Financial Development, Growth and Poverty Reduction: Evidence from Ghana

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2018

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June 1, 2018

Abstract

In this paper, we re-assess the finance-growth-poverty linkage in Ghana during the period 1960–2015. We account for structural changes and omitted variable bias, using a modified multivariate distibuted lag framework. We find financial development to cause economic growth, which in turn causes poverty reduction in Ghana. This has useful policy implications.

JEL Classification: C32; E44; I32.
Keywords: Financial Development; Economic Growth; Poverty Reduction; Ghana.

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1 Introduction

Poverty remains a bane of humanity. According to Mood and Jonsson (2016), poverty is a state of deprived economic resources, and therefore associated with negative social consequences. The poor are prone to diseases, dangerous social groups, social exclusion and stigmatization and are at risk of unfulfilling their aspirations (Sen, 1983). Hence, policymakers and international organizations such as the World Bank and the United Nations are pre-occupied with fighting poverty (Birdsall & Londoño, 1997). On the global scale, the evidence suggests that poverty has been declining over the years (Sala-i-Martin, 2006). However, there is still room for further reduction of poverty, moving forward.

The literature identifies financial development and economic growth as the means for achieving extensive poverty reduction in various ways. Firstly, financial development improves the opportunities for the poor by addressing the causes of financial market failure such as information asymmetry and the high fixed cost of small-scale lending (Stiglitz, 1993; Jalilian & Kirkpatrick, 2005). Secondly, financial development enables the poor to access financial services, and enhances their productivity (World Bank, 2001; Jalilian & Kirkpatrick, 2005). Thirdly, financial development may reduce poverty by promoting economic growth – in line with the trickle-down theory (see Ravallion & Datt, 2002; Dollar & Kraay, 2002).

A lot of work has been put in to establish the role of financial development and economic growth in poverty reduction, recently.[1] However, three issues motivate this paper. Firstly, the existing studies have produced conflicting findings, leaving the finance-growth-poverty debate open for further research. Secondly, the literature has largely excluded African countries despite the incidence of poverty being prevalent in most of these countries. Thirdly, existing studies have mostly failed to account for structural changes and omitted variables, thereby making their results somehow questionable. It is against this background that we re-assess the finance-growth-poverty debate by concentrating on an African country, Ghana. Here, we attempt to avoid the previous specification problems by accounting for structural breaks and omitted variables.

In the next section, we present our empirical methodology and the data. In section 3, we present the empirical results. In section 4, we conclude the paper.

2 Methodology and Data

2.1 Data

Our data is annual and covers the period 1960–2015. It is sourced from the World Development Indicators (WDI) (2016). We follow the existing literature and use two non-monetary indicators of poverty, namely: mortality rate, infant

[1]Some of the recent studies includeAbosedra, Shahbaz, and Nawaz (2016), Sehrawat and Giri (2016), Uddin, Shahbaz, Arouri, and Teulon (2014), Inoue and Hamori (2012), Jeanneney and Kpodar (2011), Quartey (2008), Beck, Demirgüç-Kunt, and Levine (2007), and Jalilian and Kirkpatrick (2005).

per 1,000 live births (MOR) and life expectancy at birth (LEB), total (years)[2], two indicators of financial development, namely: domestic credit to private sector as percentage of GDP (DCP) and broad money as percentage of GDP (LIQ), and real GDP per capita growth to measure economic growth (see Beck et al., 2007; Hasan, Wachtel, & Zhou, 2009; Zhang, Wang, & Wang, 2012; Abosedra et al., 2016). We include inflation rate, proxied by annual percentage changes in the consumer price index, as a control variable. Descriptive statistics of these variables are in Table 1.

2.2 Empirical Specification

We use a modified multivariate autoregressive distributed lag (ARDL) bounds testing approach to avoid the empirical pitfalls of not accounting for structural breaks and omitted variables. This approach has unique features which make it to stand out, including: (i) it does well in small samples; (ii) it avoids pretesting bias; and (iii) it is applicable even if the variables are integrated of mixed orders [i.e. I(0) and I(1)] or fractionally integrated (see Pesaran, Shin, & Smith, 2001). Using the variables, the ARDL model can be specified as:

$$\begin{aligned}\Delta lnPOV_t = \gamma_0 + \gamma_1 T + \gamma_2 DUM + \gamma_3 lnPOV_{t-1} + \gamma_4 lnINF_{t-1} + \gamma_5 lnFND_{t-1} \\ + \gamma_6 lnGRW_{t-1} + \sum_{i=1}^{n} \gamma_{1i} \Delta lnPOV_{t-i} + \sum_{i=0}^{n} \gamma_{2i} \Delta lnINF_{t-i} + \sum_{i=0}^{n} \gamma_{3i} \Delta lnFND_{t-i} \\ + \sum_{i=0}^{n} \gamma_{4i} \Delta lnGRW_{t-i} + u_t \end{aligned} \quad (1)$$

$$\begin{aligned}\Delta lnINF_t = \rho_0 + \rho_1 T + \rho_2 DUM + \rho_3 lnPOV_{t-1} + \rho_4 lnINF_{t-1} + \rho_5 lnFND_{t-1} \\ + \rho_6 lnGRW_{t-1} + \sum_{i=1}^{n} \rho_{1i} \Delta lnINF_{t-i} + \sum_{i=0}^{n} \rho_{2i} \Delta lnPOV_{t-i} + \sum_{i=0}^{n} \rho_{3i} \Delta lnFND_{t-i} \\ + \sum_{i=0}^{n} \rho_{4i} \Delta lnGRW_{t-i} + u_t \end{aligned} \quad (2)$$

$$\begin{aligned}\Delta lnFND_t = \delta_0 + \delta_1 T + \delta_2 DUM + \delta_3 lnPOV_{t-1} + \delta_4 lnINF_{t-1} + \delta_5 lnFND_{t-1} \\ + \delta_6 lnGRW_{t-1} + \sum_{i=1}^{n} \delta_{1i} \Delta lnFND_{t-i} + \sum_{i=0}^{n} \delta_{2i} \Delta lnPOV_{t-i} + \sum_{i=0}^{n} \delta_{3i} \Delta lnINF_{t-i} \\ + \sum_{i=0}^{n} \delta_{4i} \Delta lnGRW_{t-i} + u_t \end{aligned} \quad (3)$$

[2]Other studies use household final consumption expenditure per capita growth to proxy poverty (see Uddin et al., 2014; Sehrawat & Giri, 2016) but data on this variable is limited in the case of Ghana.

$$\Delta lnGRW_t = \sigma_0 + \sigma_1 T + \sigma_2 DUM + \sigma_3 lnPOV_{t-1} + \sigma_4 lnINF_{t-1} + \sigma_5 lnFND_{t-1} + \sigma_6 lnGRW_{t-1} + \sum_{i=1}^{n} \sigma_{1i} \Delta lnGRW_{t-i} + \sum_{i=0}^{n} \sigma_{2i} \Delta lnPOV_{t-i} + \sum_{i=0}^{n} \sigma_{3i} \Delta lnINF_{t-i} + \sum_{i=0}^{n} \sigma_{4i} \Delta lnFND_{t-i} + u_t \quad (4)$$

where $lnPOV$, $lnFND$, $lnINF$ and $lnGRW$ are respectively, the logs of poverty, financial development, inflation, and economic growth. Δ denotes first difference operator; γ, ρ, δ, and σ are the parameters of the model. DUM is a dummy variable which takes a value of one when there is a structural break and zero otherwise; t denotes the time subscript; u, v, w and μ are the iid innovations.

In Eq. (1), for example, we test for cointegration among the variables using the joint hypothesis that $\gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = 0$. If this hypothesis is rejected, then the variables are said to be cointegrated. Under this hypothesis, two sets of critical values have been constructed by Pesaran et al. (2001). We do not reject the null hypothesis of no cointegration relationships when the F-statistic falls below the lower-bound values. Similarly, we reject the null hypothesis of no co-integration when the calculated F-statistic is greater than the upper-bound values. However, the test is inconclusive, when the F-statistic falls between the lower and upper bounds.

If cointegration is established in Eqs. (1) to (4), we can simply transform them into the following unrestricted error correction model (UECM):

$$\Delta lnPOV_t = \gamma_0 + \gamma_3 lnPOV_{t-1} + \gamma_4 lnINF_{t-1} + \gamma_5 lnFND_{t-1} + \gamma_6 lnGRW_{t-1} + \sum_{i=1}^{n} \gamma_{1i} \Delta lnPOV_{t-i} + \sum_{i=0}^{n} \gamma_{2i} \Delta lnINF_{t-i} + \sum_{i=0}^{n} \gamma_{3i} \Delta lnFND_{t-i} + \sum_{i=0}^{n} \gamma_{4i} \Delta lnGRW_{t-i} + \gamma_5 ECM_{t-1} + u_t \quad (5)$$

$$\Delta lnINF_t = \rho_0 + \rho_3 lnPOV_{t-1} + \rho_4 lnINF_{t-1} + \rho_5 lnFND_{t-1} + \rho_6 lnGRW_{t-1} + \sum_{i=1}^{n} \rho_{1i} \Delta lnINF_{t-i} + \sum_{i=0}^{n} \rho_{2i} \Delta lnPOV_{t-i} + \sum_{i=0}^{n} \rho_{3i} \Delta lnFND_{t-i} + \sum_{i=0}^{n} \rho_{4i} \Delta lnGRW_{t-i} + \rho_5 ECM_{t-1} + u_t \quad (6)$$

$$\Delta lnFND_t = \delta_0 + \delta_3 lnPOV_{t-1} + \delta_4 lnINF_{t-1} + \delta_5 lnFND_{t-1} + \delta_6 lnGRW_{t-1} + \sum_{i=1}^{n} \delta_{1i} \Delta lnFND_{t-i} + \sum_{i=0}^{n} \delta_{2i} \Delta lnPOV_{t-i} + \sum_{i=0}^{n} \delta_{3i} \Delta lnINF_{t-i} + \sum_{i=0}^{n} \delta_{4i} \Delta lnGRW_{t-i} + \delta_5 ECM_{t-1} + u_t \quad (7)$$

$$\Delta lnGRW_t = \sigma_0 + \sigma_3 lnPOV_{t-1} + \sigma_4 lnINF_{t-1} + \sigma_5 lnFND_{t-1} + \sigma_6 lnGRW_{t-1}$$
$$+ \sum_{i=1}^{n} \sigma_{1i} \Delta lnGRW_{t-i} + \sum_{i=0}^{n} \sigma_{2i} \Delta lnPOV_{t-i} + \sum_{i=0}^{n} \sigma_{3i} \Delta lnINF_{t-i} + \sum_{i=0}^{n} \sigma_{4i} \Delta lnFND_{t-i}$$
$$+ \sigma_5 ECM_{t-1} + u_t \quad (8)$$

where ECM_{t-1} is the one-period lagged of the error correction term. Note that the structural breaks are captured in the error correction term.

Long-run causality can be established by conducting a test of significance (a t-test) on the lagged error correction term in each equation. Similarly, short-run causality can be established by conducting a joint test of statistical significance (an F-test) of the first differenced explanatory variables in each of the equations.

3 Empirical Results

3.1 Results for Stationarity and Cointegration Tests

We test for stationarity using the ADF and DF-GLS, and Zivot-Andrews tests.[3] The results of these tests, shown in Tables 2 and 3, suggest that none of the variables is integrated of orders greater than one. Hence, the sufficient condition for using the ARDL bounds testing approach is satisfied.

From Table 3, it is clear that the variables contain structural breaks. Table 4 shows the results of the cointegration tests on Eqs. (1) to (4), which take into account structural breaks. Models 1 and 2 contain two cointegrating relations; Model 3 contains one, while Model 4 contains three. The error correction estimates for variant forms of Eq. (5) in Table 5 show that the error correction term is negative and statistically significant. Therefore, short-run deviations are corrected annually. The results also show that improvements in financial development and growth are associated with falling mortality rates, and rising life expectancy at birth in the short run. The long-run results in Table 6 show that financial development and growth are associated with declining mortality rate and rising life expectancy at birth. Note that all the specifications have passed the diagnostic tests (see bottom part of Table 6, and Figures 1 to 4).

3.2 Results for Causality Test

Since the variables are cointegrated, there exists causality in one or more directions. Hence, using the UECM specified in Eqs. (5) to (8), we perform the Granger causality analysis and present the results in Table 7. The results show Granger causality among the variables in different ways. The most important among them is that financial development causes economic growth, which in

[3] See Zivot and Andrews (2002), and Elliott, Rothenberg, and Stock (1996) for technical explanations of these tests.

turn causes poverty reduction in Ghana. This is consistent with the trickle-down hypothesis (Ravallion & Datt, 2002; Dollar & Kraay, 2002). Our results are very similar to those documented by Abosedra et al. (2016), Inoue and Hamori (2012), Quartey (2008), Sehrawat and Giri (2016), Uddin et al. (2014), among others.

4 Conclusion

We set out to re-assess the finance-growth-poverty linkage in the case of Ghana. Using modified multivariate ARDL specifications to incorporate structural breaks and omitted variables, and a dataset covering the period 1960–2015, we found that financial development and economic growth are pro-poor in the case of Ghana – meaning that the trickle-down hypothesis is firmly supported. Hence, policymakers may prioritize inclusive financial development and economic growth in order to achieve drastic poverty reduction. Policies in this direction should include the commercialization of the rural economy, through supervised credit extensions to small scale enterprises (SMEs), attracting foreign investments in rural areas, and proactive involvement of women in business decision-making, since they dominate SMEs. Future research should focus on micro-level analysis and field experiments to better uncover the finance-growth-poverty linkage.

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Table 1: **Descriptive statistics**

Raw	LEB	MOR	GDP	DCP	LIQ	INF
Mean	54.513	86.222	1027.250	8.432	22.746	27.030
Median	55.694	85.800	989.444	6.958	21.643	20.041
Maximum	61.312	125.100	1696.081	20.271	34.108	123.061
Minimum	45.831	42.800	701.527	1.542	11.305	1.940
Std. Dev.	4.591	26.965	230.619	5.031	6.084	22.177
Skewness	-0.262	-0.029	1.369	0.584	0.141	2.102
Kurtosis	1.851	1.577	4.708	2.277	2.130	8.506
Jarque-Bera	3.658	4.650	23.865	4.326	1.919	110.001
Probability	0.161	0.098	0.000	0.115	0.383	0.000
Sum	2998.216	4742.200	56498.760	463.770	1251.026	1486.674
Sum Sq. Dev.	1138.235	39264.130	2872002.000	1366.704	1998.747	26559.200
Observations	55	55	55	55	55	55
Logarithm	LNLEB	LNMOR	LNGDP	LNDCP	LNLIQ	LNINF
Mean	3.995	4.404	6.913	1.933	3.087	2.996
Median	4.020	4.452	6.897	1.940	3.075	2.998
Maximum	4.116	4.829	7.436	3.009	3.530	4.813
Minimum	3.825	3.757	6.553	0.433	2.425	0.663
Std. Dev.	0.086	0.335	0.205	0.671	0.280	0.840
Skewness	-0.362	-0.341	0.800	-0.362	-0.370	-0.639
Kurtosis	1.919	1.796	3.537	2.275	2.484	3.804
Jarque-Bera	3.881	4.389	6.523	2.407	1.867	5.227
Probability	0.144	0.111	0.038	0.300	0.393	0.073
Sum	219.719	242.239	380.206	106.312	169.799	164.764
Sum Sq. Dev.	0.396	6.072	2.272	24.319	4.242	38.088
Observations	55	55	55	55	55	55

Notes: Std. Dev. and Sum Sq. Dev. denote, respectively the standard deviation, and the sum of squared deviations. LN is the natural log operator.

Table 2: **Results for Unit roots Test without Structural Breaks**

	ADF				KPSS			
Variable	Constant Statistic	Lags	Trend Statistic	Lags	Constant Statistic	Bandwidth	Trend Statistic	Bandwidth
lnLEB	-2.753*	2	0.482	2	0.894***	6	0.198**	5
ΔLNLEB	—	—	-3.583**	1	0.291	5	0.050	5
lnMOR	3.314	2	-2.073	2	0.894***	6	0.237***	5
ΔLNMOR	-3.145***	1	-6.337***	2	0.654***	5	0.078	5
lnGDP	0.245	1	0.340	0	0.372**	5	0.250***	5
ΔLNGDP	-4.793***	0	-5.516***	0	0.590**	4	0.102	1
lnDCP	-0.731	0	-1.215	0	0.384**	6	0.184**	6
ΔLNDCP	-6.908***	0	-6.961***	0	0.171	3	0.100	2
lnLIQ	-1.347	0	-1.801	0	0.407**	5	0.162**	5
ΔLNLIQ	-7.769***	0	-7.735***	0	0.099	3	0.063	3
lnINF	-3.560***	0	-3.481***	0	0.359**	4	0.215**	5
ΔLNINF	—	—	—	—	0.172	4	0.104	9

Notes: *, **, and *** denote, respectively, significance at 10, 5, and 1%. — denotes not applicable. Δ and LN are the first difference and the natural log operators, respectively.

Table 3: **Results for Unit roots Test with Structural Breaks**

	Zivot-Andrews					
	Constant Statistics	Lags	Break Date	Trend Statistics	Lags	Break Date
LNLEB	-0.582	2	1980	-2.736	2	1990
ΔLNLEB	-5.723***	1	1981	-5.627***	1	1987
LNMOR	-2.489	2	2007	-2.848	2	2006
ΔLNMOR	-8.126***	2	1998	-7.967***	2	1985
LNGDP	-2.958	1	1975	-3.033	1	1988
ΔLNGDP	-6.384***	0	1975	-6.384***	0	1975
LNDCP	-3.896	0	1973	-4.006	0	1982
ΔLNDCP	-5.555***	2	1984	-7.220***	0	1974
LNLIQ	-3.983	0	1979	-3.055	0	1984
ΔLNLIQ	-8.574***	0	1985	-7.829***	0	1980
LNINF	-4.906**	2	1972	-4.424***	2	1979
ΔLNINF	—	—	—	—	—	—

Notes: **, and *** denote, respectively, significance at 5 and 1%. — denotes not applicable. Δ and LN are the first difference and the natural log operators, respectively.

Table 4: **Results for Cointegration Test**

	F-statistic	Optimal lags	Break date
Model 1			
LNLEB	16.743***	2,02,0	1990
LNINF	5.537***	1,0,0,1	1979
LNGDP	3.142	1,0,0,0	1988
LNDCP	2.399	1,0,0,0	1982
Model 2			
LNMOR	10.498***	2,2,2,2	2006
LNINF	7.259***	1,0,1,1	1979
LNGDP	2.863	2,0,2,2	1988
LNDCP	3.393	1,0,0,2	1982
Model 3			
LNLEB	16.515***	2,0,2,0	1990
LNINF	3.441	1,0,1,2	1979
LNGDP	1.233	2,0,0,1	1988
LNLIQ	3.184	1,1,0,2	1984
Model 4			
LNMOR	7.042***	2,2,0,2	2006
LNINF	7.928***	2,1,1,1	1979
LNGDP	1.255	2,0,2,1	1988
LNLIQ	4.814**	1,2,1,1	1984
Critical values	Lower bound		Upper bound
1%	4.300		5.230
5%	3.380		4.230
10%	2.970		3.740

Note: **, and *** denote, respectively, significance at 5 and 1%. LN is the natural log operator.

Table 5: **Short-run Estimates**

Variable	Model 1	Model 2	Model 3	Model 4
	Dependent variable: ΔLNPOV			
ΔLNPOV(-1)	0.889***	0.942***	0.805***	0.945***
	(5.971)	(3.193)	(9.665)	(3.362)
ΔLNINF	0.001	0.000	0.001	0.000
	(1.157)	(1.000)	(1.327)	(1.330)
ΔLNINF(-1)	-0.002***	—	-0.002**	—
	(-3.232)	—	(-2.558)	—
ΔLNGDP	0.023***	-0.002	0.015*	-0.001
	(2.969)	(-0.837)	(1.904)	(-0.563)
ΔLNGDP(-1)	0.019**	0.006**	—	0.006**
	(2.443)	(2.437)	—	(2.299)
ΔLNFDV	0.006***	-0.000	0.002	0.001
	(3.480)	(-0.003)	(0.705)	(1.059)
ΔLNFDV(-1)	0.006***	—	0.010***	—
	(3.957)	—	(2.748)	—
Constant	0.428***	0.348***	0.341***	0.356***
	(8.304)	(9.738)	(6.863)	(9.756)
ECT(-1)	-0.072***	-0.080***	-0.059***	-0.082***
	(-8.333)	(-9.736)	(-6.906)	(-9.754)

Notes: *, **, and *** denote, respectively, significance at 10, 5, and 1%. POV, FDV, INF, GDP, and ECT are indicators of poverty, financial development, inflation, real income, and error-correction term, respectively. Δ and LN are the first difference and the natural log operators, respectively.

Table 6: **Long-run Estimates**

Variables	Model 1	Model 2	Model 3	Model 4
	Dependent Variable: LNPOV			
LNINF	0.027**	0.002	0.034*	0.002**
	(2.036)	(0.925)	(1.946)	(2.748)
LNGDP	0.153***	-0.076***	0.169**	-0.073***
	(3.023)	(-6.408)	(2.473)	(-6.228)
LNFDV	0.008***	-0.002***	0.071**	-0.001*
	(5.453)	(-3.614)	(2.622)	(-1.864)
Constant	-0.020***	-0.005***	-0.022***	-0.005***
	(-9.080)	(-8.157)	(-5.662)	(-4.171)
Diagnostics				
R-sq	0.899	0.699	0.855	0.569
Adj. R-sq	0.887	0.687	0.841	0.547
F-stat.	8.323***	7.528***	7.832***	7.463***
DW Stat.	1.287	1.136	0.816	1.112
Normality	2.179(0.337)	1.679(0.423)	1.294(0.468)	0.951(0.502)
Functional Form	1.870(0.433)	1.350(0.518)	1.576(0.460)	2.036(0.358)
Heteroskedasticity	3.889(0.143)	2.543(0.271)	0.648(0.585)	1.804(0.301)
Serial Correlation	1.932(0.312)	2.932(0.200)	1.336(0.422)	0.559(0.638)

Notes: *, **, and *** denote, respectively, significance at 10, 5, and 1%. POV, FDV, INF, and GDP are indicators of poverty, financial development, inflation, and real income, respectively.

Table 7: **Short- and Long-run Causality Analysis**

Dependent Variable	Short-run Causality				Long-run Causality
Model 1	ΣΔLNLEB(t-i)	ΣΔLNINF(t-i)	ΣΔLNGDP(t-i)	ΣΔLNDCP(t-i)	ECT(-1)
ΔLNLEB	—	5.361***(0.009)	10.974*** (0.000)	10.051***(0.000)	-0.073***(-4.466)
ΔLNINF	0.596(0.555)	—	1.572(0.220)	0.545(0.5838)	-0.070***(-4.008)
ΔLNGDP	0.600(0.553)	4.486**(0.019)	—	3.058*(0.058)	—
ΔLNDCP	0.378(0.687)	5.097**(0.012)	3.174*(0.053)	—	—
Model 2	ΣΔLNMOR(t-i)	ΣΔLNINF(t-i)	ΣΔLNGDP(t-i)	ΣΔLNDCP(t-i)	ECT(-1)
ΔLNMOR	—	3.639*(0.051)	8.222***(0.000)	5.366***(0.008)	-0.082***(-5.132)
ΔLNINF	3.782**(0.048)	—	1.745(0.188)	0.477(0.623)	-0.100***(-5.188)
ΔLNGDP	0.742(0.482)	7.468***(0.000)	—	6.777***(0.002)	—
ΔLNDCP	1.851(0.170)	8.064***(0.000)	3.715*(0.050)	—	—
Model 3	ΣΔLNLEB(t-i)	ΣΔLNINF(t-i)	ΣΔLNGDP(t-i)	ΣΔLNDCP(t-i)	ECT(-1)
ΔLNLEB	—	3.179*(0.052)	7.050***(0.000)	2.905*(0.066)	-0.059***(-5.558)
ΔLNINF	4.535**(0.017)	—	3.038*(0.059)	5.417***(0.006)	—
ΔLNGDP	5.229**(0.010)	6.540***(0.005)	—	8.856***(0.000)	—
ΔLNLIQ	0.420(0.659)	4.248**(0.034)	7.781***(0.000)	—	—
Model 4	ΣΔLNMOR(t-i)	ΣΔLNINF(t-i)	ΣΔLNGDP(t-i)	ΣΔLNDCP(t-i)	ECT(-1)
ΔLNMOR	—	4.089**(0.023)	9.500***(0.000)	7.462***(0.000)	-0.075***(-3.314)
ΔLNINF	0.267(0.7671)	—	8.304***(0.000)	1.315(0.280)	-0.401***(-4.981)
ΔLNGDP	6.982***(0.000)	7.304***(0.000)	—	6.746***(0.003)	—
ΔLNLIQ	1.779 (0.182)	3.054*(0.059)	7.031***(0.000)	—	-0.062**(-2.596)

Notes: *, **, and *** denote, respectively, significance at 10, 5, and 1%. Δ, Σ and LN are the first difference, summation, and the natural log operators, respectively.

Figure 1: **CUSUM and CUSUMSQ Plots for Model 1**

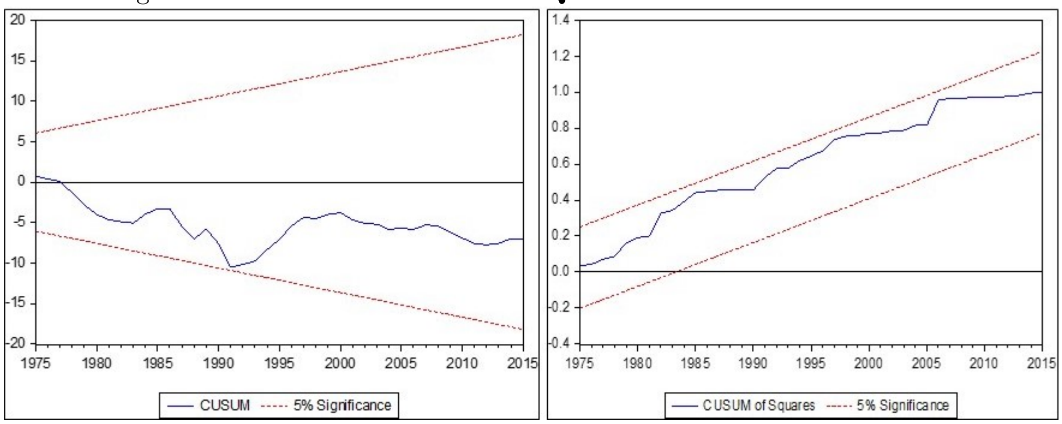

Figure 2: **CUSUM and CUSUMSQ Plots for Model 2**

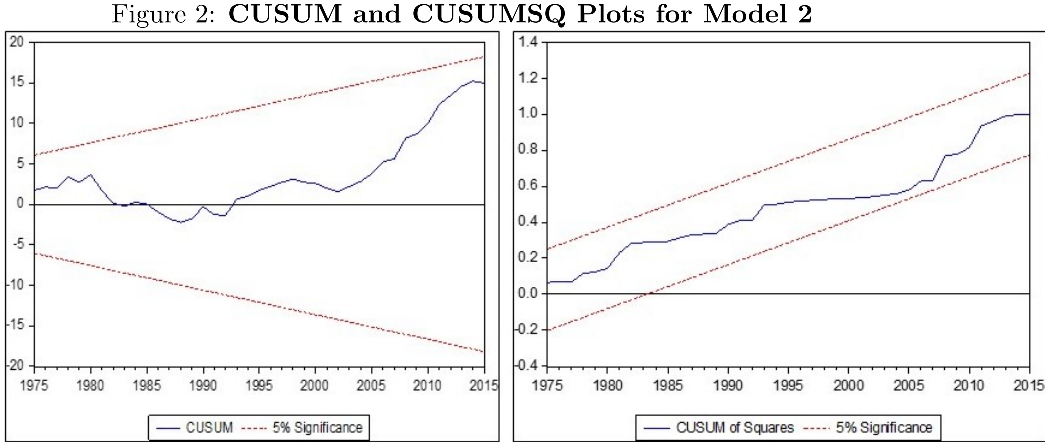

Figure 3: **CUSUM and CUSUMSQ Plots for Model 3**

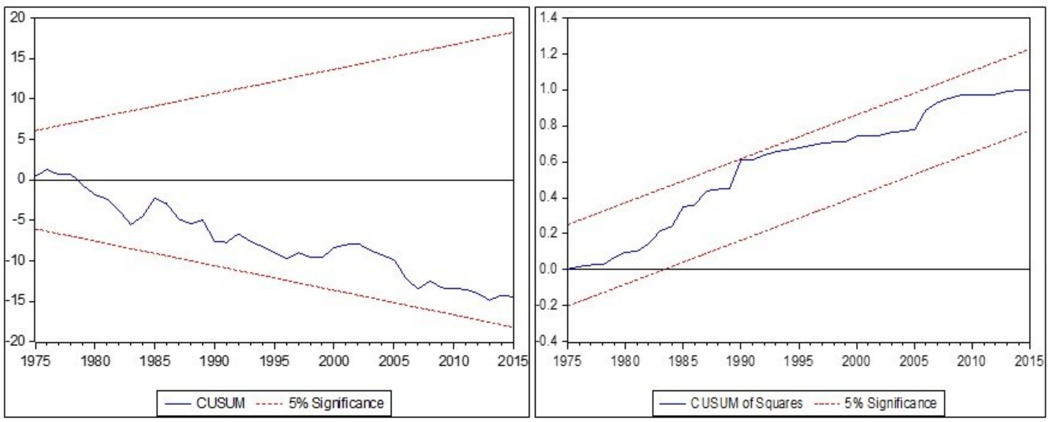

Figure 4: **CUSUM and CUSUMSQ Plots for Model 4**