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INTERNATIONAL MONETARY FUND

BENIN

Selected Issues and Statistical Appendix

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(all AFR)

Approved by the African Department

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Area				
Resident population				
Total (2005 est.)	7,395,040			
Growth rate (1998-2005)	3.1			
GDP per capita (2005)	596			
IMF Position (as of October 31, 2006)				
Quota	SDR 61.90 million			
Fund holding of currency	SDR 59.72 million			
	2002	2003	2004	2005
				Est.
	(Annual changes in percent, unless otherwise indicated)			
National income, prices and cotton production				
GDP at current prices	6.8	5.7	3.4	8.5
GDP at constant prices	4.5	3.9	3.1	2.9
GDP deflator	2.2	1.7	0.3	5.4
Consumer price index (average)	2.4	1.5	0.9	5.4
Consumer price index (end of period)	1.2	0.8	2.6	3.7
Production of cotton (in '000 of tons) 2/	337.5	333.1	427.7	190.8
Central government finance				
Revenue	13.2	10.2	0.2	9.1
Expenditure and net lending	8.2	11.6	0.7	13.9
Money and credit				
Net domestic assets 3/	4.6	11.6	3.4	12.9
Domestic credit 3/	7.5	12.8	4.8	13.4
Net claims on central government 3/	2.3	-0.2	1.5	3.2
Credit to the nongovernment sector	16.1	33.0	4.5	20.2
Broad money	-3.8	6.6	-6.7	21.8
Velocity (GDP relative to average M2)	3.4	3.6	3.6	3.7
External sector (in terms of CFA francs)				
Exports, f.o.b.	-3.9	14.1	7.7	-6.0
Imports, f.o.b.	13.8	3.6	3.9	-5.5
Export volume	10.4	11.6	-11.9	22.7
Import volume	5.5	4.7	3.0	3.3
Terms of trade (minus = deterioration)	-19.3	3.4	21.2	-15.9
Nominal effective exchange rate (minus = depreciation)	2.5	8.8	4.4	-0.5
Real effective exchange rate (minus = depreciation)	5.5	8.4	2.4	2.2
	(In percent of GDP, unless otherwise indicated)			
Basic ratios				
Gross investment	17.2	19.6	19.0	19.6
Gross domestic saving	3.3	6.7	6.7	9.6
Gross national saving	8.8	11.2	11.7	12.8
Central government finance				
Revenue	16.3	17.0	16.4	16.5
Expenditure and net lending	19.5	20.6	20.1	21.1
Primary balance 4/	-2.5	-3.1	-3.3	-4.3
Primary balance (narrow definition) 5/	1.0	0.2	0.0	-1.4
Overall fiscal deficit (payment order basis, excluding grants)	-3.3	-3.7	-3.7	-4.6
Overall fiscal deficit (cash basis, excluding grants)	-4.3	-3.7	-4.5	-3.6
Debt service (after debt relief) in percent of revenue 1/ & 6/	...	3.2	1.6	7.0
External sector				
Trade balance	-12.2	-11.3	-11.0	-9.6
Current account balance (excluding grants)	-8.6	-8.6	-7.9	-7.2
Current account balance (including grants)	-8.4	-8.3	-7.2	-6.8
Overall balance of payments	-3.6	-0.4	-3.2	2.8
Debt-service to exports ratio 1/	0.0	12.5	6.9	6.5
Net present value of debt-to-exports ratio 7/	244.2	147.1	132.1	78.6
Debt-to-GDP ratio (after HIPC and before MDRI)	50.3	38.6	32.4	36.9
Gross reserves in months of imports	8.8	11.1	8.7	11.4
Memorandum items:				
Nominal GDP (in billions of CFA francs)	1,956.7	2,067.9	2,138.2	2,319.7
CFA francs per U.S. dollar (period average)	694.6	580.1	527.6	526.6
Population (midyear, in millions)	6.8	7.0	7.2	7.4

Sources: Beninese authorities; and IMF staff estimates and projections.

1/ The 2006 projections incorporate the MDRI resources for the IMF, IDA and AfDF in stock operations.

2/ Cotton production for T-1/T season. Production of cotton seed in crop year T-1/T affects agricultural production in year T-1, industry, services, and exports of ginned cotton in year T.

3/ In percent of broad money at the beginning of the period.

4/ Total revenue minus all expenditure, excluding interest due.

5/ Total revenue minus all expenditure, excluding foreign-financed capital expenditure and interest due.

6/ Interest payment only.

7/ After HIPC relief and before MDRI.

I. PRIVATE INVESTMENT DYNAMICS AND GROWTH IN BENIN¹

Summary

Benin has been undergoing democratization since the early 1990s, a process that has been furthered by the recent 2006 presidential elections. With program engagement with the Fund virtually uninterrupted since the 1990s, the country reached the completion point under the enhanced HIPC Initiative in March 2003 and began receiving assistance under the Multilateral Debt Relief Initiative (MDRI) in 2006. The current three-year Poverty Reduction and Growth Facility arrangement was approved in August 2005. In this context, the government that took office in April 2006 has adopted a strategy to strengthen macroeconomic stability and promote private-investment-led growth.

The following study uses econometric techniques to investigate the short- and long-run behavior of private investment and its contribution to growth in Benin. It finds that besides developments in the institutional and regulatory framework and in the terms-of-trade, public investment and private capital formation facilitated by credit to the private sector have a strong impact on growth performance. The analysis also confirms that slow improvement in Benin's economic freedom, reflecting weak institutions and limited progress in implementing structural reforms, impedes private investment. Speed-of-adjustment analysis indicates that a 1 percent increase in private investment leads to a 0.2 percent increase in long-run GDP growth. Conversely, a 1 percent shock to private investment would entail a 16-percent yearly correction, requiring about 4 years to close half of the deviation of real GDP from its long-run equilibrium.

On the basis of these findings, the study underscores that:

- By promoting private sector development and directing fiscal resources to public investment in infrastructure and institutional building, the authorities could help Benin realize higher long-run growth. The additional fiscal space created by MDRI-related aid should be allocated to high-return projects.
- Structural reforms and the gradual formalization of informal economic activities through appropriate market incentives could help improve Benin's economic competitiveness and strengthen its fiscal position.
- A segmented public-private sector partnership could deepen the private sector's involvement in Benin's infrastructure development.
- Finally, broadening access to credit would boost private investment and support growth.

¹ Prepared by Issouf Samake.

A. Introduction

1. **This study analyzes the relationship between private investment and growth, and their key determinants.** To the extent that private investment is an important determinant of long-run growth, a comprehensive assessment of their relationship is essential to identify and appropriately address related policy issues. Such an assessment is of particular importance to Benin given that, despite its macroeconomic stability, the country has so far failed to attract significant private investment flows.

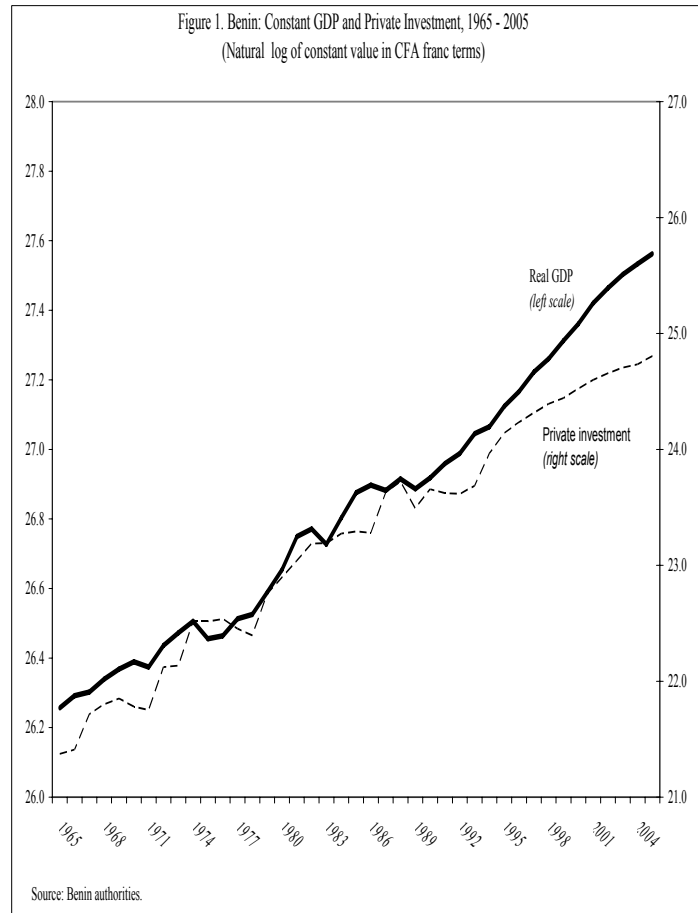
2. **The analysis uses econometric techniques to investigate the short- and long-run behavior of private investment and its links to growth.** Consistent with earlier growth accounting studies, it establishes that private investment is indeed a critical determinant of growth in Benin. Moreover, public investment appears to have an important role in supporting private investment and growth. This suggests that channeling part of the additional fiscal space in debt relief to public investment could benefit Benin's medium term growth rate. The analysis also shows that adverse shocks, e.g., the terms of trade, can have long-lasting effects, while credit to the private sector has a short-lived impact on private investment and growth. And there is significant potential for institutional reforms to improve the business environment, raise private investment and invigorate growth.

3. **The rest of the chapter is organized as follows:** Section B provides background and stylized facts on Benin's economic performance. Section C briefly describes the theoretical basis of the econometric model and discusses the estimation results. Section D provides insights on private investment behavior and its impact on growth through Variance Decomposition, Impulse Response Function, and Historical Decomposition Analysis. Section E offers concluding remarks and policy prescriptions for sustained growth through private investment.

B. Background and Stylized Facts

4. **Benin has recorded modest private investment rates and per capita GDP growth despite its relatively good position within the WAEMU.** Between 1965 and 2005, real GDP grew by an annual average of 3.4 percent, with per GDP capita increasing by only 0.3 percent per annum. After the 1994 CFA franc devaluation, real GDP growth rebounded to a yearly average of 4.4 percent during 1994–2005, and real GDP per capita increased by 1.7 percent per year.

5. **Interestingly, since 1994, real private investment has tended to slow relative to historical rates** (See Figure 1). The pace of real private investment growth decelerated from an annual average of 14 percent during 1980-93 to 6.1 percent in 1994-2006. Similarly, in the key cotton sector (see Box 1), investment has been insufficient to cover capital depreciation. The stock of foreign direct investment (FDI) in the cotton sector² declined from US\$441 million in 1998 to US\$291 million in 2004, while total FDI inflows nearly doubled during the same period (US\$ 60 millions in 2004, from US\$33 millions in 1998).



² Source: The World Bank, 2006. “West and Central Africa: Strategies for Cotton Sector Development in West and Central Africa – Towards a Regional Textile and Garment Industry”

Box 1. Cotton Production in Benin

- **The cotton sector and trade explain most of Benin's output fluctuations.** The cotton sector remains a dominant economic sector, though cotton seed production has a relatively small share of nominal GDP (about 3 percent on average during 2000-05) and is subject to large swings.
- **Production.** Of the approximately 550,000 Benin families who run small farms to generate their main income, about 310,000 grow cotton and sell cotton seed. About 14,000 new small farmers (in net terms) enter the agricultural sector each year. Average family size in rural areas is 10 people. Ginning industry processing capacity is estimated at 600,000 tons.
- **The sectoral implication of cotton production.** The production of cotton seed in crop year $T-1/T$ affects agricultural production in year $T-1$, industry, services, and exports of cotton lint in year T .
- The growth of cotton seed production in crop year $T/T+1$ affects agricultural production in year T and industry and services in year $T+1$. Noncotton-related sectors grow at the same rate as in the benchmark case. Authorities assumed a one-to-one impact. For instance a 1 percent increase in cotton seed production would imply a 1 percent increase in cotton-related activities in secondary and tertiary sectors. It was estimated in 2002 that the production of seed cotton represented about 15 percent of agricultural production, 10 percent of cotton-related industry, and 10 percent of cotton-related services.
- **Marketing.** Cotton marketing, including the allocation of seed cotton to all ginning companies, is partly controlled by the parastatal ginning company (SONAPRA). The cotton sector is overregulated. Prices for inputs, transport, and seed cotton are centrally determined by institutions representing stakeholders (farmers, suppliers of inputs, and ginning companies).
- **Risks.** Persistent sectoral risks pertain to (i) production (e.g., rainfall and high input costs); (ii) ginning quality; (iii) marketing and international price changes, (iv) transportation; and (v) credit allocation (e.g., liquidity constraints and incidence of nonperforming loans).

6. Private investment matters for growth.

Over the last five years, economic growth has been more robust in CEMAC than in WAEMU countries. Text table 1³ indicates that this can partly be explained by differing private investment performance in the two regions. High returns in the oil sector that is associated with greater private investment, have helped the CEMAC countries enjoy relatively higher real GDP growth. Interestingly, the Central African Republic, the only non-oil country in the CEMAC, achieved a real GDP growth of -0.4 percent on average during 2000-05, together with the lowest private investment ratio in the region.

Text table 1. Comparative Private Investment, 2000-05			
Country	2000-05	2000-03	2004-05
	(percent of GDP)		
WAEMU 1/	11.1	11.2	11.1
Benin	12.5	12.2	13.1
Burkina Faso	10.6	10.5	10.8
Côte d'Ivoire	7.7	7.8	7.5
Mali	12.1	12.8	10.5
Niger	5.2	5.1	5.6
Senegal	17.0	17.5	16.2
Togo	16.1	15.5	17.3
CEMAC 1/	21.0	22.5	17.9
Cameroon	16.5	16.3	16.8
Central African Rep.	4.5	4.5	4.5
Chad	27.3	33.5	14.8
Congo, Republic of	16.0	15.7	16.6
Equatorial Guinea	41.1	48.9	25.5
Gabon	19.8	20.1	19.1
Memorandum items:	(real GDP growth in percent)		
WAEMU 1/	3.0	2.6	3.6
CEMAC 1/	5.7	5.2	6.6

Source: I.M.F. - *World Economic Outlook*, 2006.
¹ PPP weighted.
 WAEMU: West African Economic and Monetary Union.
 CEMAC: Communauté Economic des Etats d'Afrique Centrale.

7. Benin's institutions, regulatory system, and financial sector developments likely impede private investment (Text Table 2). The World Bank's 2006 "Doing Business" report ranks Benin 137 out of 175 countries in terms of ease of doing business. This relatively lackluster performance partly reflects cumbersome licensing requirements, difficult labor market conditions, scarce credit, and high factor costs. Casero and Varoudakis (2004) found similar impediments to private investment in Tunisia.

8. Progress in improving the business environment has been slow. Among the WAEMU countries Benin has made the least progress in improving the business environment in the last couple of years. The country's "ease of doing business" indicators gained only 2 points from 2005 to 2006 while the WAEMU best performer during the period, Côte d'Ivoire, improved by 15 points. Excessive regulations and other institutional factors may have contributed to the laggard performance. The relatively subdued progress may also reflect delays in implementing reforms and in addressing various institutional weaknesses, especially in the cotton sector.

³ Text table 1 also raises the issue of productivity of capital which is not discussed here.

Text table 2. Selected Countries: Comparative Rankings of Doing Business 1/

	Ease of doing Business		Starting a Business		Dealing with Licenses		Employing Workers		Registering Property		Getting Credit	
	2006 rank	change 2006/05	2006 rank	change 2006/05	2006 rank	change 2006/05	2006 rank	change 2006/05	2006 rank	change 2006/05	2006 rank	change 2006/05
Benin	137	2	126	-13	133	-2	121	2	85	-1	117	0
Other WAEMU 2/												
Burkina Faso	163	8	131	2	168	-2	153	-1	164	-1	117	0
Côte d'Ivoire	141	15	154	-10	158	-1	133	0	101	64	143	0
Mali	155	10	163	-3	122	20	131	-1	93	6	143	0
Niger	160	9	147	12	126	29	168	0	103	-2	143	0
Senegal	146	6	150	-2	66	1	152	1	151	0	143	0
Togo	151	3	169	-3	132	-7	145	1	155	-19	143	0

Sources: World Bank, 2006. www.doinbusiness.org

1/ Countries are ranked from 1 to 175 with 1 being the best performer.

2 Except Guinea-Bissau.

C. The Empirical Model

9. **The background discussion suggests that understanding the impact of private investment on Benin's long-run growth requires an understanding of institutional factors and the regulatory framework.** There is not much empirical research in this area, particularly on developing countries. Most studies have to some extent looked separately at financial development or trade liberalization and growth, or have emphasized the role of public or fiscal policy, or institutions. Also, less attention has been paid to the relationship between private sector dynamics and growth while controlling for public investment, financial sector development, external factors, and institutional changes.

10. **The analysis here uses the time-to-build approach to estimate the potential impact of private investment on growth.** According to this approach, capital stock becomes productive once the investment projects are completed in sequence. It acknowledges that lags in investment returns depend on production technology (see Altug 1989, 1993 and Kydland and Prescott 1982), as opposed to the cost-of-adjustment model⁴ or irreversible investment under uncertainty models.⁵ The empirical model used here is a structural vector

⁴ The neoclassical prospective, cost-of-adjustment approach considers that decision-makers choose the capital stock rather than investment rate, therefore, as the cost of capital changes, they would instantaneously adjust the level of capital stock to the "desired" level. The "desired" capital could be considered the optimal level which is different from the actual capital stock.

⁵ As removing investment is costly and in the presence of uncertainty, the decision-maker may delay investment decision in light of new information.

autoregression model (SVECM) that captures the time lag needed for initial investment to contribute to future growth,⁶ as well as endogeneity problems among the system variables.

11. **The model includes** the following set of endogenous variables:

$$Y'_t = (LTRAD_t, LGINV_t, LCRED_t, LPINV_t, LGDP_t),^7$$

Where:

- *LTRAD*: the log of trade volume index is the external factor variable.
- *LGINV*: the log of public investment is the proxy for fiscal variable.
- *LCRED*: the log of credit to the private sector is the proxy for financial variable (as opposed to interest rate).
- *LPINV*: the log of private investment incorporates private sector behavior.
- *LGD*: the log of real *GDP* represents supply factors.

12. **The background discussion above and existing empirical literature motivate the choice of variables⁸.** Including public capital (*LGINV*) in the model helps to assess whether there is a crowding-in or a crowding-out effect of fiscal policy on private investment. The choice of *LCRED*, credit to the private sector, is justified as it is well known from the empirical literature that the interest rate channel is less effective in, and the credit channel better suited for, capturing the effectiveness of monetary policy.⁹ However, *LCRED* can also be viewed as a structural variable given that Benin's financial sector has been growing in response to ongoing sector reforms. Furthermore, as shown in Figure A, the *LCRED* would give a sense of the extent to which financial deepening may be conducive to growth.

⁶ For instance, among others, the empirical studies of Breitung et al. (2003) and Zhou (2000) attempted to use time-to-build approach and VAR methodologies to explain relations between investment and its determinants.

⁷ The number of endogenous variables was limited to five to preserve degrees of freedom problems given the relatively limited number of annual observations (41).

⁸ See Ghura and Hadjimichael (1996) and Calamitsis, Basu, and Ghura (1999) for the use of a similar set of variables in the modified version of the neoclassical growth model.

⁹ See for instance “*Reflections on Credit Policy in Developing Countries: Its Effect on Private Investment*” by Mansoor Dailami and Marcelo Giugale in Country Economics Department (The World Bank, April 1991, WPS 654).

13. An institutions variable, denoted $INST_t$, is assumed to be exogenous in the system. It is measured using the Fraser Institute's Economic Freedom Index¹⁰ results for 1996–2006, extrapolated back to 1965 using the average scores derived from individual correlation to (only) trade, fiscal burden, foreign investment, banking, and wages and prices. The ranking ranges from 5 to 1¹¹; the better the institution is, the lower the ranking.

14. **The model set up.** The full representation of the model is as follows:

$$Y_t = \sum_{i=1}^p \pi_i Y_{t-i} + \phi INST_t + \varepsilon_t \quad (1)$$

where π_i ($i = 1, \dots, p$), p is the number of lag, and ϕ are unknown parameter vectors. As variables in (1) are in log terms, by subtracting and adding various lags of Y_t one gets the following dynamics of (1): basis for cointegration analysis. By subtracting and adding various lags of Y_t , (1) can be re-written as:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \sum_{i=0}^{p-1} \chi_i \Delta INST_{t-i} + \varepsilon_t \quad (2)^{12}$$

A variable preceded by the operator Δ can be interpreted as the percentage change; (2) can also be rewritten as:

¹⁰ The index's total scores the average of a set of variables that includes trade, fiscal burden, foreign investment, banking, wages and prices (excluding property rights, regulations, government intervention, monetary policy, and the informal market). There is some empirical evidence of a bidirectional relationship between institutions, growth, and investment. The rationale for the choice of $INST$ as an exogenous variable is that its composition is mostly dominated by fiscal and monetary policy instruments—which are not used in our set of endogenous variables; however, the extrapolation back to 1965 may induce some noise. Conversely, using alternative measures such as those for institutions and democracy from the Polity project would not support the choice of $INST$ as exogenous. (<http://www.cidcm.umd.edu/polity/data/variables.asp>)

¹¹ Although this is the original ranking, the order is reversed in the dataset in order to facilitate the economic interpretation. See Text table 4, a positive change in $INST$ would be interpreted as improvement in institution.

¹² (2) is the basis for cointegration analysis. $\Pi = -\left[I - \sum_{i=1}^p \pi_i \right]$, $\Gamma_i = -\left[\sum_{j=i+1}^p \pi_j \right]$, $i = (1, \dots, p-1)$, and

from, $\chi_i = \begin{cases} \phi, & i = 0 \\ -\Gamma_i \phi, & i = 1, \dots, p-1 \end{cases}$

$$\Delta Y_t = \alpha(\beta' Y_{t-1}) + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \sum_{i=0}^{p-1} \chi_i \Delta INST_{t-i} + \varepsilon_t \quad (3)$$

This equation, the “error correction” representation, has the merit of representing the dynamics for each individual (system) variable in terms of its deviation from its long-run equilibrium (the first term¹³) and in terms of its year-to-year or short-term change (the last two terms).

D. Empirical Evidence^{14 15}

15. **The investment equation supports the conclusion that the trade index and public investment have a positive impact on private investment in the long-run.** It appears that credit to the private sector does not have a significant long-run impact on private investment or on GDP growth. However, public investment and the export index have a direct impact on GDP growth and an indirect output effect via private investment. This result is consistent with the empirical literature, which suggests that public investment stimulates private investment (Oshikoya 1994, Odedokun 1997, and Ramirez 2000).

The long-run equilibrium equations for private investment and GDP are¹⁶:

$$\begin{aligned} PINV &= 0.316 * TOT + 0.431 * GINV + ECT_PINV \\ &\quad [2.003] \quad [3.987] \\ GDP &= 0.422 * TOT + 0.204 * GINV + 0.219 * PINV + ECT_GDP \\ &\quad [4.191] \quad [3.693] \quad [2.288] \end{aligned}$$

¹³ The relations $\beta' Y_{t-1}$ are the cointegrating relations, and the coefficients β are the long-run parameters; The coefficients α can be interpreted as the speed of adjustment to the long-run equilibrium.

¹⁴ The model variables passed most diagnostic tests for the SVECM analysis: (i) unit root test; (ii) choice of optimal lag length; (iii) residual normality and heteroschedasticity tests; and (iv) system variables stability tests.

¹⁵ There are two long-run relationships within the system (3) above. The analysis below focuses on the behavior of private investment and the relationship between GDP and private investment. We test whether there is a long-run relationship between the endogenous variables using the maximum eigenvalue test. As shown in Text table 3, the application of the likelihood ratio test shows that the null hypothesis of no cointegrating relationship can be rejected at the 5 percent confidence level (for the null hypothesis of at most 1 cointegrating equation, max-eigenvalue statistics = 31.86 > critical value = 24.16, [p-value: 0.00]), thereby strongly suggesting that there is two cointegrating equations among the endogenous variables.

¹⁶ To identify the cointegrating vector, and because the long-run impact of *LGDP* on *PINV* is insignificant, we impose a zero restriction on *LGDP* coefficient in the *PINV* equation. *ECT_PINV* is the error correction term for private investment and *ECT_GDP* for GDP equations.

ECT_PINV and ECT_GDP are the error correction terms for private investment and GDP equations respectively. They are the residual terms between actual value (left-hand side) and estimated values (right-hand side)

The short-run dynamic equations are:¹⁷

Text table 4. Error Correction Model, 1965 - 2005

		Short-run dynamic equation of			
		Public investment	Credit to the private sect.	Private investment	GDP
Loading parameters	ECT_PINV 1/	-0.19 [-1.41]*	0.22 [2.88]**	-0.11 [-2.83]**	0.00 n.a.
	ECT_GDP 1/	0.31 [3.33]**	-0.28 [-1.79]*	0.00 n.a.	-0.26 [2.84]**
Short-run parameters	Change in:				
	TOT(-1)	-0.38 [-2.00]**	0.26 [0.60]	0.14 [0.49]	0.23 [0.90]
	GINV(-1)	0.17 [4.03]**	-0.20 [-1.63]*	0.05 [0.38]	-0.26 [-1.33]*
	CRED(-1)	0.26 [1.03]	0.66 [3.64]**	0.84 [1.66]*	0.11 [1.43]*
	PINV(-1)	-0.25 [-3.17]**	0.09 [1.10]	0.17 [2.22]**	-1.65 [-2.17]**
	GDP(-1)	0.49 [2.99]**	0.67 [0.53]	0.52 [2.91]**	0.24 [1.02]
	INST	0.04 [0.06]	0.44 [1.82]*	0.15 [2.03]**	0.03 [1.07]
	INST(-1)	0.58 [0.51]	-0.01 [-0.29]	0.01 [0.44]	0.24 [2.01]**
	Adj. R-squared	0.75	0.64	0.85	0.75
	S.E. equation	0.02	0.02	0.02	0.05
F-statistic	1.79	1.33	1.29	-0.02	
Akaike AIC	-2.27	-3.65	-1.39	-3.48	
Schwarz SC	-2.77	-1.55	-1.87	-2.78	

t-statistics in [], 41 observations, optimal lag length = 2,

ECT_PINV= Error correction model for private investment;

ECT_GDP= Error correction model for GDP;

TOT= Terms of trade; GINV=Public investment; CRED=Credit to the private sector

PINV=Private investment; INST=Economic freedom index (institution variable).

1/ The joint test weak exogeneity test (WETS) of TOT for the two cointegrating vectors,

PINV for GDP equation and GDP for PINV failed to reject the null hypothesis at

$\chi^2(3) = 4.160$ [0.2447]

16. It follows from the long- and short-run equations above that:

- **Private investment is a significant long-run determinant of growth though its sluggish adjustment tends to dampen output growth.** A 1 percent increase in private investment will yield a 0.2 percent long-run increase in GDP. However, as the speed of adjustment to the long-run equilibrium depends crucially on the cause of the gap, a 1 percent shock to private investment would entail an estimated 16 percent

¹⁷ The weak exogeneity test statistics (WETS) indicates that TOT is weakly exogenous to two cointegrating vectors, and that $PINV$ and GDP are weakly exogenous to beta vector associated to GDP and to the beta vector associated to $PINV$. The retained system has then imposed zero these feedback coefficient..

