institution based influences (ODA) have significant negative relationships by the static long-run estimates, one in by the long-run levels, two by the dynamic contemporaneous changes; and three strong positive relationship for dynamic changes in the long-run; (2) there is one finding of a significant and negative relationship

between contemporaneous dynamic change in CBS and PCI ; (3) there are four findings of significant relationships between BQM and PCI – two findings of positive for the long-run effect of the dynamic change of BQM on PCI , and two negatives for the static long-run. Further, it is interesting to note that the social and political institutional issues (feuds) during 1963-64 maintain a significantly negative impact on PCI growth in all equations, while the suspension from IFIs support is positive and important in all equation, with significance in five. Likewise, the ERP was important in all equations, with significance in six. On the basis of these results I use the GETs and consider both CPS and ODA are determinants of PCI growth in Guyana financial deepening. Institution-organization-based influence is the major determinant of economic growth. However, given the preponderance of negative relationships between these influences and economic growth, measures to enhance institutional reform in the social-economic and political sectors must be encouraged per capita income growth is desired.

There remain some limitations in this paper. First, the data indicated several instances of weak parameter stability and though the addition of dummy and trend variable helped improve the results, I ignored to consider non-linearities in the data. Second, placing emphasis on private credit and institution-organization-based influence, while ignoring others leave room for deeper insights; and provide opportunity for research that may focus on analyzing per capita income growth for Guyana or other developing nations using threshold cointegration methods. Third, the preponderance of impact of the institution-organization-based influence suggests the usefulness of controlling for this influence in estimating financial deepening models not merely as dichotomous variables, but to capture the political and sociological influences that underpin economic decisions in developing countries.

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