

https://dspace.org/

# Essays on central bank independence and macroeconomic performance: selected African economies

**Mpofu, Sehliselo**

**2012-07-10**
http://hdl.handle.net/10539/11653

Downloaded from a DSpace repository. https://dspace.org/




# ESSAYS ON CENTRAL BANK INDEPENDENCE AND MACROECONOMIC PERFORMANCE: SELECTED AFRICAN ECONOMIES

By

Sehliselo Mpofu

Supervisor:

Professor Christopher Malikane

A dissertation submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, Johannesburg, in Fulfillment of the Requirements for the Degree of Doctor of Philosophy

18 April 2012

**DECLARATION**

I declare that this dissertation is my own unaided work. It is submitted for the degree of Doctor of Philosophy in Economics, University of the Witwatersrand, Johannesburg. It has not been submitted to this university or any other university for any other degree or examination.

Name of Student: Sehliselo Mpofu

Signed _____

Date: 18th day of April 2012

## DEDICATION

This work is dedicated to my son, Phumulo.

**ACKNOWLEDGEMENTS**

I am highly indebted to my supervisor, Professor Christopher Malikane for his guidance. I would like to acknowledge the financial support that I received from the African Economic Research Consortium (AERC).

**ABSTRACT**

The thesis focuses on central bank independence (CBI) in 20 selected African countries over 1990-2008. Firstly, we measure the degree of CBI. Secondly, we measure the effects of CBI on macroeconomic performance. Thirdly, we measure the effects of fiscal dominance (FD) on CBI and macroeconomic performance. The thesis has 5 chapters. Chapter 1 is the introduction. Chapters 2, 3 and 4 are stand-alone related papers on CBI and macroeconomic performance. Chapter 5 is the conclusion.

Chapter 1 introduces the study. We give a brief background of the study, its motivation, the main objectives and the hypotheses to be tested. We describe the innovations that we make to CBI measurement, effects of CBI on macroeconomic performance, and the effects of FD on CBI and macroeconomic performance. We highlight the key findings and notable limitations of the study. Finally, we conclude with a brief outline of the rest of the chapters namely 2, 3, 4 and 5.

Chapter 2 measures CBI. We develop a comprehensive set of CBI indices. We follow the methodologies developed by Grilli et al. (1991) and Cukierman et al. (1992). Firstly, we measure CBI in legal (de jure) and in factual (de facto) terms. Secondly, we measure CBI in political terms and in economic terms. We measure factual CBI by the annual average turnover rate (TOR) of central bank (CB) governors. We use central bank Acts and their amendments as well as country constitutions (where applicable) to calculate the legal CBI indices.

The results suggest that legal CBI is low but factual CBI is high. Political CBI is low but economic CBI is high. In overall terms, both legal and factual CBI have improved from their late 1980 levels. The levels of legal CBI over 1990-2008 are slightly above what characterized developed countries in the late 1980s. Factual CBI has improved significantly in most African countries, but it still varies considerably across the countries. The variations seem to reflect different political, economic and legal conditions. The results suggest that legal CBI still deviates considerably from actual CB practices in Africa. Factual CBI seems to proxy actual CBI better than legal CBI. However, to some extent, factual CBI seems to reflect subservience of some CB governors in Africa. We conclude that African governments still need to grant their CBs, more CBI in line with modern-day CBs, world-wide. Specifically, they need to consider constitutionalizing CBI, so that it is not easily violated by some political authorities.

Chapter 3 measures the effects of CBI on macroeconomic performance. We use the difference-in-difference (DID) method. This method is associated with Ball and Sheridan (2005), who investigate the effects of inflation targeting (IT) on macroeconomic performance in 20 OECD countries in the 1990s. We use simple cross-country regression analysis with period averages macroeconomic variables of choice. We use the CBI dummy variable ($D_i$) as the target explanatory variable instead of the CBI index ratings in levels. We use 3 measures to control for the effect of the regression to the mean (RTM). The results suggest that CBI does not matter for macroeconomic performance. Instead, we find that the recent past and initial macroeconomic performance have significant impact on macroeconomic performance during CBI reform. This is because pre-reform poor performers perform better during reform. The results reflect some effect of the RTM on inflation and interest rates, which have considerable cross-country variations. Generally, the results suggest that CBI per se, is not a panacea for improved macroeconomic performance. In order to improve macroeconomic performance, African governments need to restructure their economies, alongside and beyond CBI reforms.

Chapter 4 measures the effects of FD on CBI and macroeconomic performance. We use the 2-step system generalized method of moments (GMM) in dynamic panel data (DPD). This method is associated with Arellano and Bover (1995) and Blundell and Bond (1998). It is a recent move away from simple correlation analysis and Vector Autoregressive (VAR) models. We do not find evidence that fiscal deficits are monetized over the study period. This outcome could be reflecting effectiveness of anti-inflation strategies undertaken by high fiscal-deficit countries. The results suggest that FD generally does not matter for CBI and macroeconomic performance. FD only matters for political and factual CBI. The results suggest that domestic inflation, which is explained by exchange rate depreciation, is a major determinant of factual CBI, economic growth and interest rates. The relative static nature of the legal CBI indices, due to the infrequent changes in CB legislation in most African countries, makes it difficult to establish any systematic link between the legal CBI indices and their potential determinants.

Chapter 5 concludes the study. We summarize the key CBI issues covered in chapters 1, 2, 3 and 4. We highlight the main contributions of the study and its key policy implications. Finally, we conclude by suggesting outstanding areas for any further research in the relationship between CBI and macroeconomic performance.

## TABLE OF CONTENTS


DECLARATION ..... ii
DEDICATION ..... iii
ACKNOWLEDGEMENTS ..... iv
ABSTRACT ..... v
LIST OF TABLES ..... x
LIST OF FIGURES ..... xi
LIST OF APPENDICES ..... xi
CHAPTER 1: INTRODUCTION ..... 1
1.1 Background to the Study ..... 1
1.2 Statement of the Research Problem ..... 2
1.3 Motivation for the Study ..... 3
1.4 Objectives of the Study ..... 6
1.5 Hypotheses of the Study ..... 6
1.6 Key Findings of the Study ..... 7
1.7 Innovations of the Study ..... 8
1.8 Limitations of the Study ..... 9
1.9 Organization of the Study ..... 10
CHAPTER 2: MEASUREMENT OF CENTRAL BANK INDEPENDENCE ..... 11
2.1 Introduction ..... 11
2.2 Theoretical and Empirical Cases for Central Bank Independence ..... 13
2.3 Methodology and Sample Data ..... 16
2.3.1 Legal Central Bank Independence Indices: Cukierman et al. (1992) Approach ..... 18
2.3.2 Legal Central Bank Independence Indices: Grilli et al. (1991) Approach ..... 20
2.3.3 Factual Central Bank Independence Index: Cukierman et al. (1992) Approach ..... 21
2.4 Presentation and Analysis of Results ..... 23
2.4.1 Legal Central Bank Independence Outcomes (1990-2008) ..... 25
2.4.2 Political and Economic Central Bank Independence Outcomes (1990-2008) ..... 36
2.4.3 Factual Central Bank Independence Outcomes (1990-2008) ..... 41
2.5 Conclusion ..... 46
2.6 Appendices ..... 47
CHAPTER 3: EFFECTS OF CBI ON MACROECONOMIC PERFORMANCE ..... 54
3.1 Introduction ..... 54

3.2 Measurement of the Effects of CBI on Macroeconomic Performance ..... 56
3.3 Related Empirical Literature ..... 57
3.4 Methodology and Sample Data ..... 59
3.4.1 Empirical Regression Equations ..... 63
3.4.2 Regression Estimation Technique ..... 65
3.5 Presentation and Analysis of Results ..... 66
3.5.1 Key Descriptive Statistics (1990-2008) ..... 69
3.5.2 Regression Results on Effects of CBI on Macroeconomic Performance (1990-2008) ..... 77
3.6 Conclusion ..... 79
3.7 Appendices ..... 80
CHAPTER 4: FISCAL DOMINANCE AND CENTRAL BANK INDEPENDENCE ..... 82
4.1 Introduction ..... 82
4.2 Common Measures of Fiscal Dominance ..... 85
4.3 Related Theoretical and Empirical Literature ..... 87
4.4 Methodology and Sample Data ..... 91
4.4.1 Regression Estimation Technique ..... 97
4.4.2 Pre-Estimation Diagnostic Tests and Data Treatment ..... 102
4.4.3 Post-Estimation Diagnostic Test Statistics ..... 103
4.5 Presentation and Analysis of Results ..... 103
4.5.1 Key Descriptive Statistics (1990-2008) ..... 103
4.5.2 Panel Data Regression Results (1990-2008) ..... 111
4.6 Conclusion ..... 117
4.7 Appendices ..... 118
CHAPTER 5: CONCLUSION AND POLICY IMPLICATIONS ..... 120
5.1 Introduction ..... 120
5.2 Measurement of CBI ..... 120
5.3 Effects of CBI on Macroeconomic Performance ..... 121
5.4 Effects of FD on CBI and Macroeconomic Performance ..... 121
5.5 Main Contributions of the Study ..... 122
5.6 Policy Implications and Recommendations of the Study ..... 123
5.7 Suggested Areas for Further Research ..... 125
6. Bibliography ..... 127

**LIST OF ACRONYMS**

| | |
|---|---|
| AMU | African Monetary Union |
| CB | Central Bank |
| CBI | Central Bank Independence |
| CBIR | Central Bank Independence Reform |
| CMA | Common Monetary Area |
| COMC | Council of Money and Credit |
| COMESA | Common Market for Eastern and Southern Africa |
| CPI | Consumer Price Index |
| CWN | Cukierman, Webb and Neyapti |
| DC | Developed Country |
| DID | Difference-in-Difference |
| FD | Fiscal Dominance |
| GDP | Gross Domestic Product |
| GMT | Grilli, Masciandaro and Tabellini |
| IFS | International Financial Statistics |
| IMF | International Monetary Fund |
| IT | Inflation Targeting |
| LDC | Less Developed Country |
| NEPAD | New Partnership for Africa's Development |
| OECD | Organization for Economic Cooperation and Development |
| RTM | Regression to the Mean |
| SADC | Southern African Development Community |
| TOO | Term of Office of the Central Bank Governor |
| TOR | Turnover Rate (Annual Average) |

| | |
|---|---|
| WB | World Bank |
| WDI | World Development Indicators |

## LIST OF TABLES


TABLE 2.1: SELECTED CENTRAL BANKS AND THE THEIR LATEST ACTS ..... 16
TABLE 2.2: CWN LEGAL CENTRAL BANK INDEPENDENCE RATINGS (1990-2008) ..... 25
TABLE 2.3: CHANGES IN LEGAL CENTRAL BANK INDEPENDENCE (1990-2008) ..... 26
TABLE 2.4: LEGAL INDEPENDENCE RATINGS FOR BENCHMARK CENTRAL BANKS (1990-2008) ..... 27
TABLE 2.5: LEGAL TERMS OF GOVERNORS AND TERMS OF GOVERNMENT (1990-2008) ..... 28
TABLE 2.6: POLITICAL AND ECONOMIC INDEPENDENCE RATINGS AND RANKINGS (1990-2008) ..... 37
TABLE 2.7: POLITICAL AND ECONOMIC INDEPENDENCE RATINGS (1990-2008) ..... 39
TABLE 2.8: FACTUAL INDEPENDENCE RATINGS AND RANKINGS (1980-2008) ..... 41
TABLE 2.9: FACTUAL INDEPENDENCE RATINGS FOR BENCHMARK CENTRAL BANKS (1980-2008) ..... 42
TABLE 2.10: LEGAL AND FACTUAL CENTRAL BANK INDEPENDENCE INDICES (1990-2008) ..... 45
TABLE 3.1: CENTRAL BANK INDEPENDENCE EFFECTIVE REFORM CALENDAR (1990-2008) ..... 67
TABLE 3.2: PRE-REFORM AND POST-REFORM PERIODS (1990-2008) ..... 68
TABLE 3.3: CLASSIFICATION CRITERIA FOR HIGH AND LOW PRE-REFORM PERFORMERS (1990-2008) ..... 69
TABLE 3.4: MEANS AND STANDARD DEVIATIONS OF MACROECONOMIC VARIABLES OF CHOICE (1990-2008) ..... 70
TABLE 3.5: DID ESTIMATES FOR REFORMERS AND NON-REFORMERS (1990-2008) ..... 75
TABLE 3.6: DID ESTIMATES FOR HIGH AND LOW PRE-REFORM PERFORMERS (1990-2008) ..... 75
TABLE 3.7: EFFECTS OF CBI ON MACROECONOMIC PERFORMANCE (1990-2008) ..... 77
TABLE 3.8: SENSITIVITY ANALYSIS FOR LOW AND HIGH PRE-REFORM PERFORMERS (1990-2008) ..... 78
TABLE 4.1: EMPIRICAL LITERATURE ON FISCAL DEFICITS AND CENTRAL BANK INDEPENDENCE ..... 89
TABLE 4.2: FISCAL DOMINANCE AND MONETARY AGGREGATES CORRELATION MATRIX (1990-2008) ..... 108
TABLE 4.3: FISCAL DOMINANCE AND CBI CORRELATION MATRIX (1990-2008) ..... 108
TABLE 4.4: FISCAL DOMINANCE AND MACROECONOMIC VARIABLES CORRELATION MATRIX (1990-2008) ..... 109
TABLE 4.5: FISCAL DOMINANCE, CBI AND MACROECONOMIC PERFORMANCE (1990-2008) ..... 110
TABLE 4.6: EFFECTS OF FISCAL DOMINANCE ON CENTRAL BANK INDEPENDENCE (1990-2008) ..... 111
TABLE 4.7: EFFECTS OF FISCAL DOMINANCE ON INFLATION OUTCOMES (1990-2008) ..... 112
TABLE 4.8: EFFECTS OF FISCAL DOMINANCE ON ECONOMIC GROWTH OUTCOMES (1990-2008) ..... 113
TABLE 4.9: EFFECTS OF FISCAL DOMINANCE ON INTEREST RATE OUTCOMES (1990-2008) ..... 114

## LIST OF FIGURES

FIGURE 2.1: CROSS-COUNTRY VARIATIONS IN CWN LEGAL INDEPENDENCE (1990-2008) ..... 26
FIGURE 2.2: LEGAL TERMS OF GOVERNORS AND TERMS OF GOVERNMENT (1990-2008) ..... 28
FIGURE 2.3: DISTRIBUTION OF PREMATURE TERMINATIONS OF GOVERNORS' CONTRACTS (1990-2008) ..... 31
FIGURE 2.4: POLITICAL AND ECONOMIC INDEPENDENCE CROSS-COUNTRY VARIATIONS (1990-2008) ..... 37
FIGURE 2.5: FACTUAL INDEPENDENCE CROSS-COUNTRY VARIATIONS (1990-2008) ..... 41
FIGURE 4.1: FISCAL BALANCE AS A PERCENTAGE OF GDP (1990-2008) ..... 104

## LIST OF APPENDICES

APPENDIX 2.1: CWN LEGAL INDEX CODE TABLE ..... 47
APPENDIX 2.1 CONTINUED: CWN LEGAL INDEX CODE TABLE ..... 48
APPENDIX 2.2: GMT INDEX CODE TABLE ..... 49
APPENDIX 2.3: LATEST CENTRAL BANK ACTS ..... 49
APPENDIX 2.4: ORIGINAL GMT RATINGS (1990-2008) ..... 50
APPENDIX 2.5: REASON (S) FOR PREMATURE TERMINATION OF CB GOVERNORS' CONTRACTS (1990-2008) ..... 51
APPENDIX 2.6: CENTRAL BANK GOVERNORS AND THE PERIODS SERVED (1990-2008) ..... 52
APPENDIX 2.7: DEFINITION OF VARIABLES USED TO CALCULATE CBI INDICES ..... 53
APPENDIX 3.1: MAJOR CENTRAL BANK INDEPENDENCE REFORM LEGISLATION ..... 80
APPENDIX 3.2: EFFECTIVE CENTRAL BANK INDEPENDENCE CHANGE DATES ..... 80
APPENDIX 3.3: LIST OF REFORMERS AND NON-REFORMERS (1990-2008) ..... 81
APPENDIX 3.4: QUESTIONNAIRE TO CENTRAL BANKS ..... 81
APPENDIX 4.2: LIST OF MAIN VARIABLES, DEFINITIONS AND KEY SOURCES ..... 119

# CHAPTER 1: INTRODUCTION

## 1.1 Background to the Study

Central bank independence (CBI) is the freedom of the central bank (CB) to conduct monetary policy without undue political interference (Walsh (2005)). Although not a new concept, CBI has generated considerable debate since the 1990s. The theoretical argument for CBI is associated with the dynamic inconsistency theory of monetary policy. This concept is due to Kydland and Prescott (1977), Barro and Gordon (1983), among others. The theory suggests that political authorities have a tendency to abuse the money printing aspect of CBs to finance fiscal deficits. This practice leads to the dynamic inconsistency problem of monetary policy. The theory suggests that CBI can reduce the dynamic inconsistency problem of monetary policy and inflation bias, which is linked with political business cycles (Nordhaus (1975)). To solve the dynamic inconsistency problem, Rogoff (1985 a) advocates for a conservative CB governor, whose priority is on price stability and CB credibility building. Priorities of the Rogoff (1985 a) CB governor differ from those of political authorities, with short-term political objectives.

The importance of CBI rests on the premise that inflation is primarily a monetary phenomenon and that the cost of reducing inflation can be lowered by an independent CB, using monetary policy and institutional credibility (Wessels (2008)). The general support for CBI stems from the argument that the power that creates money should be separated from the power that spends it. This suggests a separation between the CB and the national Treasury. This is relevant for African countries with weak legal institutions and high fiscal deficits. This is because in such countries, governments with weak fiscal revenue sources tend to put pressure on the CBs to monetize the fiscal deficits. Advocates of CBI suggest that CBI can reduce the pressure to monetize fiscal deficits (Pollard (1993)). However, contrary arguments are that excessive fiscal deficits can still tempt governments to force CBs to monetize the fiscal deficits even when the CB is independent. Under such conditions, institutional CBI may not necessarily guarantee monetary policy independence (Cukierman et al. (1992)). These conflicting arguments are still debatable.

In Africa, the move towards more CBI has also been promoted by regional organizations. In the Southern African Development Community (SADC) region, CBI is considered as one of the key

requirements for the establishment of an effective monetary union in 2016. As part of the move in that direction, a model SADC CB Act has already been drafted. According to the New Partnership for Africa's Development (NEPAD), CBI is stated as one of the pre-requisites for the establishment of an effective economic and monetary union in the SADC region. The formation of the African Monetary Union (AMU), envisaged to start in 2021, with an African CB (ACB), places high priority on CBI. The proposed ACB requires free centrally decided monetary policy without national political interference. CBI is part of the eligibility criteria for membership.

There is general empirical literature that suggests that CBI can have potential benefits for enhanced macroeconomic performance (Mangano (1998); Oately (1999); DeHaan and Kooi (1997, 2000); Arnone et al. (2008); DeHaan and Klomp (2010)). CBI can help reduce average inflation and its variability, cushion the adverse effects of political business cycles on the economy, enhance financial sector stability and boost fiscal discipline without much sacrifices in terms of real output losses or an increase in output variability (Arnone et al. (2008)).

Despite the good attributes accorded to CBI by some authors, there are some contrary arguments against CBI. According to DeBelle and Fischer (1994), CBI may not stabilize real output because the sacrifice ratio can be high with CBI. There are empirical studies that do not find convincing and conclusive evidence that CBI can improve macroeconomic performance (Banaian et al. (1995); Posen (1995, 1998); Campillo and Miron (1997); Fuhrer (1997); Crosby (1998)). These contrary arguments on potential benefits of CBI are still subject to investigation.

## 1.2 Statement of the Research Problem

Empirical evidence on the envisaged potential benefits of CBI on macroeconomic performance is mixed and inconclusive. There is lack of evidence on African countries in the post-1989 period. African countries have not been adequately researched using updated CBI indices and current methods that link CBI to macroeconomic performance. In addition, African countries have been reforming their CBs, post-1989, in a bid to boost CBI. Part of this move towards more CBI has been motivated by the need to harness the envisaged benefits of CBI. So far, not much empirical work has been done to assess how far African countries have gone in enhancing CBI, what impact this has had on macroeconomic performance and any constraints that could be there. This study investigates the status of CBI in Africa, its impact on macroeconomic performance and the

current interactions between monetary authorities (policies) and fiscal authorities (policies). We investigate how far African countries have gone in meeting the modern-day CBI requirements.

### 1.3 Motivation for the Study

We are motivated by the need to focus on Africa, post-1989. Previously, a number of studies have been done for different countries over different periods. However, most of them have focused on different groups of countries and individual countries (Cukierman (1992); Cukierman et al. (1992); Alesina and Summers (1993); DeHaan and Kooi (2000); Sturm and DeHaan (2001); Arnone et al. (2008); DeHaan and Klomp (2010)). A few studies that have focused on African countries only, have used small numbers of these countries (Presnak (1996); Wessels (2006, 2007, 2008)). Presnak (1996) covers 11 Sub-Saharan African (SSA) countries over 1960-1989. These include Botswana, Ethiopia, Ghana, Kenya, Nigeria, South Africa, Uganda, Tanzania, Zaire, Zambia and Zimbabwe. Wessels (2006) covers 6 African countries. These include Botswana, Kenya, Liberia, Nigeria, Tanzania and South Africa. Wessels (2007) covers 4 Common Monetary Area (CMA) countries of Southern Africa. These include Lesotho, Namibia, Swaziland and South Africa. Wessels (2008) covers 5 SADC countries. These include Angola, Malawi, Tanzania, Zambia and Zimbabwe. Small numbers of African countries like these may not adequately reveal much of any systematic differences in CBI that may prevail among the African countries. These include political, economic and legal differences. Countries with some notable CBI features like Angola and Mauritania have not been adequately covered in these and most other previous studies, which include African countries (Cukierman et al. (1992); DeHaan and Kooi (2000); DeHaan and Klomp (2010)). Possible reasons include lack of data, outliers in some of the data, poor supportive documentation and language problems pertaining to these countries. Studies on African countries only, have used legal and factual indices. Wessels (2006) and Wessels (2008) use unit-weight indices with 14 and 12 legal CBI variables, respectively. Presnak (1996) uses a legal and a factual index, the annual average TOR of CB governors.

Most previous studies have focused more on developed countries, particularly the OECD countries (Grilli et al. (1991)). We specifically focus on Africa. Existing literature suggests that the concept of CBI in less developed countries, of which African countries are a part, differs from what attains in developed countries and other regions (Cukierman et al. 1992); Arnone et al. (2008); DeHaan and Klomp (2010)). We examine these differences among 20 selected

African countries, given that there are already well-known and well-documented differences between Africa as a region and other regions, developed countries and less developed countries (Cukierman et al. (1992); Arnone et al. (2008); DeHaan and Klomp (2010)).

Most previous studies have used legal CBI indices (Bade and Parkin (1977, 1982, 1988); Alesina (1988, 1989); Bodart (1990); Grilli et al. (1991); Cukierman (1992); Cukierman et al. (1992); Eijffinger and Schaling (1993); Alesina and Summers (1993); Ilieva and Healey (2001); Jácome and Vázquez (2005), Arnone et al. (2007); Arnone et al. (2008)). Legal indices have been found to be weak indicators of actual CBI in less developed countries (Cukierman et al. (1992); Dreher et al. (2007); DeHaan and Klomp (2010)). Most previous studies use legal indices because they mostly focus on developed countries, where legal CBI suffices to measure actual CBI. It is relatively easy to quantify CBI in developed countries. The gap between the letter of the law and the actual practices or application of the law in CBs is argued to be narrower in developed countries and wider in less developed countries (Cukierman et al. (1992)). In addition, it is difficult to measure factual CBI because the process involves quantifying factors such as informal arrangements and evolved behavioural norms between the CB and the government.

Over years, a few previous studies have used factual CBI indices, commonly the annual average TOR of CB governors (Cukierman (1992); Cukierman et al. (1992); Cukierman and Webb (1995); DeHaan and Kooi (2000); Sturm and DeHaan (2001); Dreher et al. (2007); DeHaan and Klomp (2010)). The TOR index has been found to be a better proxy for actual CBI in less developed countries than legal indices. We use 2 legal indices, 1 factual index and a qualitative CBI dummy variable. We seek to account for the multidimensional aspect of CBI, which some previous studies have ignored. Single indicators, which have been used in some previous studies, narrow the analysis of CBI, which is a multidimensional concept.

Existing data sets from typical comprehensive indices are now outdated. These include the Grilli et al. (1991) and the Cukierman et al. (1992) data sets. The Grilli et al. (1991) study on political and economic CBI only covers 18 OECD countries over 1950-1989. The Cukierman et al. (1992) study covers 72 countries over 1950-1989. These include 11 of the countries in our sample. These indices are no longer relevant for current analysis of CBI and its relationship with fiscal dominance (FD) and macroeconomic performance. A study by Arnone et al. (2008) uses political and economic indices, but it only covers 2 periods, end-1980s and end-2003. It also does not

cover all the countries in our study. Another CBI study by DeHaan and Klomp (2010) focuses on over 100 countries, both developed and less developed countries, over 1970-2005, but it only uses a single factual index, the annual average TOR index. There are thus no previous updated comprehensive indices that we can use. Most of the previous studies used indices previously constructed by Cukierman et al. (1992), which are now outdated. We construct a new comprehensive set of 5 indices. We take account that CBI has both (i) legal and factual aspects, (ii) economic and political aspects and (iii) quantitative and qualitative aspects.

Although there is considerable work that investigates the effects of CBI on macroeconomic performance, empirical evidence is still mixed, conflicting and inconclusive. There are studies that find that CBI matters for macroeconomic performance (Grilli et al. (1991); Cukierman et al. (1992), Cukierman et al. (1992); Alesina and Summers (1993); Oately (1999); Arnone et al. (2006, 2007, 2008)). There are also studies that find that CBI does not matter for macroeconomic performance (Burdekin and Wohar (1990); Lohmann (1992); DeBelle and Fischer (1994); Fuhrer (1997); Banaian et al. (1998); Posen (1995, 1998); Crosby (1998); Campillo and Miron (2007); DeHaan and Klomp (2010)). Most of these studies have used simple correlation analysis and bivariate regressions between CBI indices in levels and macroeconomic variables of choice, also in levels. These studies have been prone to endogeneity bias, reverse causality, simultaneity bias, errors of measurement, omitted variable bias and other estimation problems associated with bivariate regressions. CBI indices in levels are determined with subjectivity and arbitrariness. We use the DID method to avoid some of the previous estimation problems, elements of subjectivity and arbitrariness associated with the construction of CBI indices in levels.

Although there is considerable work that investigates the effects of FD on CBI and macroeconomic performance, empirical evidence is still mixed and inconclusive. There are studies that find that FD matters for CBI and macroeconomic performance (Choudhary and Parai (1991); Easterly and Schmidt-Hebbel (1993); Metin (1998); Neyapti (2003)). There are also studies that find that FD does not matter for CBI and macroeconomic performance (Masciandaro and Tabellini (1988); Burdekin and Wohar (1990); Grilli et al. (1991); Fujiki (1996); Fry (1998); Sikken and DeHaan (1998)). Most of the previous studies have used simple correlation analysis and Vector Autoregressive (VAR) models (Aisen and Hauner (2007, 2008)). We use the 2-step system GMM in DPD to reduce some of the estimation problems associated with these previous

estimation techniques. These include endogeneity bias among estimable variables. We use several descriptive statistics to support the regression analysis results. Most previous studies were done for a combination of developed countries and less developed countries. The case of African countries only, could yield different results. This is the subject of our investigation.

## 1.4 Objectives of the Study

The objectives of the study are as follows.

(i) To measure CBI in 20 selected African countries.
(ii) To measure the effects of CBI on macroeconomic performance.
(iii) To measure the effects of fiscal dominance on CBI and macroeconomic performance.

The selected countries are Algeria, Angola, Botswana, Egypt, Ethiopia, Ghana, Kenya, Malawi, Mauritania, Mauritius, Mozambique, Nigeria, Rwanda, South Africa, Sudan, Tanzania, Tunisia, Uganda, Zambia and Zimbabwe. The study period is 1990-2008.

## 1.5 Hypotheses of the Study

**Chapter 2: Hypothesis**

Chapter 2 has no hypothesis. We simply construct a comprehensive set of CBI indices based on the well-known methodologies developed by Grilli et al. (1991) and Cukierman et al. (1992).

**Chapter 3: Hypothesis 3.1**

Hypothesis 3.1 is on the effects of central bank independence on macroeconomic performance.

$H_0$: Central bank independence does not matter for macroeconomic performance.

$H_1$: Central bank independence matters for macroeconomic performance.

**Chapter 4: Hypothesis 4.1**

Hypothesis 4.1 is on the effects of fiscal dominance on central bank independence.

$H_0$: Fiscal dominance does not matter for central bank independence.

$H_1$: Fiscal dominance matters for central bank independence.

**Chapter 4: Hypothesis 4.2**

Hypothesis 4.2 is on the effects of fiscal dominance on macroeconomic performance.

$H_0$: Fiscal dominance does not matter for macroeconomic performance.

$H_1$: Fiscal dominance matters for macroeconomic performance.

## 1.6 Key Findings of the Study

The results suggest that on average, legal CBI is still low but factual CBI is high in African countries. Political CBI is low but economic CBI is high. On average, both legal and factual CBI have improved significantly from what they were in the late 1980s. Current levels of legal CBI are slightly above what characterized developed countries in the late 1980s. Factual CBI still varies considerably across Africa. The results suggest that legal CBI, as stipulated in the CB laws, still deviates considerably from actual CB practices. In Africa, factual CBI seems a better proxy for actual CBI than legal CBI. However, to some extent, factual CBI seems to suggest subservience of CB governors in some of the African countries.

The results suggest that CBI does not matter for macroeconomic performance. Instead, recent past and initial macroeconomic performance have significant impact on macroeconomic performance during CBI reform. Pre-reform poor performers generally perform better than pre-reform high performers, during CBI reform. CBI seems to be efficient in previously poor performing countries. The results indicate some effect of the regression to the mean (RTM) for inflation and interest rates. Improved macroeconomic performance over the study period seems to be associated with factors, other than CBI reform.

The results suggest that FD does not matter for CBI and macroeconomic performance. We do not find evidence that fiscal deficits are monetized in the selected African countries over the study period. We attributed this to anti-inflation strategies in African countries with high fiscal deficits. Domestic inflation, which is explained by exchange rate depreciation, is a major determinant of factual CBI, economic growth and interest rates. It is generally not clear what determines legal CBI. The relative static nature of legal CBI indices, due to the infrequent changes in CB legislation in African countries, makes it difficult to establish any systematic link between the legal CBI indices and their potential determinants. The factual measure of CBI is more relevant.

## 1.7 Innovations of the Study

To fill some of the existing gaps in the literature, we make several innovations in our analysis of CBI. Firstly, we focus on 20 selected African countries over 1990-2008. As far as we know, this is one of the latest studies in CBI. The multicounty nature of the study accounts for the potential variations in CBI across different political, economic and legal conditions. We include some African countries with notable CBI characteristics. These include Angola, Mauritania and Zimbabwe, among others. There are several previous multicounty CBI studies in the literature (Bade and Parkin (1980); Skanland (1984); Alesina (1987); Parkin (1987); Masciandaro and Tabellini (1988); Bodart (1990); Swinburne and Castello-Branco (1991); Grilli et al. (1991); Cukierman et al. (1992); DeHaan and Kooi (2000); Sturm and DeHaan (2001); DeHaan (2001); Jácome (2001); Jácome and Vázquez (2005); Dreher et al. (2007); Arnone et al. (2006, 2007, 2008); DeHaan and Klomp (2010); Klomp and DeHaan (2010)). However, most of these previous studies are now outdated for the current analysis of CBI. Some of the latest studies do not cover all the countries in our sample (Arnone et al. (2008) and, DeHaan and Klomp (2010)).

Secondly, we account for the multidimensional aspect of CBI by constructing a comprehensive set of both legal (de jure) and factual (de facto) CBI indices. We use recent data covering 1990-2008. We use a basket of CBI indices, 2 legal and 1 factual. We use 2 types of legal indices, following Grilli et al. (1991) and Cukierman et al. (1992). We use both legal and factual indices for some reasons. Firstly, legal CBI is an essential component of actual CBI. It indicates the degree of CBI that the legislators meant to confer on the CB. Secondly, most previous attempts at rating CBI commonly start with legal CBI indices. Some of the previous studies are actually based solely on legal CBI indices (Bade and Parkin (1977, 1982, 1988); Alesina (1988, 1989); Bodart (1990); Grilli et al. (1991); Cukierman (1992); Cukierman et al. (1992); Eijffinger and Schaling (1993); Alesina and Summers (1993); Ilieva and Healey (2001); Jácome and Vázquez (2005); Arnone et al. (2007); Arnone et al. (2008)). Thirdly, comparing results in this study to the results in most previous studies, requires a legal CBI index. This is because previous comparable CBI studies commonly used legal indices only. However, since CB laws in Africa are often incomplete, subject to interpretation spreads, least respected and do not cover all possible contingencies, we use a factual CBI measure as well. Previous studies suggest that factual measures of CBI are a better proxy for actual CBI in less developed countries

(Cukierman (1992); Cukierman et al. (1992); Cukierman and Webb (1995); Presnak (1996); DeHaan and Kooi (2000); Sturm and DeHaan (2001); Dreher et al. (2007); and DeHaan and Klomp (2010)). We use both aggregated and disaggregated indices to allow for both generality and specificity in CBI analysis. The indices we develop cover a wide range of CBI aspects. The multiple indices are a robustness check on the results because any one index is a noisy indicator of actual CBI. The indices complement each other in explaining CBI because each one of them focuses on only one and a different aspect of CBI. In addition, and to support the statistical results, we use a considerable amount of qualitative information on CBI in each country.

Thirdly, we use a new method of measuring the effects of CBI on macroeconomic performance, the difference-in-difference (DID) method. This method is associated with Ball and Sheridan (2005), who investigate the effects of inflation targeting (IT) on macroeconomic performance in 20 OECD countries in the 1990s. We use the DID method to avoid subjectivity and arbitrariness associated with the construction of CBI indices in levels. Using this approach, we reduce some level of endogeneity bias associated with CBI indices in levels and the macroeconomic variables of choice. Our application of the DID method from IT in Ball and Sheridan (2005) to CBI in this study is a recent innovation in CBI literature. It is also one of the first of such studies.

Fourthly, recently there is an alternative technique that is being used to investigate the effects of fiscal dominance (FD) on CBI and macroeconomic performance. We attempt this estimation technique in this study. It is the 2-step system generalized method of moments (GMM) in dynamic panel data (DPD). The method is originally associated with Arellano and Bover (1995) and Blundell and Bond (1998). We use it mainly to reduce endogeneity bias among variables and other common estimation problems associated with methods in previous studies.

## 1.8 Limitations of the Study

The study is limited by the relatively small sample size and short study period. A larger number of countries and a longer study period would have broadened analysis. Because of these data limitations, we could not do more rigorous sensitivity analysis in terms of sub-groups of countries and sub-periods of the study period. With a larger sample size, we could have split Africa into its various sub-African regions. We would have checked for any systematic differences in CBI across the sub-African regions. With a longer study period we could have

observed factual CBI over more legal terms of office of CB governors instead of the current 3.2-4.8 legal terms. Some countries have weak data on CB institutional variables. As a result, we were limited to the use of only one factual CBI measure, the annual average TOR of CB governors. In addition, accuracy of the legal CBI indices partly largely depends on accurate interpretation of the CB laws, CBI criteria choice and the validity of the weights and codes used.

We could not get suitable instrumental variables (IVs) to instrument the CBI dummy variable ($D_i$). As a result, we could not do much to control for its own potential endogeneity bias. We could not get a reasonable number of comparable previous studies that investigate the effects of CBI on macroeconomic effects, which specifically use the DID method. As a result, we do not directly compare our findings to any previous similar studies. However, we borrow some methodology ideas from Daunfelt et al. (2008) and Daunfeldt and Luna (2008). Due to the short study period, we could not create several break years between the pre-reform and the post-reform periods as part of the sensitivity analysis with respect to time. We restricted analysis to one break year, 1998. More break years would have produced more robust and more conclusive results.

We could not get complete and consistent data on alternative measures of FD. As a result, we were limited to the use of only one measure of FD, the fiscal balance as a percentage of GDP. More FD measures would have constituted a robustness check on the analysis. This is because each measure is a noisy indicator of FD. With alternative measures, we would have possibly got more robust and more conclusive results. We would have compared impact among several FD measures. We are aware that the primary balance, measured on a cash basis, is a more appropriate measure of FD but we could not get data on it. We could not get data on the Treasury component of the monetary base for some of the countries. This variable has a more direct link with FD. We resorted to the use of the money supply growth rates because of this data limitation.

## 1.9 Organization of the Study

The rest of the study is organized as follows. Chapter 2 measures the degree of CBI. Chapter 3 measures the effect of CBI on macroeconomic performance. Chapter 4 measures the effect of FD on CBI and macroeconomic performance. Finally, chapter 5 concludes the study with some policy implications and recommendations. We suggest some areas for any further research in the relationship between CBI and macroeconomic performance in African countries.

# CHAPTER 2: MEASUREMENT OF CENTRAL BANK INDEPENDENCE

## 2.1 Introduction

The 1990s were marked by increased quest for CBI, world-wide. As a result, most countries revised their CB legislation in a bid to enhance CBI, with expectations of improved macroeconomic performance. One of the main reasons behind arguments for CBI is the claim that CBI can restrict potential avenues for undue political interference in the conduct of monetary policy (Woolley (1984) and Goodman (1992)). CBI has also been promoted as part of financial globalization, evolution of new monetary policy strategies and increased search for institutions designed to safeguard the price stability objective (Maxfield (1997); Rogoff (2003); Mishkin (2007)). CBI is associated with credible monetary policy conduct (Arnone et al. (2008)).

The widespread interest in CBI has been motivated by claims that credible international commitment to monetary policy coordination requires some guarantee of CBI from government. Actions and the capacity of a CB are considered critical signals to national creditors, purchasers of government paper, private international banks, bilateral and multilateral lending agencies. CBI ratings are used for international credit ratings by international creditors such as the International Monetary Fund (IMF) and the World Bank (WB). High CBI ratings signal government commitment to credible monetary policy. International creditors consider CBI ratings critical in determining the likelihood that a nation's economic policies will promote sustainable economic growth and the capacity to repay external debt (Maxfield (1997)).

Some literature suggests that CBI can enhance macroeconomic performance. This is because there are claims that CBI can assist countries achieve lower average inflation and reduce its variability, reduce the impact of political business cycles on the economy (Nordhaus (1975)), foster fiscal discipline and enhance financial stability without any real additional costs or sacrifices in terms of reduced average output growth or an increase in output growth variability (Alesina and Summers (1993) and Arnone et al. (2008)).

Some African countries are now moving towards inflation targeting (IT) and others are contemplating and working towards doing so (for example Nigeria and Zambia). The South African Reserve Bank and the Bank of Ghana started IT in 2000 and 2007, respectively. CBI is a

requisite institutional arrangement for IT. CBI ratings can be used to assess the readiness of a CB for IT. There are also claims that high CBI could reduce the fiscal dominance (FD) of monetary policy. This is because there are claims that highly independent CBs are likely to resist government pressure to monetize fiscal deficits (Pollard (1993) and Chandavarkar (1996)).

Despite the good attributes that some authors associate with CBI, there are counter claims that high CBI might not improve macroeconomic performance as it is commonly claimed. As argued by DeBelle and Fischer (1994), monetary policy may not stabilize real output if CBI is excessive. The inflation-output trade-off may be widened by CBI. DeBelle and Fischer (1994) claim that the sacrifice ratio in terms of output losses and increased output variability, could be high with CBI. Other contrary claims are that CBI could possibly weaken the accountability and transparency of CBs. This is because these CBI aspects require enforceable mechanisms, which are often lacking in most African countries. For these and other reasons, CBI reforms commonly grant the CBs, instrument CBI and leave goal setting to the country's legislature (Walsh (2005)).

We measure the degree of CBI in 20 selected African countries over 1990-2008. We measure CBI through country ratings and cross-country rankings of the CBI scores in levels. We account for the multidimensional aspect of CBI by constructing a comprehensive set of 5 CBI indices. This approach follows Grilli, Masciandaro and Tabellini (GMT (1991)) and Cukierman, Webb and Neyapti (CWN (1992)). Following Grill et al. (1991), we define CBI in political and in economic terms. Following Cukierman et al. (1992), we define CBI in legal (de jure) and in factual (de facto) terms. We calculate the GMT (1991) and the CWN (1992) type of indices.

We rate and rank CBI at aggregated and disaggregated levels. We identify notable strengths and weaknesses in CBI aspects. We benchmark our CBI ratings against 6 of the world's most renowned CBs. These include the Bank of Canada (CAD), Bundesbank, Bank of England (BOE), National Bank of Switzerland (CHF), US Federal Reserve Bank (USD), Reserve Bank of Australia (AUD) and Reserve Bank of New Zealand (RBNZD). We compare our CBI ratings and rankings to the last decade ratings in Cukierman et al. (1992), which we use as the benchmark previous related empirical study. Their last decade covers the period 1980-1989.

Our main contribution is that we produce a new and updated comprehensive set of 5 CBI indices, based on 20 selected African countries. We indicate the extent of progress in CBI reforms in Africa since the 1990s. The results suggest that legal CBI is low but factual CBI is high. Political

CBI is low but economic CBI is high. CBI ratings vary across CBs, depending on specific CBI aspects. Both legal and factual CBI have improved over the years since the early 1990s. This implies that the CBI reforms have had some effect on the levels and the status of CBI in Africa.

The rest of the paper is organized as follows. Section 2.2 outlines the theoretical and empirical cases for CBI. Section 2.3 presents the methodology and sample data. Section 2.4 presents empirical findings. Finally, section 2.5 concludes the paper.

## 2.2 Theoretical and Empirical Cases for Central Bank Independence

Among several theories, the case for CBI is associated with the (i) political business cycles model (Nordhaus (1975)), (ii) dynamic inconsistency problem of monetary policy (Kydland and Prescott (1977)), and the (iii) delegation theory of monetary policy (Rogoff (1985)). These theories claim that there are incentives for political authorities to misuse the money printing aspect of the CBs, to achieve real economic objectives or short-term political motives. In view of the dynamic inconsistency problem of monetary policy and the inflation bias, these theories argue for CBI. These theories suggest that independent CBs are likely to resist political pressure to monetize the fiscal deficits (Nordhaus (1975) and Pollard (1993)). These claims imply that more independent CBs can implement monetary policy with commitment. The theories suggest a separation between political policy makers and CB authorities. The reasons are that, to avoid potential misuse of money printing, there is a need to separate the authority that prints money, which is the CB, and the authority that uses the money, which is the government.

Kydland and Prescott (1977) claim that CBI is associated with credible monetary policy and enhanced macroeconomic performance. CBI can improve macroeconomic performance in several ways. Firstly, an independent CB that is free from political pressure may behave more predictably, promote economic stability and reduce risk premia in real interest rates (Romer and Romer (1989)). Secondly, there are claims that an independent CB may insulate the economy from political business cycles either by preventing pre-election manipulation of monetary policy (Nordhaus (1975), Rogoff and Sibert (1988)) or by reducing partisan shocks to policy, following elections (Hibbs (1987); Alesina (1988, 1989); Willett (1988)). Independence of the CB from the government might enhance the effectiveness of the CB in conducting monetary policy with commitment (Alesina and Summers (1993); Lybek (1999); Fischer (1995); Cukierman (2005)).

Rogoff (1985) suggests that to reduce the dynamic inconsistency of monetary policy, policy making should be delegated to an independent and conservative CB governor whose preferences differ from the short-term focused politicians. This is because the Rogoff (1985) type of CB governor cares more about confidence building and the credibility of the CB. The Rogoff (1985) central banker's preference for price stability relative to economic growth is stronger than that of general society. The Rogoff (1985) model CB has both goal and instrument CBI. Romer and Romer (1989) suggest that more consistently inflation-averse policy, associated with enhanced CBI would be associated with less variable macroeconomic performance. This implies that CBI is associated with enhanced macroeconomic stability. Romer and Romer (1997) claim that CBI can depoliticize the monetary policy making process. In this case, the CB becomes credible.

The empirical case for CBI rests on considerable empirical evidence suggesting that, on average, countries with more independent CBs have lower average inflation rates and reduced inflation variability (Burdekin and Willett (1991); Masciandaro and Spinelli (1993); Alesina and Summers (1993); Banaian (1995, 1997); DeHaan and Kooi (2000); Mangano (1998); Oately (1999); Arnone et al. (2007, 2008); Cukierman (2008)). However, despite the claims of potential benefits of enhanced CBI on macroeconomic performance, some other authors have found little or no evidence of the macroeconomic benefits of CBI (Banaian et al. (1995); Posen (1995, 1998); Campillo and Miron (1997); Fuhrer (1997); Crosby (1998); DeHaan and Klomp (2010)).

Empirical evidence on the hypothesized improved macroeconomic performance, associated with enhanced CBI, is largely mixed and inconclusive. Empirical results tend to vary with groups of countries, study periods, CBI indices, macroeconomic variables of choice and methods of analysis used (Banaian and Willett (1983); Bade and Parkin (1985); Alesina (1988); Grilli et al. (1991); Cukierman (1992); Cukierman et al. (1992); Alesina and Summers (1993); Cukierman and Webb (1995); Eijffinger and DeHaan (1996); Dolmas et al. (2000); Neyapti (2003); Diana and Sidiropoulos (2003); Down and Siklos (2004); DeHaan and Klomp 2010)).

Over the years, considerable research has been done in the measurement and analysis of CBI. However, most pre-1990 studies have relied more on the comprehensive set of CBI indices published by Grilli et al. (1991) and Cukierman et al. (1992). The Grilli et al. (1991) indices only cover 18 OECD countries over 1950-1989. The Cukierman et al. (1992) indices cover 1950-1989 on a decade-wise basis. They include 72 countries, 51 less developed countries and 21 developed

countries. Out of the 51 less developed countries, 12 are African countries. These indices (GMT (1991) and CWN (1992)) have several merits. Firstly, these are baseline indices that have been used as reference indicators of CBI, globally (Arnone et al. (2008)). The indices have been used in their original, modified and in extended form by several previous authors, among others (DeHaan and Kooi (2000); Arnone et al. (2006, 2007, 2008); DeHaan and Klomp (2010)). Secondly, the indices are still comparable to new ones that come up in the literature. Thirdly, the indices are comprehensive in terms of numbers of CBI variables covered. The Grilli et al. (1991) index has 15 variables with 2 sub-indices, political CBI and economic CBI. The Cukierman et al. (1992) index has 16 variables with 4 sub-indices, which cover (i) personal, (ii) policy, (iii) goal and (iv) financial (fiscal) CBI. In addition, it includes factual (de facto) measures of CBI. The wide range of CBI variables accounts for the multidimensional aspect of CBI. Fourthly, the indices are quantitative and easy to replicate. The guidelines for calculation are available in their code tables. These cover the CBI variables, their corresponding weights and codes.

Over years, some authors have made some updates and extensions to the CWN (1992) data sets. The annual average TOR of governors index, originally introduced in chapter 19 in Cukierman (1992) and in the Cukierman et al. (1992) study is updated and extended to cover a wider sample of 82 countries over 1980-1989 by DeHaan and Kooi (2000). They also use legal aspects of both the GMT (1991) and the CWN (1992) indices. Dreher et al. (2007, 2008) update and extend the CWN (1992) annual average TOR data set by applying it to 137 countries over 1970-2004. Jacome and Vazquez (2008) update the CWN (1992) legal index for 24 Latin American and Caribbean countries over 1985-2002. Arnone et al. (2006) reconstruct the GMT (1991) index for 82 countries, developed and less developed. Their study period covers 2 periods, end-1980s and end-2003. Arnone et al. (2008) calculate CBI indices for 163 CBs for end-2003. These include 28 developed countries, 32 emerging market economies and 103 less developed countries. DeHaan and Klomp (2010) calculate TOR index for over 100 countries during 1980-2005.

Existing CBI indices, their updates and extensions seem to cover specific groups of countries and study periods. They are based on specific CBI variables. Most authors have focused more on the legal definition of CBI (Bade and Parkin (1982); Alesina (1988, 1989); Grilli et al. (1991); Eijffinger-Schaling (1993); Jacome and Vazquez (2005)). We take account that reliance on legal CBI measures only may be inadequate for the analysis of CBI in African countries. This is

because these countries have weak legal institutions. In addition, reliance on only one type of CBI index, narrows the analysis of CBI, which is a multidimensional concept. Most previous studies have focused more on developed countries. Possible reasons include that it is likely easier to measure CBI in developed countries because the CB Act suffices to measure actual CBI. The case of less developed countries is likely to be different because there is a claimed wide gap between the "letter of law" and the "application of the law" in such countries (Cukierman et al. (1992); DeHaan and Kooi (2000); Dreher et al. (2007); and DeHaan and Klomp (2010)).

## 2.3 Methodology and Sample Data

We calculate the legal CBI indices from the reading of the CB Acts, Act amendments and country constitutions. The latest Acts are shown in table 2.1 and their detailed specifications are cited in appendix 2.3. The sources of the Acts are the CB databases and the Arnone et al. (2008) database on CB laws, that is available on http://marco.arnone.googlepages.com/centralbanklaws. We use country constitutions because in some countries, legal CBI is constitutionally granted.

Table 2.1: Selected Central Banks and the their Latest Acts

| Country | Name of Central Bank | Central Bank Acronym | Commencement Date | Latest Central Bank Act |
|---|---|---|---|---|
| Algeria | Bank of Algeria | BOA | 1963 | 2003 |
| Angola | National Bank of Angola | BNA | 1975 | 1997 |
| Botswana | Bank of Botswana | BOB | 1975 | 1996 |
| Egypt | Central Bank of Egypt | CBE | 1961 | 2003 |
| Ethiopia | National Bank of Ethiopia | NBE | 1963 | 2008 |
| Ghana | Bank of Ghana | BOG | 1957 | 2002 |
| Kenya | Central Bank of Kenya | CBK | 1966 | 1997 |
| Malawi | Reserve Bank of Malawi | RBM | 1964 | 2002 |
| Mauritania | Central Bank of Mauritania | BCM | 1973 | 1994 |
| Mauritius | Bank of Mauritius | BOM | 1967 | 2004 |
| Mozambique | Bank of Mozambique | BM | 1975 | 1992 |
| Nigeria | Central Bank of Nigeria | CBN | 1958 | 2007 |
| Rwanda | National Bank of Rwanda | NBR | 1964 | 1997 |
| South Africa | South African Reserve Bank | SARB | 1921 | 2000 |
| Sudan | Bank of Sudan | BOS | 1960 | 2002 |
| Tanzania | Bank of Tanzania | BOT | 1965 | 2006 |
| Tunisia | Central Bank of Tunisia | BCT | 1958 | 2006 |
| Uganda | Bank of Uganda | BOU | 1966 | 1993 |
| Zambia | Bank of Zambia | BOZ | 1985 | 1996 |
| Zimbabwe | Reserve Bank of Zimbabwe | RBZ | 1956 | 2001 |

Source: Central bank databases and the Arnone et al. (2008) database on CB laws on (http://marco.arnone.googlepages.com/centralbanklaws).

We calculate the factual CBI index from the number of CB governor changes. We collected this data mainly from the CB databases. Most CBs post a list of current and previous governors on their internet websites. We filled the data gaps through e-mail correspondence with the CBs. As

a consistency check on the accuracy of this information for CBs that do not systematically display it, we consulted IMF databases. These include the Morgan Stanley Dean Witter's Central Bank Directory (2004) and the IMF Article IV Consultation documents on individual countries.

The study is based on 20 African countries. Out of the 20 selected countries, Egypt and South Africa are emerging market economies and the rest are less developed countries. 11 of the selected countries are investigated in Cukierman et al. (1992), which includes 12 African countries out of the 72 countries studied. The 11 countries are Botswana, Egypt, Ethiopia, Ghana, Kenya, Malawi, Nigeria, South Africa, Tanzania, Uganda, Zambia and Zimbabwe. Our sample size is limited to 20 African countries for several reasons. Firstly, we seek to account for the claimed CBI variations across political, economic and legal conditions. Secondly, we exclude countries that belong to monetary unions or monetary arrangements, except the lead countries like South Africa in the CMA region of Southern Africa. This is because in a monetary union, the broad monetary policy stance is determined by the monetary union or lead country (for example South Africa in the CMA region of Southern Africa) as opposed to the individual countries. Thirdly, we considered data availability and consistency in sample choice. Fourthly, we exclude countries that are not strategic to CBI analysis. Fourthly, we chose countries whose CBs are prominent in their geographical sub-African regions. Our sample covers East, West, North and Southern Africa. The selected countries are regionally important in terms of political, economic and legal conditions. By selecting countries with different backgrounds, we seek to broaden the analysis of CBI. We examine sources of any systematic differences in CBI across African countries. This is because actual CB practices tend to vary across countries.

Due to the relatively small sample size and the relatively short study period, we do not create sub-groups of countries or sub-periods. We examine the whole sample. Analysis starts from 1990 for several reasons. Firstly, by 1990, all the selected CBs were already operating. Secondly, the 1990s were marked by increased quest for CBI as suggested by the widespread CBI reforms. Thirdly, before the 1990s, some of the selected countries had dictatorships. The concept of CBI is less plausible under dictatorship. The end of the study period (2008) was determined by data availability on the macroeconomic variables of choice, which we use in chapters 3 and 4.

The methodology of the paper involves CBI index calculation, country ratings and cross-country rankings. We calculate a comprehensive set of 5 indices for several reasons. Firstly, this accounts

for the multidimensional aspect of CBI. Secondly, the indices are complementary in explaining CBI status because each focuses on a different aspect of CBI. Thirdly, since each CBI index is a noisy indicator of CBI, a comprehensive set constitutes a robustness check on the analysis. Fourthly, each CBI index measures a somewhat different aspect of CBI. To calculate legal indices, we use the Grilli et al. (1991) and the Cukierman et al. (1992) code tables. We take the CBI variables, codes and weights as given in the adopted approaches without extensions or modifications. We do this for comparative analysis of the indices calculated in this paper and those in the benchmark study by Cukierman et al. (1992). The code tables are shown in appendices 2.1 and 2.2, respectively. Our aggregation process follows the adopted approaches.

In equations 2.1-2.5, we measure legal CBI, following Cukierman et al. (1992). In equations 2.6-2.8, we measure legal CBI, following Grilli et al. (1991). In equations 2.9-2.10, we measure factual CBI, following Cukierman et al. (1992). We calculate each CBI variable for country i where i=1,2,3…20. We define the study period by t, where t=1990-2008.

### 2.3.1 Legal Central Bank Independence Indices: Cukierman et al. (1992) Approach

We calculate the aggregate legal CWN index as defined in equation 2.1.

$$\mathrm{CWN}_{i,t} = 0.20 * \mathrm{CBGC}_{i,t} + 0.15\mathrm{CBPO}_{i,t} + 0.15\mathrm{PFAA}_{i,t} + 0.50 * \mathrm{CBLC}_{i,t} \qquad (2.1)$$

Where, $\mathrm{CWN}_{i,t}$ is the aggregate legal CBI index for country i over period t. $\mathrm{CBGC}_{i,t}$ is the CB governor characteristics for country i over period t. $\mathrm{CBGC}_{i,t}$ measures the personal independence of the governor in country i over period t. This concerns the authority that appoints the governor; legal term of office (TOO) of the governor; dismissal conditions of the governor; and whether the governor is allowed to take any other office in government during his or her term of office. $\mathrm{CBPO}_{i,t}$ is the legal CB policy objective (s) for country i over period t. CBPO measures goal independence of a CB. $\mathrm{PFAA}_{i,t}$ is the monetary policy formulating authority in country i over period t. PFAA measures the policy independence of a CB. $\mathrm{CBLC}_{i,t}$ is restrictions on CB lending to government in country i over period t. CBLC measures the financial independence of a CB. The coefficients in equation 2.1 are the corresponding weights for each of the variables. They each represent the significance and contribution of the individual sub-components of the index or variables to the overall index. These weights are shown in appendix 2.1 (See Appendix 2.1).

The aggregate CWN index is a weighted average of the 4 sub-indices from the 16 CBI variables that compose the index. Each of the 16 CBI variables takes values on a continous scale of 0-1. The higher the value of the index, the higher the level of CBI, and vice versa. The weights across CBI aspects are not uniform as shown in equation 2.1. The sub-indices in equation 2.1 are each decomposed further. The first component of equation 2.1, $CBGC_{i,t}$, is defined in equation 2.2.

$$CBGC_{i,t} = \frac{GTOF_{i,t}+GAAT_{i,t}+GDAT_{i,t}+GOOF_{i,t}}{4} \quad (2.2)$$

Where $CBGC_{i,t}$ is as defined before; $GTOF_{i,t}$ is the governor's legal term of office in country i over period t; $GAAT_{i,t}$ is the authority that appoints the governor in country i over period t; $GDAT_{i,t}$ is the authority that can dismiss the governor in country i over period t; and $GOOF_{i,t}$ means other offices that the governor can hold in government in country i over period t. $CBGC_{i,t}$ is a simple average of the 4 components $GTOF_{i,t}$, $GAAT_{i,t}$, $GDAT_{i,t}$ and $GOOF_{i,t}$. The second component of equation 2.1, $CBPO_{i,t}$, is defined in equation 2.3.

$$CBPO_{i,t} = PSOP_{i,t} \quad (2.3)$$

The only component of $CBPO_{i,t}$ is $PSOB_{i,t}$. $PSOB_{i,t}$ is the CB price stability objective in country i over period t. The price stability objective is considered as the primary objective of a CB. The third component of equation 2.1, $PFAA_{i,t}$, is defined in equation 2.4.

$$PFAA_{i,t} = 0.25 * MPFA_{i,t} + 0.50 * CFRM_{i,t} + 0.25 * CBBG_{i,t} \quad (2.4)$$

Where $PFAA_{i,t}$ is as defined before; $MPFA_{i,t}$ is the monetary policy formulating authority in country i over period t; $CFRM_{i,t}$ is the existence of a policy conflict resolution mechanism between the CB and government in country i over period t; and $CBBG_{i,t}$ is the CB role in government budget process in country i over period t. The fourth component of equation 2.1, $CBLC_{i,t}$, is defined in equation 2.5.

$$CBLC_{i,t} = 0.15 * CBGA_{i,t} + 0.10 * CLGL_{i,t} + 0.10 * CLGT_{i,t} + 0.05 * COBF_{i,t} + 0.025 * CBTL_{i,t} + 0.025 * CLGM_{i,t} + 0.025 * CLRR_{i,t} + 0.025 * CBPM_{i,t} \quad (2.5)$$

Where $CBLC_{i,t}$ is as defined before; $CBGA_{i,j}$ is the stringency of limits in CB advances to government in country i over period t; is the $CLGL_{i,t}$ is the stringency of limits in CB loans to government in country i over period t; $CLGT_{i,t}$ is the authority that determines the terms of lending CB funds in country i over period t; $COBF_{i,t}$ is the circle of beneficiaries of CB funds in

country i over period t; $CBTL_{i,t}$ is the type of limits on lending CB funds in country i over period t; $CLGM_{i,t}$ is the maturity profile of CB loans in country i over period t; $CLRR_{i,t}$ is the restrictions on interest rates in country i over period t. $CBPM_{i,t}$ is the existence of an explicit ban on CB participation in primary market for government securities in country i over period t. Limits can be in percentage shares of the reference variables or in absolute figures. The CWN (1992) index, which we follow, gives more weight to financial CBI.

To aggregate the CWN index for country i, we multiply each CBI variable by its corresponding weight. To get the sample average aggregate legal CWN index, we take a simple average of the individual CB average CWN scores. We rank the 20 countries according to the aggregate scores.

### 2.3.2 Legal Central Bank Independence Indices: Grilli et al. (1991) Approach

As shown in appendix 2.2, the aggregate GMT legal CBI index has 2 sub-indices. The political CBI sub-index has 8 variables. The economic CBI sub-index has 7 variables. The aggregate GMT index and the 2 sub-indices are unit-weight indices. Each of the 15 CBI variables takes values on a binary scale of 0 (minimum) or 1 (maximum). The aggregate GMT index takes values from 0 (minimum) to 16 (maximum). The higher the value of the index, the higher the level of CBI, and vice-versa. The fifteenth variable on bank supervision has a maximum score of 2. We calculate the aggregate GMT index as defined in equation 2.6.

$$\mathrm{GMT}_{i,t} = \mathrm{POLCBI}_{i,t} + \mathrm{ECOCBI}_{i,t} \tag{2.6}$$

$GMT_{i,t}$ is the aggregate GMT legal index in country i over period t. $POLCBI_{i,t}$ is political CBI in country i over period t. $ECOCBI_{i,t}$ is economic CBI in country i over period t. Political CBI is defined in equation 2.7.

$$\mathrm{POLCBI}_{i,t} = \mathrm{CBGA}_{i,t} + \mathrm{CBGT}_{i,t} + \mathrm{CBBA}_{i,t} + \mathrm{CBBT}_{i,t} + \mathrm{CBBG}_{i,t} + \mathrm{MPFA}_{i,t} + \mathrm{PSSO}_{i,t} + \mathrm{LDCR}_{i,t} \tag{2.7}$$

Where $POLCBI_{i,t}$ is as defined before; $CBGA_{i,t}$ is that government does not appoint the governor in country i over period t; $CBGT_{i,t}$ is that the governor is in office for more than 5 years in country i over period t; $CBBA_{i,t}$ is that the government does not appoint the majority of the CB board members in country i over period t; $CBBT_{i,t}$ is that the CB board is in office for more than 5 years in country i over period t; $CBBG_{i,t}$ is that a government representative participates on the CB policy board meetings in country i over period t; $MPFA_{i,t}$ is that government does not

approve monetary policy in country i over period t; $PSSO_{i,t}$ is that the CB has a legal mandate of price stability in country i over period t; and $LDCR_{i,t}$ is that there is a conflict resolution mechanism in place to resolve any policy conflict between the CB and government in country i over period t. Economic independence is defined in equation 2.8.

$$ECOCBI_{i,t} = CLGA_{i,t} + CLGT_{i,t} + CLGL_{i,t} + CLGM_{i,t} + OGDP_{i,t} + DRSA_{i,t} + CBSR_{i,t} \quad (2.8)$$

Where $ECOCBI_{i,t}$ is as defined before; $CLGA_{i,t}$ is that direct credit to government is not automatic in country i over period t; $CLGT_{i,t}$ is that CB credit is granted at full market interest rates in country i over period t; $CLGL_{i,t}$ is that there is a temporary limit amount that the CB can lend in country i over period t; $CLGM_{i,t}$ is that there is a maturity limit for the CB loans in country i over period t; $OGDP_{i,t}$ is that the CB participates on the primary market for government securities in country i over period t; $DRSA_{i,t}$ is that the CB sets the discount rate in country i over period t. $CBSR_{i,t}$ is that the CB participates in bank supervision in country i over period t.

For the GMT indices, overall GMT, political and economic sub-indices, aggregation involves a simple summation of the CBI variables. For ease of comparability among all the CBI indices, we standardize the GMT scores by conversion. We divide the individual absolute scores by the maximum potential score for each of the 15 CBI variables. The comparable indices are the legal CWN and TOR. The standardization technique follows Arnone et al. (2008). After conversion, the overall GMT index becomes a simple average of the political and economic sub-indices.

### 2.3.3 Factual Central Bank Independence Index: Cukierman et al. (1992) Approach

Legal indicators of CBI may not reflect the true relationship between the CB and the government in less developed countries, where the CB laws are least respected, partial and leave some room for interpretation spreads (Cukierman (1992); Cukierman et al. (1992); Forder (1996); Mangano (1998); Walsh (2005)). To account for potential inadequacies in legal CBI measures as indicators of actual CBI practices in less developed countries and to be more robust in the analysis of CBI, we develop a behavioural CBI index to reflect factual or effective CBI. This approach follows several previous authors (Cukierman (1992); Cukierman et al. (1992); Cukierman and Webb (1995); DeHaan and Kooi (2000); Sturm and DeHaan (2001); DeHaan (2001); Dreher et al. (2007); DeHaan and Klomp (2010)). The study by DeHaan (2001) covers 2 decade-wise periods, 1980-1989 and 1990-1998. The study by Dreher et al. (2007) covers 137 countries over 1970-

2004. Generally, factual CBI covers several behavioural aspects. These include the annual average TOR of CB governors, their personalities and charisma, their design of monetary policy, the political vulnerability of the CB governors and evolved behavioural norms between the CB governor and government authorities (Radzyner and Riesinger (1997)). In this study, we restrict factual CBI to the actual annual average TOR of governors. The TOR is an informal and indirect indicator of actual CBI. We chose the annual average TOR based on (i) its wide recognition in the literature and empirical analysis, (ii) data availability and consistency, (iii) ease of calculation and (iv) limited subjectivity bias. In addition, hirings and firings are one typical potential avenue through which some political authorities exert influence on the CBs in less developed countries. Angola and Mauritania are typical examples. However, the TOR index is limited in that low turnovers, which imply high factual CBI, may reflect subservience of CB governors. We construct a new TOR data set because the commonly used previous data sets by Cukierman et al. (1992) and DeHaan and Kooi (2000) are now outdated and do not cover all the countries in our sample. We calculate the actual annual average TOR of CB governors in equation 2.9.

$$\text{Actual TOR} = \frac{\text{Number of Central Bank Governor Changes}}{\text{Number of Years or Part of Years}} \tag{2.9}$$

We use some restrictions in calculating the actual TOR. Firstly, we restrict actual annual average TOR of governors to actual practices in CBs, against CB legislation (Acts, Act Amendments and country constitutions). Secondly, we count all turnovers of governors, voluntary or compulsory, dismissals, resignations and reassignments. Thirdly, we count reappointed governors, who are in their $2^{nd}$…$n^{th}$ consecutive term of office, only once. Fourthly, we exclude interim governors from the total number of governors. The actual TOR scores range from 0 (highest level of CBI) to 1 (lowest level of CBI). The actual TOR score is the inverse of the actual term of office. The actual TOR is high if above the threshold TOR. The threshold TOR is the inverse of the legal term of office of the governor. It is the turnover rate, beyond which CBI begins to deteriorate (Cukierman et al. (1992)). We calculate the annual average threshold TOR in equation 2.10.

$$\text{Threshold TOR} = \frac{1}{\text{Legal Term of Office of the Central Bank Governor (Years)}} \tag{2.10}$$

We get the sample annual average actual TOR and the threshold TOR scores by taking simple averages of their individual country scores. We rank countries according to actual TOR scores.

We investigate cases of extremely high and extremely low turnovers. We find out possible causal factors. We use other qualitative CB information to explain the statistical outcomes. To measure changes in factual CBI from 1980-1989 to 1990-2008, we use the 1980-1989 TOR scores in Cukierman et al. (1992). For accuracy and consistency, and following Dvorsky (2000), we recalculate the Cukierman et al. (1992) figures to ensure that our method is exactly the same as the Cukierman et al. (1992) method that we replicate. In addition, we recalculate the 1980-1989 period TOR scores because 9 of the countries in our sample are not covered in Cukierman et al. (1992). We also compare the changes in cross-country TOR rankings over the same periods.

### 2.4 Presentation and Analysis of Results

The results confirm the claimed increased move towards enhanced CBI since the early 1990s. This finding of improved CBI since the early 1990s is also echoed in various previous studies (Cukierman and Webb (1995); Cukierman (1996); Arnone et al. (2008); Daunfeldt and DeLuna (2008); Daunfelt et al. (2010)). The results suggest that improvements in CBI in Africa have generally been associated with political, economic and historical reasons, among other factors. The results suggest that most governments amended their CB Acts, post-1989. By the end of 2008, only the Reserve Bank of Malawi was still using the 1989 Act, which grants it, low legal CBI. For most CBs, CBI is only granted through the CB Act. It is not constitutionally granted. This implies that CBI can be easily violated by the political authorities. Out of the 20 CBs, only the Bank of Uganda and the South African Reserve Bank were constitutionally granted legal CBI in 1993 and 1996, respectively (See Appendix 2.3). The results suggest that most governments still need to revise their CB Acts, to further reduce government control over the CBs. The results suggest that some governments like the Kenyan one have been revising their CB Acts while others like the Malawian government have not been active in trying to move in line with modern-day CBI requirements. The Central Bank of Nigeria Act has been revised several times but without major enhancements in legal CBI. The analysis suggests that the respective CB Acts differ in terms of focus, scope, clarity, specificity, amount of detail and presentation.

Table 2.2 shows the aggregated and disaggregated legal CWN country ratings. The results suggest that aggregate legal CBI is low. The sample average is 0.47. The disaggregated legal indices suggest that legal CBI frameworks in most CBs, share several common principles. This is shown by equal CBI ratings for specific sub-indices for several countries. For example, the

general uniformity of CBI ratings for variable numbers 2, 3, 4, 5, 6, 7 and 16 in table 2.2, confirm this outcome. There is more variation in the financial independence variables (9)-(15).

### 2.4.1 Legal Central Bank Independence Outcomes (1990-2008)

Table 2.2: CWN Legal Central Bank Independence Ratings (1990-2008)

| Country | Term of Office | Who Appoints? | Dis-missal | Other Offices | Who formu-lates | Final Auth-ority | Role in Budget | Objective (s) Variable | Adva-nces | Securi-tised Lending | Terms of Lending | Potential Borrowers | Type of Limit | Maturity of Loans | Interest Rates | Primary Market | Aggre-gate CBI | Country CBI Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CBI Variable Number | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | **Overall** | **Rank** |
| South Africa | 0.50 | 0.00 | 0.83 | 0.50 | 1.00 | 0.20 | 0.00 | 1.00 | 0.67 | 0.67 | 0.33 | 1.00 | 0.67 | 1.00 | 0.25 | 0.00 | 0.59 | 1 |
| Tanzania | 0.50 | 0.00 | 0.83 | 0.50 | 0.67 | 0.20 | 0.00 | 1.00 | 0.67 | 0.67 | 1.00 | 0.00 | 0.33 | 0.67 | 0.75 | 0.00 | 0.59 | 1 |
| Botswana | 0.50 | 0.00 | 0.83 | 0.50 | 0.67 | 0.20 | 0.00 | 0.60 | 1.00 | 1.00 | 0.33 | 0.67 | 0.33 | 0.33 | 0.50 | 0.00 | 0.57 | 2 |
| Algeria | 0.75 | 0.00 | 0.83 | 0.50 | 0.67 | 0.20 | 0.00 | 0.60 | 0.67 | 0.67 | 0.67 | 0.67 | 0.33 | 0.33 | 0.50 | 0.00 | 0.53 | 3 |
| Mozambique | 0.50 | 0.00 | 0.00 | 0.50 | 0.67 | 0.20 | 0.00 | 0.80 | 0.67 | 0.67 | 1.00 | 0.00 | 0.67 | 0.67 | 0.50 | 0.00 | 0.52 | 4 |
| Kenya | 0.25 | 0.00 | 0.83 | 0.50 | 0.67 | 0.20 | 0.00 | 1.00 | 0.67 | 0.67 | 0.33 | 0.00 | 0.33 | 0.67 | 0.75 | 0.00 | 0.51 | 5 |
| Nigeria | 0.50 | 0.50 | 0.83 | 0.50 | 0.67 | 0.20 | 0.00 | 0.60 | 0.67 | 0.67 | 0.33 | 0.00 | 0.67 | 0.67 | 0.50 | 0.00 | 0.49 | 6 |
| Rwanda | 0.75 | 0.00 | 0.83 | 0.50 | 0.67 | 0.20 | 0.00 | 0.60 | 0.67 | 0.67 | 0.33 | 0.33 | 0.33 | 0.33 | 0.75 | 0.00 | 0.49 | 6 |
| Tunisia | 0.75 | 0.00 | 0.83 | 0.50 | 0.67 | 0.20 | 0.00 | 0.60 | 0.67 | 0.67 | 0.33 | 0.33 | 0.33 | 0.67 | 0.50 | 0.00 | 0.49 | 6 |
| Mauritania | 0.50 | 0.00 | 0.83 | 0.50 | 0.67 | 0.20 | 0.00 | 0.60 | 0.67 | 0.67 | 0.33 | 0.33 | 0.67 | 0.67 | 0.33 | 0.00 | 0.48 | 7 |
| Angola | 0.50 | 0.00 | 0.83 | 0.50 | 0.67 | 0.20 | 0.00 | 0.40 | 0.67 | 0.67 | 0.67 | 0.00 | 0.67 | 0.67 | 0.50 | 0.00 | 0.47 | 8 |
| Zambia | 0.50 | 0.25 | 0.83 | 0.50 | 0.67 | 0.20 | 0.00 | 0.60 | 0.67 | 0.67 | 0.33 | 0.33 | 0.33 | 0.00 | 0.50 | 0.00 | 0.47 | 8 |
| Ghana | 0.25 | 0.00 | 0.83 | 0.50 | 0.67 | 0.20 | 0.00 | 0.60 | 0.67 | 0.67 | 0.33 | 0.00 | 0.33 | 1.00 | 0.50 | 0.00 | 0.46 | 9 |
| Uganda | 0.50 | 0.50 | 0.83 | 0.50 | 0.67 | 0.20 | 0.00 | 0.60 | 0.33 | 0.33 | 0.67 | 0.33 | 0.33 | 1.00 | 0.75 | 0.00 | 0.46 | 9 |
| Egypt | 0.25 | 0.00 | 1.00 | 0.00 | 0.67 | 0.20 | 0.00 | 0.60 | 0.67 | 0.67 | 0.33 | 0.00 | 0.67 | 0.67 | 0.50 | 0.00 | 0.44 | 10 |
| Ethiopia | 0.50 | 0.25 | 0.00 | 0.50 | 0.67 | 0.20 | 1.00 | 0.00 | 0.67 | 0.67 | 0.67 | 0.33 | 0.33 | 0.67 | 0.75 | 0.00 | 0.43 | 11 |
| Sudan | 0.50 | 0.00 | 0.83 | 0.50 | 0.67 | 0.20 | 0.00 | 0.00 | 0.67 | 0.67 | 0.67 | 0.00 | 0.33 | 0.67 | 0.75 | 0.00 | 0.41 | 12 |
| Mauritius | 0.50 | 0.00 | 0.83 | 0.50 | 0.67 | 0.20 | 0.00 | 0.60 | 0.33 | 0.33 | 0.33 | 0.00 | 0.33 | 0.33 | 0.50 | 0.00 | 0.37 | 13 |
| Zimbabwe | 0.50 | 0.00 | 0.83 | 0.50 | 0.67 | 0.00 | 0.00 | 0.60 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.25 | 0.00 | 0.36 | 14 |
| Malawi | 0.50 | 0.00 | 0.00 | 0.50 | 0.33 | 0.20 | 0.00 | 0.40 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 1.00 | 0.25 | 0.00 | 0.31 | 15 |
| **Sample Average** | **0.50** | | | | | | | | | | | | | | | | **0.47** | |

Source: Calculated from the respective central bank Acts, Act Amendments and Country Constitutions where applicable.

Notes

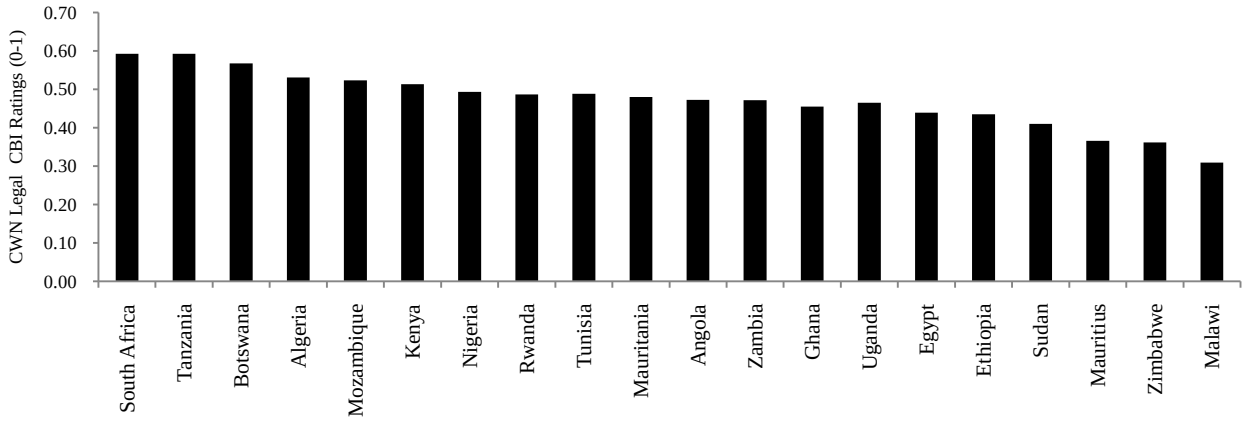
The aggregate legal CWN index for each country is a weighted average of the 16 CBI variables that compose the aggregate legal CWN index. The weights are not uniform across the 16 CBI variables.

The sample average legal CWN index of 0.47 is a simple average of the individual countries' aggregate legal CWN scores, which are shown in the Aggregate CBI or Overall column.

The countries are ordered according to their aggregate legal CWN scores, with the highest scoring country ranked as number 1 and most legally independent, and vice-versa.

The CBI variables (1)-(4) define personal independence of the CB governor, (5)-(7) policy independence of the CB, (8) goal independence of the CB, and (9)-(16) financial or fiscal independence of the CB.

Figure 2.1: Cross-Country Variations in CWN Legal Independence (1990-2008)




Source: Calculated from the respective central bank Acts.

Table 2.3: Changes in Legal Central Bank Independence (1990-2008)

| Economy | CWN (1980-1989) | CWN (1990-2008) | CBI Change |
|---|---|---|---|
| Egypt | 0.49 | 0.44 | -0.05 |
| Kenya | 0.44 | 0.51 | 0.07 |
| Tanzania | 0.44 | 0.59 | 0.15 |
| Ethiopia | 0.40 | 0.43 | 0.03 |
| Nigeria | 0.37 | 0.49 | 0.12 |
| Uganda | 0.35 | 0.46 | 0.11 |
| Botswana | 0.33 | 0.57 | 0.09 |
| Zambia | 0.33 | 0.47 | 0.14 |
| Ghana | 0.31 | 0.46 | 0.15 |
| South Africa | 0.25 | 0.59 | 0.34 |
| Zimbabwe | 0.20 | 0.36 | 0.16 |
| Sample Average | 0.36 | 0.47 | 0.11 |

Source: CWN (1980-1989) figures are from Cukierman et al. (1992). CWN (1990-2008) figures were calculated in this paper.

Both table 2.1 and figure 2.1 suggest that there are considerable cross-country variations in legal CBI. Out of the 20 CBs, there are 15 CBI cross-country rankings. Legal CBI ranges from 0.31 for the Reserve Bank of Malawi to 0.59 for the South African Reserve Bank.

Table 2.3 shows that legal CBI has improved since the early 1990s. This is because the CWN scores are higher over 1990-2008 than over 1980-1989. The sample average increased by 0.11 points or 30.56% from 0.36 in CWN (1992) to 0.47 in this paper (1990-2008). 10 out of 11 CBs improved. This represents 90.91% improvement. Notably, the Bank of Botswana, Bank of Zambia and the South African Reserve Bank made significant improvements. The Central Bank of Egypt, however, had a decline in overall legal CBI. This is because when the CBE Act was

amended in 2003, some legal clauses that had previously enhanced CBI such as in 1993 were removed and replaced by others that reduced overall legal CBI. Table 2.4 shows the legal CBI ratings for the 6 benchmark CBs in Cukierman et al. (1992) for the period 1980-1989.

Table 2.4: Legal Independence Ratings for Benchmark Central Banks (1990-2008)

| Country | Name of Central Bank | Legal CWN Index (1980-1989) |
|---|---|---|
| Germany | Bundesbank | 0.69 |
| United States of America | Federal Reserve Bank | 0.48 |
| Canada | Bank of Canada | 0.45 |
| Australia | Reserve Bank of Australia | 0.36 |
| United Kingdom | Bank of England | 0.27 |
| New Zealand | Reserve Bank of New Zealand | 0.24 |
| Sample Average | | 0.42 |

Source: Cukierman et al. (1992).

Table 2.4 suggests that the sample average legal CBI score of 0.47 over 1990-2008 in this study, compares with 0.42 for the 6 benchmark CBs over 1980-1989. This outcome implies that although still low, on average, legal CBI in Africa has improved to levels slightly above what characterized developed countries in the late 1980s (that is 0.47>0.42). This view on the improvements in legal CBI in Africa is also echoed in Arnone et al. (2008) results for the African countries' group. The low sample average legal CBI in African countries is explained by various factors relating to the sub-components of the aggregate legal indices as we explain below.

Table 2.2 shows that the sample average legal term of office (TOO) of the CB governor is 0.50, implying from appendix 2.1 that the average TOO is 5 years. This outcome implies low legal CBI. The range is 4-6 years, with a rating of 0.25-0.75. These outcomes compare with an average legal term of 8 years, a range of 5-14 years and a rating of 0.50-1.00 for the 6 benchmark CBs over 1990-2008. Our sample legal terms are short but have legal provision for renewal. Most, but not all CBs explicitly specify a limit on the number of times a CB governor can be reappointed. Most CB Acts provide for a maximum of 2 consecutive terms. The Bank of Sudan Act provides for a maximum of 3 terms of 5 years each. Comparatively, for the 6 benchmark CBs, the Federal Reserve Bank has the longest, but strictly non-renewable legal term of 14 years. The Bundesbank has a non-renewable legal term of 8 years. We do not find strict non-renewability of legal terms in our sample. The combination of short legal terms and their renewability implies easy opportunities for lobbying and soliciting for renewal. This likely

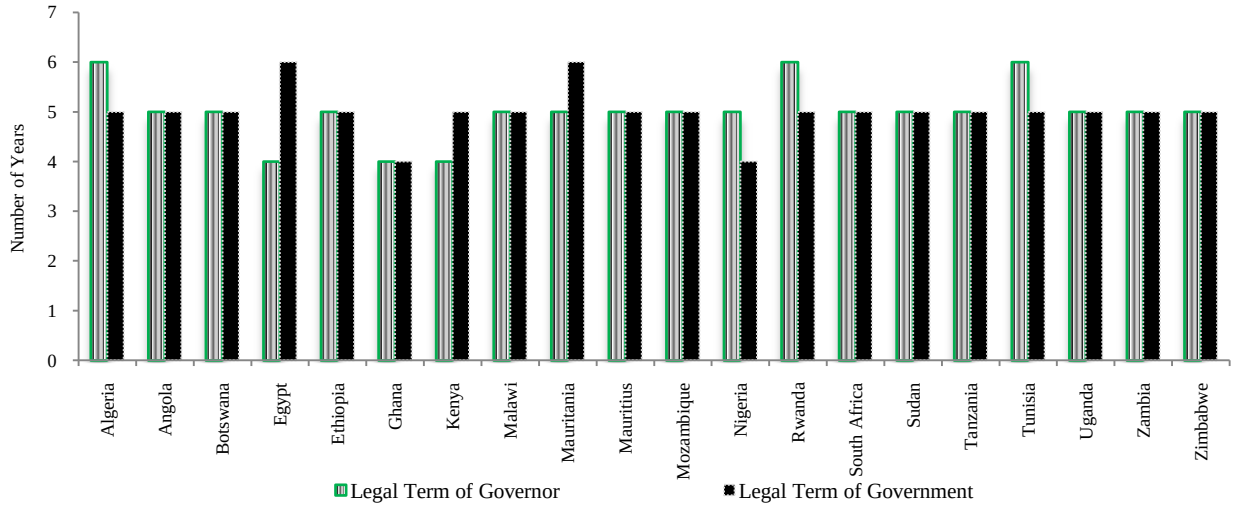
erodes personal independence of CB governors, who may likely lobby for reappointment. This outcome potentially creates subservient CB governors. In most African countries, the legal terms of office of CB governor, averaging 5 years for the sample, commonly overlap with government legal terms as shown in table 2.5 and figure 2.2, respectively.

Table 2.5: Legal Terms of Governors and Terms of Government (1990-2008)

| Economy | Legal Term of CB Governor | Legal Term of Government | Overlap in Legal Terms |
|---|---|---|---|
| Algeria | 6 | 5 | 1 |
| Angola | 5 | 5 | 0 |
| Botswana | 5 | 5 | 0 |
| Egypt | 4 | 6 | -2 |
| Ethiopia | 5 | 5 | 0 |
| Ghana | 4 | 4 | 0 |
| Kenya | 4 | 5 | -1 |
| Malawi | 5 | 5 | 0 |
| Mauritania | 5 | 6 | -1 |
| Mauritius | 5 | 5 | 0 |
| Mozambique | 5 | 5 | 0 |
| Nigeria | 5 | 4 | 1 |
| Rwanda | 6 | 5 | 1 |
| South Africa | 5 | 5 | 0 |
| Sudan | 5 | 5 | 0 |
| Tanzania | 5 | 5 | 0 |
| Tunisia | 6 | 5 | 1 |
| Uganda | 5 | 5 | 0 |
| Zambia | 5 | 5 | 0 |
| Zimbabwe | 5 | 5 | 0 |
| Sample Average | 5 | 5 | 0 |

Source: Central bank databases and respective government publications.

Figure 2.2: Legal Terms of Governors and Terms of Government (1990-2008)




Source: Central bank databases and the respective government publications.

Table 2.5 shows that only 4 countries, Algeria, Nigeria, Rwanda and Tunisia have legal terms of CB governors that are longer than the term of government or electoral cycle. In Egypt, Kenya and Mauritania, the term of government is longer than that of the CB governors. For the other 13 countries, the 2 terms have an equal life cycle. These outcomes imply potential political influence on the respective CB governors, especially if the calendar dates of the terms coincide. The combination of short legal terms, provision for renewal and the overlap in governor terms with government terms is conducive to potential political influence on the CB governors.

The sample governors are appointed by the political authorities. Most CBs are rated 0 with the exceptions of Bank of Uganda, Bank of Zambia and the Central Bank of Nigeria, with ratings of 0.50, 0.25 and 0.50, respectively. The appointing authority is the State President. Cross-country variations concern the authority that the State President consults in making the appointment and the effectiveness of consultation, if done. These include the Prime Minister, Minister of Finance and the CB board. The consultations are done for proposals, advice and recommendations. The appointment is done with the approval of Cabinet in Uganda, National Assembly in Zambia, Senate in Nigeria and the CB board in South Africa. In Nigeria, the appointment has to reflect Federal Character. This means that the governor and the Federal Minister of Finance should not come from the same State at the same time. This derives from the large size of Nigeria and the prominence of the Federal State concept in that country. The Central Bank of Nigeria Act provides for this arrangement, which is not common in other countries. For the 6 benchmark CBs, most of the governors are also appointed by the Heads of State. In New Zealand, however, the CB formally proposes the governor, who is then appointed by the Minister of Finance.

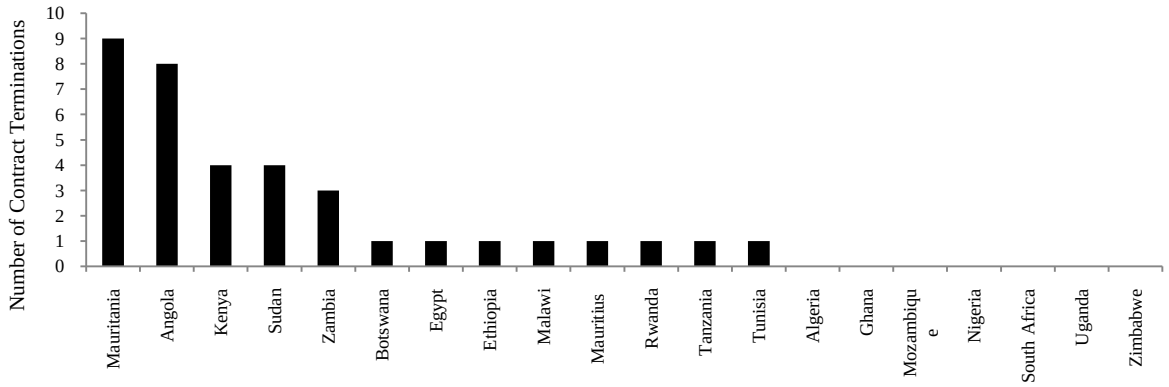
The sample governors are only dismissed by the State Presidents. Generally, the legal dismissal conditions include general and specific policy-related factors. For this sample, the common legal dismissal conditions include personal insolvency, bankruptcy, suspension of payment of debt, compounding with creditors, gross personal misconduct, body infirmity, unsound mind felony, offences involving dishonesty, moral turpitude, imprisonment, conviction to an offence, serious dereliction of duties and gross incompetence. Out of the 20 CBs, only the Central Bank of Egypt Act does not legally provide for dismissal. This implies complete independence and immunity for the governor. In practice, however, governors have been dismissed in Central Bank of Egypt, even for policy reasons (See Appendix 2.5), implying divergence between the law and practice.

Some CBs state dismissal conditions in rather unclear or vague terms. For example, the Bank of Mozambique and the National Bank of Angola Acts state that the governor can only be dismissed if he "does something serious". The Central Bank of Tunisia Act only "partially" states the dismissal conditions. The Bank of Algeria Act states that the governor cannot be dismissed except for medical reasons or "major errors". The Act is silent on what the major errors are. The South African Reserve Bank Act does not state the conditions explicitly although dismissal is mentioned in the Act. The Reserve Bank of Malawi Act is silent on dismissal but does not provide legal immunity against unfair dismissal. The Act therefore potentially leaves some room for unfair dismissals through undue political influence. Unclear statutes potentially compromise CBI practices in African countries, where there are weak legal institutions.

The CB Acts suggest that most African governments have eschewed the dismissal of governors for policy related reasons. This is because the legal dismissal conditions broadly do not relate to policy. Possible reasons could be that room for dismissal for policy failure could induce undue political pressure from government. In practice, most of the CBs have no potential or history of meeting set policy targets. In practice, however, some governors have been dismissed for policy failure in some of the CBs (See Appendix 2.5). For some of the 6 benchmark CBs on the other hand, the Reserve Bank of New Zealand Act permits dismissal for policy failure, which is defined as missing the set inflation target. For the Bank of England, if the inflation target is not met, the governor has to write a public statement, explaining the reasons for failure to meet the target and the proposed corrective measures. In practice, however, the Bank of England (BOE) target has always been met.

Actual practices in the CBs suggest that termination of CB governors' contracts result from several factors (See Appendix 2.5). These include undisclosed or unknown reasons, arguably associated with political motives, reassignments to alternative government jobs, resignations, bank failures (mainly state banks) and failure to rescue them, policy failure, corruption, personal insecurity associated with political threats, pursuit of the previous State Presidents' economic policies and failure to take Ministers' directives, among other reasons. Undisclosed reasons, associated with political motives are more common in practice. Unserved CB governor terms range from less than 12 months to 4 years. Figure 2.3 shows the cross-country distribution of premature terminations of CB governor contracts across the 20 countries over 1990-2008.

Figure 2.3: Distribution of Premature Terminations of Governors' Contracts (1990-2008)




Source: Derived from the respective central bank databases.

Note: Countries without bars had no terminations of CB governors over the entire study period, 1990-2008.

Out of the 20 countries, premature terminations were reported in 13 countries. These include the Mauritania, Botswana, Mauritius, Sudan, Tanzania, Zambia, Tunisia, Egypt, Kenya, National Angola, Ethiopia, Rwanda and Malawi. This represents 65% of the sample. 7 countries had no premature terminations. These include Algeria, Ghana, Mozambique, Uganda, Nigeria, South Africa and Zimbabwe. This represents 35% of the sample. As figure 2.3 shows, Mauritania had the highest number of premature terminations of 9, followed by Angola with 8. Out of the 85 governors in the sample, 36 had their contracts prematurely terminated (See Appendix 2.5). This represents a 42% termination rate. The terminations in Mauritania and Angola were generally politically-motivated. The terminations in Kenya resulted from policy failure, financial mismanagement and alleged corruption or abuse of public office by some of the governors. In Tanzania, the premature termination was associated with alleged gross financial mismanagement through irregular international money transfers. The terminations in Zambia resulted from macroeconomic instability in the late 1980s to the early 1990s and political regime change.

Out of the 36 CB governors whose contracts were terminated, 32 were terminated by the State Presidents who appointed them and only 4 were terminated by different State Presidents. This analysis is, however, affected by several other reasons. Over the study period, Angola and Tunisia had one State President. Mauritania also had a high turnover of State Presidents with 7 State Presidents over the study period. The turnovers in Mauritania almost amount to each State President recruiting his or her own CB governor. Kenya had only 2 State Presidents but Central Bank of Kenya's terminations are associated with both political and economic factors.

Most CB Acts suggest that incumbent governors are not allowed to concurrently hold any other office in government, regardless of remuneration. Most CB Acts state that the governor can only hold another office in government, only with the permission of the country legislature. Governors therefore have full time jobs. This condition seeks to rid the governors of conflict of interest in discharging CB business. The average CBI rating is 0.50 in this aspect. In practice, however, there are some few deviations. In Angola for instance, there are times when the governor operates as both the BNA governor and as Minister of Economy, as instructed by the State President. This practice diminishes the difference between monetary policy (authority) and fiscal policy (authority), a practice which erodes CBI, and is against the principles of CBI.

Most of the CBs now stipulate price stability as one of the major policy objectives, among other either consistent or conflicting objectives. Only the Bank of Sudan Act does not state the price stability objective in its mandate. The Reserve Bank of Malawi specifies too many objectives, most of which conflict with the price stability objective. A few CBs now state the price stability mandate as the primary or the only objective of the CB. For example, the Bank of Mozambique, Bank of Tanzania, Bank of Zambia, Central Bank of Kenya and the South African Reserve Bank now state the price stability objective as the primary CB objective. In 1996, the BOT Act was changed to move away from multiple to a single price stability objective. The sample CBI ratings range 0.40-0.80. Notably, the South African Reserve Bank and the Bank of Ghana are already on inflation targeting (IT) since 2000 and 2007, respectively. These moves support CBI efforts.

Most of the CBs formulate monetary policy in consultation with government through the Ministry of Finance. The CBI ratings range 0.33-1.00. Some CBs require government approval of monetary policy but others do not. For the Bank of Botswana, government approval is not required. The South African Reserve Bank has the governor's committee, which has the final authority in the monetary policy formulation process, after consultations have been made with key stakeholders. The committee comprises the South African Reserve Bank governor and the 3 deputy governors. For the Bank of Algeria, the Council of Money and Credit (COMC), composed of 3 external members who hold positions in the Bank of Algeria, the governor and the 3 deputy governors, have final authority on monetary policy formulation. Most CBs now have monetary policy committees (MPCs), which are in charge of formulating monetary policy

and setting interest rates on CB credit. The only exception is the Reserve Bank of Zimbabwe, which has no MPC over the study period.

A number of the CBs now have policy conflict resolution mechanisms but others still do not have. The sample average CBI rating is 0.20. Countries whose CBs now have policy conflict resolution mechanisms include Botswana, Ghana, Mauritius, Uganda, Kenya, Nigeria and South Africa. In South Africa, the Minister of Finance is legally entitled to implement corrective measures on the South African Reserve Bank, should the South African Reserve Bank violate any rules spelt out in the South African Reserve Bank Act 90. In Kenya, if after consultation with the Central Bank of Kenya, the Minister of Finance is of the opinion that the monetary policy adopted by the Central Bank of Kenya is inconsistent with the principal objective of the Central Bank of Kenya, the Minister of Finance may, upon resolution by the Cabinet, direct the Central Bank of Kenya in writing, to adopt such monetary policy as the Minister of Finance may specify for a period of 6 months or less as the Minister may specify. Upon receipt of a directive under this section, and the Central Bank of Kenya shall, adopt and implement the monetary policy so directed notwithstanding any other provision of the Central Bank of Kenya Act (CBK (2008)). However, despite the existence of these conflict resolution mechanisms in a number of CBs, the reading of the mechanisms seems to be in favour of governments and not the CBs. The mechanisms do not seem to strengthen the position of the CB in case of policy conflict. For example, the Bank of Botswana has a standing government overriding mechanism, which effectively reduces the independence of the Bank of Botswana. The mechanisms are rather still insufficient to protect CB policy positions in face of conflict.

On a comparative basis, some benchmark CBs have explicit policy conflict resolution mechanisms. These include the Reserve Bank of Australia, Bank of Canada and the Reserve Bank of New Zealand. In Australia, legislation provides that the Reserve Bank of Australia may disclose differences in opinion between the Reserve Bank of Australia and government on policy matters by tabling a statement in Parliament. This legal provision has been in place for several decades but has never been invoked because such a situation has not yet arisen in practice. There are also political costs in invoking the prohibition. In the event of a dispute over monetary policy, the government can override the Reserve Bank of Australia by tabling its objections before both Houses of Parliament. In Canada, the Minister of Finance may issue a directive to

the governor in the event of a difference of opinion over monetary policy to be followed. This is done only after consulting the governor and obtaining the approval of the State President. Any such directive must be made public, forthwith. In Canada, in the event of disagreement between the governor and the Minister of Finance, the Minister of Finance need only give the governor a 30-day notice in writing of the course of action to be followed. If the governor does not comply, he has his walking papers. In England, in face of policy conflict, the direction to be followed is given by the King in Council. In this case, the Bank of England is given the opportunity to give its opinion before the directing resolution is voted on. In New Zealand, if there is conflict between monetary policy targets and other government objectives, the governor may force a negotiation of a new agreement. The policy conflict is then made public. If the government directive is inconsistent with price stability, the governor may force the Minister of Finance to formally override the price stability objective. This is also publicized. For the Bank of England where there is close cooperation between the CB and the Treasury, policy conflict is supposed to be publicized. In the case of the Bank of England, however, policy conflict is very unlikely.

Across the sample, the role of the CB in government is generally advisory. The CBs act as bankers, fiscal agents and financial advisors for the governments. The CB governors are regularly called upon to advise government on monetary policy issues. The respective CBs do not have strong influence on the government budget formulation process. The sample CBI ratings average 0. In practice, however, some countries do not follow their Act provisions. For example, for Angola, there is in practice, no clear separation between the National Bank of Angola and the Ministry of Economy in terms of operations and monetary policy conduct. This is because the governor sometimes concurrently works as Minister of Economy. There is no separation between monetary policy and fiscal policy, a practice which violates CBI principles.

The CB Acts suggest that CB credit to government is no longer automatic. The sample average CBI ratings range 0.33-1.00. The conditions under which CB credit can be granted cover temporary accommodation of government to off-set fluctuations between government receipts and payments in case of emergencies, unusual and unforeseen circumstances, contingent commitments, exceptional and seasonal demands for credit. The advances are normally granted for a temporary period. Notably, the Bank of Botswana does not give loans to government but states the conditions that would apply if such credit was granted. On the other hand, lending by

the Bank of Algeria is heavily influenced by political motives and the historical socialist orientation in that economy, which loosen credit conditions. The National Bank of Rwanda also mandatorily has to advance credit to government.

Most CBs place limits on the amount of credit granted to government. For most CBs, the reference variable is a fixed percentage of recurrent government revenue. The actual shares range 5-25%. The limits are thus, only moderately binding. Only a few CBs have low percentages, reflecting high stringency. Notably and favourably, the Central Bank of Kenya has a stringent limit of not more than 5% of recurrent government revenue. There is another difference across countries in terms of the definition of government revenue. Some CBs like the Bank of Botswana use ordinary revenues while others like the Central Bank of Kenya use recurrent revenues. Only the South African Reserve Bank uses its own liabilities as the reference variable. This is a more binding limit variable. None of the CBs in this sample uses absolute quantity limits, which are more binding. The sample CBI ratings range 0.33-1.00. On a comparative basis with the benchmark CBs, the Bank of Canada uses government expenditure as the reference variable. This is considered to be relatively more accommodative to government credit requirements.

The authority that determines credit terms varies across CBs. For some CBs, the CBs or their boards determine the credit terms. In others, the CB and the government agree on the terms. This second negotiated arrangement is more common, but it implies low CBI as the negotiated interest rates are usually below market interest rates. The CBI ratings range 0.33-1.00. The main beneficiaries of CB credit commonly include the government, banks and other financial institutions. CBI ratings range 0-0.67. In practice, however, in most CBs that lack actual independence, government takes a larger share of CB credit, at the expense of the private sector. Credit to banks is usually in the form of temporary liquidity support and it is granted to illiquid, but solvent banks. The CB loan duration ranges from 3 months to more than 12 months. The CBI ratings range 0.33-1.00. Some CB Acts explicitly state what should happen if there is default on repayment, but others do not. The Central Bank of Mauritania Act states that outstanding amounts are automatically converted into government securities at market interest rates. For the Bank of Mauritius, outstanding amounts are charged interest at the Bank of Mauritius discount rate. The restrictions on interest rates on CB credit vary across the CBs. The CBI ratings range 0.25-0.75. There are CBs that now quote market interest rates. These include the Bank of

Mozambique, Bank of Mauritius, Bank of Sudan, Bank of Tanzania, Bank of Uganda, Central Bank of Egypt, Central Bank of Kenya and the National Bank of Rwanda. For other CBs, the interest rate is agreed on between the CB and government. The Bank of Botswana is a typical example of this common scenario. For the South African Reserve Bank, the interest rate is determined by the South African Reserve Bank board of directors. On a comparative basis with the 6 benchmark CBs, for the Bank of England, the interest rate charged on the government overdraft is the Bank of England's bank rate plus a premium, which is negotiated between the Debt Management Office and the Bank of England (Anorne et al. (2008)).

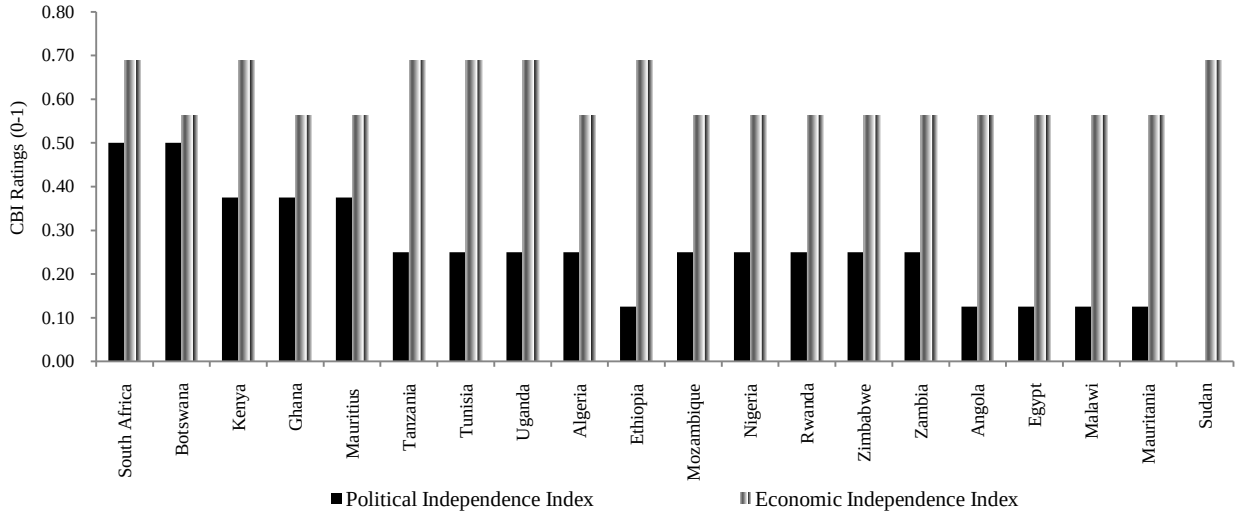
Most CB Acts have no outright ban on the CB primary market participation in government securities.BA notable exception is the Bank of Mauritius, which does not participate in the primary market for government securities (BOM (2008)). The sample average CBI rating is 0. The typical practice of CB participation is partly explained by shallow domestic capital markets. This practice, however, poses inflationary risks. Among the SSA countries and the countries in this sample, only South Africa has a well developed capital market. The capital market is almost non-existent in Angola. It is poorly developed in most other African countries.

### 2.4.2 Political and Economic Central Bank Independence Outcomes (1990-2008)

As shown in tables 2.6 and 2.7, the sample average aggregate legal CBI, as measured by the overall GMT index is 0.43. This outcome suggests low legal CBI. The sample range is 0.31-0.59. The outcomes compare with a sample average of 0.47 and a range of 0.31-0.59 in our CWN index. These outcomes compare with an average overall GMT figure of 0.47 and a range of 0.32-0.82 in Arnone et al. (2008) results for the African region. The sample average economic CBI is high, with an average of 0.61 and a range of 0.56-0.69. These outcomes compare with an average economic CBI figure of 0.60 and a range of 0.38-0.75 in Arnone et al. (2008) results for the African region. The sample average political CBI is low, with an average of 0.25 and a range of 0.00-0.50. These outcomes compare with an average political CBI figure of 0.34 and a range of 0.00-1.00 in Arnone et al. (2008) results for the African region. The Arnone et al. (2008) study covers end-2003 for the African region. However, the Arnone et al. (2008) analysis excludes Mauritania, which is in our sample. Arnone et al. (2008) have very high ratings for Algeria. We do not find the source of this difference because their results only show final ratings without individual CBI variable scores.

Figure 2.4 shows that political CBI is low but economic CBI is high. It also shows the low cross-country variations in the GMT sub-indices, political CBI and economic CBI. Table 2.6 shows the GMT index country ratings and cross-country rankings for the overall index and its sub-indices. The original or unconverted GMT indices are shown in appendix 2.4.

Figure 2.4: Political and Economic Independence Cross-Country Variations (1990-2008)




Source: Calculated from the respective central bank Acts.

Table 2.6: Political and Economic Independence Ratings and Rankings (1990-2008)

| Country | GMT Overall Index | Country CBI Rank | Political Independence Index | Country CBI Rank | Economic Independence Index | Country CBI Rank |
|---|---|---|---|---|---|---|
| South Africa | 0.59 | 1 | 0.50 | 1 | 0.69 | 1 |
| Botswana | 0.53 | 2 | 0.50 | 1 | 0.56 | 2 |
| Kenya | 0.53 | 2 | 0.38 | 2 | 0.69 | 1 |
| Ghana | 0.47 | 3 | 0.38 | 2 | 0.56 | 2 |
| Mauritius | 0.47 | 3 | 0.38 | 2 | 0.56 | 2 |
| Tanzania | 0.47 | 3 | 0.25 | 3 | 0.69 | 1 |
| Tunisia | 0.47 | 3 | 0.25 | 3 | 0.69 | 1 |
| Uganda | 0.47 | 3 | 0.25 | 3 | 0.69 | 1 |
| Algeria | 0.41 | 4 | 0.25 | 3 | 0.56 | 2 |
| Ethiopia | 0.41 | 4 | 0.13 | 4 | 0.69 | 1 |
| Mozambique | 0.41 | 4 | 0.25 | 3 | 0.56 | 2 |
| Nigeria | 0.41 | 4 | 0.25 | 3 | 0.56 | 2 |
| Rwanda | 0.41 | 4 | 0.25 | 3 | 0.56 | 2 |
| Zimbabwe | 0.41 | 4 | 0.25 | 3 | 0.56 | 2 |
| Zambia | 0.41 | 4 | 0.25 | 3 | 0.56 | 2 |
| Angola | 0.34 | 5 | 0.13 | 4 | 0.56 | 2 |
| Egypt | 0.34 | 5 | 0.13 | 4 | 0.56 | 2 |
| Malawi | 0.34 | 5 | 0.13 | 4 | 0.56 | 2 |
| Mauritania | 0.34 | 5 | 0.13 | 4 | 0.56 | 2 |
| Sudan | 0.34 | 5 | 0.00 | 5 | 0.69 | 1 |
| Sample Average | 0.43 | | 0.25 | | 0.61 | |

Source: Calculated from respective central bank Acts.

Table 2.6 suggests that the GMT index ratings and rankings imply that legal CBI frameworks across CBs, share several common principles. Several CBs have equal ratings on specific CBI aspects. Most countries have the same rating on economic CBI, which has the least variation across countries. Because of the original binary nature of the GMT indices, the scores are concentrated, with very limited variation across the countries. Although not shown in these results, which are cross-sectional over 1990-2008, the GMT indices also have little variation within individual countries, over time. This is shown by our annualized indices in chapter 4.

Tables 2.2 and 2.7 suggest that the outcomes of the GMT and the CWN legal indices are similar for most CBI aspects that are shared between the 2 indices. The additional CBI variables in the GMT indices, which are not covered in the CWN legal index include the (i) difference in the legal term of office of the governor rating criteria, (ii) legal term of office and the authority that appoints the other CB board members, (iii) government participation in CB meetings, (iv) authority that sets the CB discount rate, and the (v) role of the CB in bank supervision. Our analysis of the GMT indices only covers the CBI aspects that are not covered in the CWN index.

With respect to the legal term of office of the governor, only 3 CBs have high CBI with a rating of 1. These include the Bank of Algeria, Central Bank of Tunisia and National Bank of Rwanda, which have legal terms of 6 years. In most CBs, the government appoints the majority of the members of the CB board of directors. This outcome suggests low CBI with a sample average rating of 0. Under CWN, this rating would be 0.75. The fact that CB board members are appointed by government creates personal dependence of the CB governor and other board of directors on political authorities. Politicians may tend to use this to their own advantage.

For most CBs, the board of directors is only in office for less than 5 years. The cross-country board terms of office range 3-5 years. This implies low CBI, with a sample average rating of 0. For some CBs, the terms are staggered but in most others, they are not. Only the Central Bank of Kenya, Bank of Tanzania and the Bank of Uganda have staggered board of directors' terms of office. In practice, board term staggering fosters continuity and renewal. It can be used to reduce short-term political influence on the CB while permitting change if there are prolonged and fundamental differences in policy views between the CB and government. For the 6 benchmarks on the other hand, the Bank of England and the Federal Reserve Bank have staggered board of directors' terms of office.

Table 2.7: Political and Economic Independence Ratings (1990-2008)

| Country | CBI Variable Acronym | South Africa | Botswana | Kenya | Ghana | Mauritius | Tanzania | Tunisia | Uganda | Algeria | Ethiopia | Mozambique | Nigeria | Rwanda | Zambia | Zimbabwe | Angola | Egypt | Malawi | Mauritania | Sudan | **Average** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Index of Political Independence** | **POLCBI** | **0.50** | **0.50** | **0.38** | **0.38** | **0.38** | **0.25** | **0.25** | **0.25** | **0.25** | **0.13** | **0.25** | **0.25** | **0.25** | **0.25** | **0.25** | **0.13** | **0.13** | **0.13** | **0.13** | **0.00** | **0.25** |
| Government does not appoint the CB governor | CBGA | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| CB governor is in office for more than 5 years | CBGT | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15 |
| Government does not appoint CB board members | CBBA | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| CB board is in office for more than 5 years | CBBT | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Government participation in CB board meetings | CBBG | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.45 |
| Government does not approve monetary policy | MPFA | 1.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 |
| Legal mandate of price stability primary | PSSO | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.95 |
| Conflict resolution mechanism exists | LDCR | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.35 |
| **Index of Economic Independence** | **ECOCBI** | **0.69** | **0.56** | **0.69** | **0.56** | **0.56** | **0.69** | **0.69** | **0.69** | **0.56** | **0.69** | **0.56** | **0.56** | **0.56** | **0.56** | **0.56** | **0.56** | **0.56** | **0.56** | **0.56** | **0.69** | **0.61** |
| Direct CB credit not automatic | CLGA | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.95 |
| Market interest rates are charged | CLGI | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.35 |
| Temporary limited amount on CB credit | CLGL | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Maturity of loans restricted | CLGM | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Primary market participation by the CB | OGDP | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.05 |
| Discount rate set by the central bank alone | DRSA | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Banking supervision responsibility of the CB | CBSR | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| **Aggregate GMT Legal Index** | **GMT** | **0.59** | **0.53** | **0.53** | **0.47** | **0.47** | **0.47** | **0.47** | **0.47** | **0.41** | **0.41** | **0.41** | **0.41** | **0.41** | **0.41** | **0.41** | **0.34** | **0.34** | **0.34** | **0.34** | **0.34** | **0.43** |
| Country CBI Rank | | (1) | (2) | (2) | (3) | (3) | (3) | (3) | (3) | (4) | (4) | (4) | (4) | (4) | (4) | (4) | (5) | (5) | (5) | (5) | (5) | |

Source: Calculated from the respective central bank Acts.

Notes

The GMT index scores were converted by dividing each CBI score by the maximum possible score per CBI aspect.

This conversion was done for ease of comparability among the indices. These include the CWN, the GMT and the TOR indices. The overall GMT index is further split into its POLCBI and ECOCBI sub- indices.

After conversion, the aggregate GMT index becomes a simple average of the Political Independence Sub-Index and the Economic Independence Sub-Index.

The countries are arranged according to the overall GMT scores, with the most independent country as the first and the least independent as the last.

The figures in parentheses are the cross-country CBI rankings according to the aggregate GMT index scores.

The sample average legal CBI according to the overall GMT index is 0.43. This figure compares with 0.47 using the CWN index. The difference is attributed to the different weights attached to the indices.

For most CBs, there is a mandatory government representative on the CB board. For most CBs, the Treasury Secretary is an ex-officio member. The Treasury Secretary attends and participates in CB policy board meetings but does not count in constituting the quorum and has no voting powers. In most cases, in his or her absence, the Treasury Secretary, in writing, nominates another government representative to attend meetings on his behalf. However, for a few CBs like the National Bank of Angola, the Treasury Secretary has voting powers. In Ethiopia, 3 Ministers are part of the National Bank of Ethiopia Bank although they do not have voting powers. In our view, this still likely has potential political influence because the Ministers are not technocrates, but politicians. Some CBs do not have the Treasury Secretary as a board member. These include the Bank of Algeria, Bank of Mozambique, South African Reserve Bank and the Reserve Bank of Zimbabwe. Other government representatives on the CB board commonly include representatives from the Ministries of Finance, Finance and Development Planning, and Industry and Trade. Other outside board members appointed by government constitute high ranking officials representing key economic sectors. These commonly include Agriculture, Commerce, Finance, Banking and Industry, among others. Interestingly, for Nigeria, board representation at Central Bank of Nigeria has to reflect Federal Character, which the CBN Act legally provides for. Actual practices, however, suggest that the mere presence of a government representative in CB policy meetings does not necessarily reduce CBI. In our view, the representation is still, however, important in keeping government updated on monetary policy developments and to avoid public disagreements between the CB and the Treasury on monetary policy stance.

All the sampled CBs have full independence in setting the key CB policy rate. This refers to the CB discount rate or bank rate. The sample average CBI rating is 1. This outcome allows CBs to influence money market interest rates. In terms of bank supervision, all the CBs are still key bank supervisors. However, the Bank of Algeria and the Central Bank of Tunisia share bank supervision with other institutions. For the Bank of Algeria, bank supervision is shared among 3 institutions. In most other countries, the CB is the sole bank supervisor. Bank supervision is still regarded as a core function of the CB in most African countries. The results suggest that most African countries are still lagging behind most DCs that have now transferred bank supervision to other independent institutions. For the benchmark CBs on the other hand, the Bank of England transferred the bank supervision role to a new regulator for financial services.

### 2.4.3 Factual Central Bank Independence Outcomes (1990-2008)

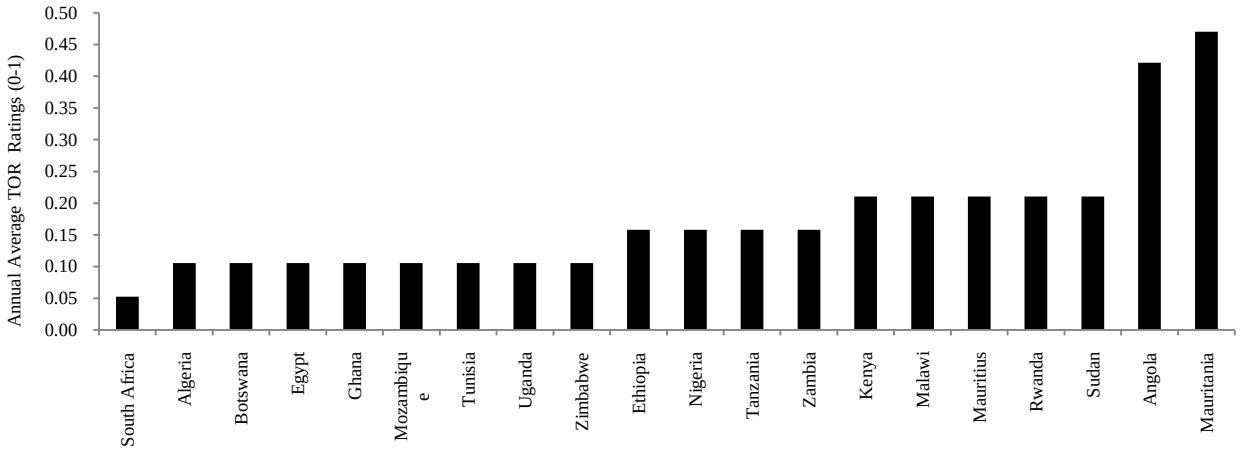
Table 2.8 shows the factual CBI country ratings, cross-country rankings and the changes in factual CBI from 1980-1989 to 1990-2008. Figure 2.5 shows the cross-country variations in factual CBI over 1990-2008. Table 2.9 shows the benchmarking against the developed countries.

Table 2.8: Factual Independence Ratings and Rankings (1980-2008)

| Country | Actual TOR (1980-1989) | Country Rank (1980-1989) | Actual TOR (1990-2008) | Threshold TOR (1990-2008) | Country Rank (1990-2008) | Actual TOR Change |
|---|---|---|---|---|---|---|
| South Africa | 0.20 | 2 | 0.05 | 0.20 | 1 | -0.15 |
| Algeria | 0.40 | 4 | 0.11 | 0.17 | 2 | -0.29 |
| Botswana | 0.40 | 4 | 0.11 | 0.20 | 2 | -0.29 |
| Egypt | 0.30 | 3 | 0.11 | 0.25 | 2 | -0.19 |
| Ghana | 0.20 | 2 | 0.11 | 0.25 | 2 | -0.09 |
| Mozambique | 0.20 | 2 | 0.11 | 0.20 | 2 | -0.09 |
| Tunisia | 0.40 | 4 | 0.11 | 0.17 | 2 | -0.29 |
| Uganda | 0.20 | 2 | 0.11 | 0.20 | 2 | -0.09 |
| Zimbabwe | 0.10 | 1 | 0.11 | 0.20 | 2 | 0.01 |
| Ethiopia | 0.10 | 1 | 0.16 | 0.20 | 3 | 0.06 |
| Nigeria | 0.10 | 1 | 0.16 | 0.20 | 3 | 0.06 |
| Tanzania | 0.10 | 1 | 0.16 | 0.20 | 3 | 0.06 |
| Zambia | 0.50 | 5 | 0.16 | 0.20 | 3 | -0.34 |
| Kenya | 0.20 | 2 | 0.21 | 0.25 | 4 | 0.01 |
| Malawi | 0.30 | 3 | 0.21 | 0.20 | 4 | -0.09 |
| Mauritius | 0.40 | 4 | 0.21 | 0.20 | 4 | -0.19 |
| Rwanda | 0.20 | 2 | 0.21 | 0.17 | 4 | 0.01 |
| Sudan | 0.30 | 3 | 0.21 | 0.20 | 4 | -0.09 |
| Angola | 0.30 | 3 | 0.42 | 0.20 | 5 | 0.12 |
| Mauritania | 0.40 | 4 | 0.47 | 0.20 | 6 | 0.07 |
| Average | 0.27 | | 0.18 | 0.20 | | -0.09 |

Sources: Cukierman et al. (1992) and our calculations for 1980-1989 figures. Our calculations for the 1990-2008 figures.

Figure 2.5: Factual Independence Cross-Country Variations (1990-2008)




Source: Calculated from central bank databases.

Table 2.9: Factual Independence Ratings for Benchmark Central Banks (1980-2008)

| Country | Name of Central Bank | Actual TOR (1980-1989) | Actual TOR (1990-2008) | Change in Actual TOR |
|---|---|---|---|---|
| Australia | Reserve Bank of Australia | 0.10 | 0.16 | 0.06 |
| Canada | Bank of Canada | 0.10 | 0.16 | 0.06 |
| Germany | Bundesbank | 0.10 | 0.26 | 0.16 |
| New Zealand | Reserve Bank of New Zealand | 0.30 | 0.11 | -0.19 |
| United Kingdom | Bank of England | 0.10 | 0.16 | 0.06 |
| United States of America | Federal Reserve Bank | 0.10 | 0.11 | 0.01 |
| Sample Average | | 0.13 | 0.16 | 0.03 |

Sources: Cukierman et al. (1992) for 1980-1989 figures and own calculations for the 1990-2008 figures.

Table 2.8 suggests that average factual CBI is high over 1990-2008. The sample annual average actual TOR of 0.18, against the average threshold TOR of 0.20 suggests high factual CBI. Over 1980-1989, actual TOR is greater than the threshold TOR, implying low factual CBI. Over 1990-2008, actual TOR is less than the threshold TOR, implying high CBI. Factual CBI improved from 1980-1989 to 1990-2008. The decline in TOR by 0.09 points or 33.33%, from 0.27 over 1980-1989 to 0.18 over 1990-2008 suggests improvement in factual CBI. Out of the 20 CBs, 12 improved. This represents 60% improvement in factual CBI. The annual average TOR declined for most African countries, except for the National Bank of Angola and the Central Bank of Mauritania. The decline in TOR is consistent with findings in Dreher et al. (2007), which suggest that actual TOR declined in the last years of the study period, 1970-2005, for the group of SSA countries. DeHaan and Klomp (2010) show that for the African region in their sample (1980s-2000s), the average TOR was 0.22 in the 1980s, 0.16 in the 1990s and 0.13 in the 2000s. This further suggests a general decline in TOR or improvement in factual CBI over the years. The general improvement in factual CBI is attributed to significant declines in TOR in specific CBs.

For example, Zambia had the largest decline in TOR of 0.34 points or 68%. The TOR at the Bank of Zambia declined from 0.50 over 1980-1989, to 0.16 over 1990-2008. The Bank of Zambia country rank moved from 5 out of 5 cross-country ranks over 1980-1989, to 3 out of 6 ranks over 1990-2008. Poor macroeconomic conditions in Zambia in the late 1980s were associated with high turnovers of the Bank of Zambia governors, who were dismissed for various political and economic reasons. These included unfavourable economic policy outcomes, failure of some domestic banks (public and private) and inability of the CB governors to rescue them, high inflation outcomes, poor monetary policy strategies, political regime change and alleged political influence on the Bank of Zambia (See Appendix 2.5). The high TOR in Zambia in the

1980s, which was associated with adverse economic conditions over 1980-1989, declined with improvements in macroeconomic conditions since the late 1990s. Other countries with significant declines in TOR include Algeria, Botswana, Egypt and Mauritius.

The low sample average TOR is explained by several factors. These include low terminations and renewability of legal terms of office of the CB governors. Renewability is legally provided for in most CB Acts. As a result, most governors have effectively served 2 full consecutive terms. This implies a governor being in office for 8-10 years for most CBs and 12 years for the Bank of Algeria, Central Bank of Tunisia and the National Bank of Rwanda. Few governors voluntarily resign before the end of their legal term. The sample effective term ranges from less than one year to 15 years. The 15-year actual term was served at the Bank of Mozambique over 1991-2006. The effective average term is 5.2 years and ranges 2-10 years. Over 1990-2008, the number of governors per CB ranges 2-11. The Central Bank of Mauritania had the highest number of governors of 11. The South African Reserve Bank only had 2. The South African Reserve Bank had no terminations and renewed terms. The low sample TOR could also imply subservience of some governors. Given that 36 governors had contracts terminated out of the 85 that served over 1990-2008, the turnover rate is 42%. This is high and differs from TOR results.

Figure 2.5 shows that the actual annual average TOR scores vary considerably across countries from 0.05 (highest factual CBI) in South Africa to 0.47 (lowest factual CBI) in Mauritania. The South African Reserve Bank has exceptionally low TOR of 0.05. Over 1980-1989, the sample average TOR ranged from 0.10 to 0.40. Over 1990-2008, TOR ranged from 0.05 to 0.47. The actual sample TOR range is 0.05-0.47, against the average TOR threshold of 0.17-0.25. The range is considerably wide. The range of 0.05-0.47 over 1990-2008 for this sample compares with 0.16-0.26 for the 6 benchmark CBs over 1990-2008. The wide range reflects considerable cross-country variations in political, economic and legal conditions. The wide cross-country variations in actual TOR is also echoed in Cukierman et al. (1992) for less developed countries. Only 6 CBs in the sample have low factual CBI, as reflected in the actual TOR that is higher than the threshold TOR. These include the Central Bank of Mauritania, Bank of Mauritius, Bank of Sudan, National Bank of Angola, National Bank of Rwanda and the Reserve bank of Malawi. In these CBs with high actual TOR, the results imply that the actual term served by the governor is less than the electoral cycle. This outcome makes governors susceptible to political influence. In

such cases, the governor may not be able to program long-term monetary policy strategies. In addition, a longer term enables governors to build their personal reputation in conducting monetary policy and CB credibility. The other 14 CBs have high factual CBI, with the actual TOR that is lower than the threshold TOR. The 6 CBs with low factual CBI over 1990-2008, compare with 10 CBs over 1980-1989. This outcome suggests significant improvements in factual CBI. The South African Reserve Bank has a low average TOR of 0.05. It is considered stable. The Central Bank of Mauritania and National Bank of Angola have extreme TOR values of 0.47 and 0.42, respectively. These suggest considerable lack of factual CBI.

Table 2.8 shows that the sample annual average TOR of 0.18 over 1990-2008 in this paper, compares with 0.13 for the 6 benchmark CBs over 1980-1989, and 0.16 over 1990-2008 for the 6 benchmark CBs. The comparative analysis with the 6 benchmark CBs suggests that factual CBI in Africa is still slightly lower than what attains in developed countries over both 1990-2008 and 1980-1989. This outcome confirms the findings in Cukierman et al. (1992). The actual TOR of 0.18 compares with 0.21 in CWN (1992) over 1980-1989, 0.21 in DeHaan (2001) over 1980-1989, 0.21 in DeHaan (2001) over 1990-1998, and 0.18 in Dreher et al. (2007) over 1970-2004 for the countries in our sample. However, the comparative analysis with these studies excludes Angola, Mauritania and Rwanda, which have high TOR in our sample. These 3 countries are not covered in previous studies. Comparatively, the Bundesbank, one of the most highly legally independent CBs with a legal term of office of the governor of 8 years, has the highest TOR over 1990-2008. This implies a wide gap between legal and factual CBI. Our sample annual average TOR of 0.18 implies that every 6.5 years, a governor is replaced. Given the average term of 4-6 years, this means most CB governors serve one actual term or do not complete the second term.

The high TOR at the National Bank of Angola is explained by a combination of political and economic factors. These include excessive State Presidential control of the National Bank of Angola, high turnover of Ministers of Economy, passive role and weakened powers of the Ministry of Economy, high government need for monetization of fiscal deficits, lack of a clear separation of the role of the National Bank of Angola governors, who sometimes concurrently work as governors and Ministers of Economy, political dictatorship, governors who are made to by-pass the Minister of Economy and take instructions directly from the State President and general lack of coherence in banking. Angola has no clear separation between monetary and

fiscal policies. Hiring and firing is one important way in which the State President interferes with monetary policy operations. For example, between 1992 and 2002, Angola had 8 governors and 8 Ministers of Economy. There is a high turnover of both governors and Ministers of Economy. Banking in Angola has been under too much government control. The capital markets are not developed. Consequently, there is high monetization of fiscal deficits. At the National Bank of Angola, actual terms of office are too short for effective implementation of monetary policy.

Analysis of background literature on the CBs suggests that some African political authorities do not exert political influence through dismissals of governors, except in countries like Mauritania and Angola. They tend to avoid dismissals and use other less obvious and indirect means of exerting political influence. Some political authorities are reluctant to dismiss governors. The low sample average TOR in this case may indicate subservient governors in most CBs in Africa. Angola and Mauritania have a history of excessive political influence on their CBs. Their cases do not allow for policy consistency and long-term stability in monetary policy programming.

Table 2.10: Legal and Factual Central Bank Independence Indices (1990-2008)

| Country | CWN Legal Index | Country CBI Rank | GMT Overall Index | Country CBI Rank | Political CBI Index | Country CBI Rank | Economic CBI Index | Country CBI Rank | Factual CBI Index (TOR) | Country CBI Rank |
|---|---|---|---|---|---|---|---|---|---|---|
| South Africa | 0.59 | 1 | 0.59 | 1 | 0.50 | 1 | 0.69 | 1 | 0.05 | 1 |
| Tanzania | 0.59 | 1 | 0.47 | 3 | 0.25 | 3 | 0.69 | 1 | 0.16 | 3 |
| Botswana | 0.57 | 2 | 0.53 | 2 | 0.50 | 1 | 0.56 | 2 | 0.11 | 2 |
| Algeria | 0.53 | 3 | 0.41 | 4 | 0.25 | 3 | 0.56 | 2 | 0.11 | 2 |
| Mozambique | 0.52 | 4 | 0.41 | 4 | 0.25 | 3 | 0.56 | 2 | 0.11 | 2 |
| Kenya | 0.51 | 5 | 0.53 | 2 | 0.38 | 2 | 0.69 | 1 | 0.21 | 4 |
| Nigeria | 0.49 | 6 | 0.41 | 4 | 0.25 | 3 | 0.56 | 2 | 0.16 | 3 |
| Rwanda | 0.49 | 6 | 0.41 | 4 | 0.25 | 3 | 0.56 | 2 | 0.21 | 4 |
| Tunisia | 0.49 | 6 | 0.47 | 3 | 0.25 | 3 | 0.69 | 1 | 0.11 | 3 |
| Mauritania | 0.48 | 7 | 0.34 | 5 | 0.13 | 4 | 0.56 | 2 | 0.47 | 6 |
| Angola | 0.47 | 8 | 0.34 | 5 | 0.13 | 4 | 0.56 | 2 | 0.42 | 5 |
| Zambia | 0.47 | 8 | 0.41 | 4 | 0.25 | 3 | 0.56 | 2 | 0.16 | 3 |
| Ghana | 0.46 | 9 | 0.47 | 3 | 0.38 | 2 | 0.56 | 2 | 0.11 | 2 |
| Uganda | 0.46 | 9 | 0.47 | 3 | 0.25 | 3 | 0.69 | 1 | 0.11 | 2 |
| Egypt | 0.44 | 10 | 0.34 | 5 | 0.13 | 4 | 0.56 | 2 | 0.11 | 2 |
| Ethiopia | 0.43 | 11 | 0.41 | 4 | 0.13 | 4 | 0.69 | 1 | 0.16 | 3 |
| Sudan | 0.41 | 12 | 0.34 | 5 | 0.00 | 5 | 0.69 | 1 | 0.21 | 4 |
| Mauritius | 0.37 | 13 | 0.47 | 3 | 0.38 | 2 | 0.56 | 2 | 0.21 | 4 |
| Zimbabwe | 0.36 | 14 | 0.41 | 4 | 0.25 | 3 | 0.56 | 2 | 0.11 | 2 |
| Malawi | 0.31 | 15 | 0.34 | 5 | 0.13 | 4 | 0.56 | 2 | 0.21 | 4 |
| Average | 0.47 | | 0.43 | | 0.25 | | 0.61 | | 0.18 | |

Source: Calculated from central bank Acts and other central bank databases.

Table 2.10 suggests that CBI ratings vary per index. There are also differences between legal and factual CBI. For example, the South African Reserve Bank has the highest levels of both legal

and factual CBI while the National Bank of Angola lacks both legal and factual CBI. Low factual CBI at the Central Bank of Mauritania is associated with high turnovers of State Presidents, who each somewhat hires his or her own CB governor. The National Bank of Angola has high turnovers despite that there is one State President over 1990-2008. The turnover of Ministers of Economy is high in Angola. The variations in CBI across countries reflects different political, economic and legal conditions. The difference between legal and actual terms of office for CB governors suggests a gap between the law and actual practices in the CBs. Political authorities seem to use CB Acts, CB terms of credit to government, hiring and firing of CB governors, to influence CBI. The TOR is affected by various factors, other than legal terms of office. Despite high legal and factual CBI, the South African Reserve Bank still needs to further improve legal CBI. The South African Reserve Bank Act needs to strengthen the conflict resolution mechanism between the South African Reserve Bank and government, further clarify restrictions on South African Reserve Bank credit terms to government in terms of the repayment schedule and maturity profile. Zimbabwe has high factual CBI as indicated by the TOR figures, which seems anomalous. It largely reflects potential subservience of the Reserve Bank of Zimbabwe governors and political dictatorship. Some of the political and economic problems that Zimbabwe has experienced should have led to some dismissals. These include absence of rule of law, change of political regime, poor economic policies, high inflation, foreign and domestic currency shortages and pressures from the IMF and other international organizations.

## 2.5 Conclusion

We measured the degree of CBI in 20 African countries over 1990-2008. The results suggest that legal CBI is low but factual CBI is high. Political CBI is low but economic CBI is high. Both legal and factual CBI have improved since the early 1990s. Legal CBI has improved to levels slightly above what attained in developed countries in late 1980s. Factual CBI has improved, but it varies considerably across countries. To some extent, factual CBI seems to reflect subservience of governors in some of the African countries. We find a need for African governments to grant their CBs, more CBI. There is still room for some improvements. Specifically, we find a need for African governments to consider constitutionalizing CBI so that it is not easily violated by some political authorities. However, the effectiveness of the proposed constitutionalization of CBI would partly depend on how much the political authorities respect their national constitutions.

## 2.6 Appendices

**Appendix 2.1: CWN Legal Index Code Table**

| Description of CBI Variable | **Weight** | Code |
|---|---|---|
| **1. Central Bank Governor (CBGC).** | **0.20** | |
| (a) Term of Office (GTOF). | | |
| Over 8 years. | | 1.00 |
| 6-8 years. | | 0.75 |
| 5 years. | | 0.50 |
| 4 years. | | 0.25 |
| <4 years. | | 0.00 |
| (b) Who appoints the central bank governor? (GAAT). | | |
| Governor appointed by the central bank board. | | 1.00 |
| Governor appointed by the council of the central bank, executive branch and legislative branch. | | 0.75 |
| Governor appointed by the Legislative body. | | 0.50 |
| Governor appointed by the Executive collectively (e.g. council of ministers). | | 0.25 |
| Governor appointed by 1 or 2 members of executive branch. | | 0.00 |
| (c) Dismissal of the central bank governor (GDAT). | | |
| No provision for dismissal. | | 1.00 |
| Only for reasons not related to policy or violation of law. | | 0.83 |
| At the discretion of the central bank board. | | 0.67 |
| At the discretion of the legislature. | | 0.50 |
| Unconditional dismissal possible by the legislature. | | 0.33 |
| Dismissal for policy reasons at executive branch's discretion. | | 0.17 |
| Unconditional dismissal possible at executive branch's discretion. | | 0.00 |
| (d) May central bank governor hold other positions in government (GOOF). | | |
| Governor prohibited by law from holding any other office in government. | | 1.00 |
| Governor can hold another office only with permission of executive branch. | | 0.50 |
| No rule against central bank governor holding another office. | | 0.00 |
| **2. Policy Formulation (PFAA).** | **0.15** | |
| (a) Who formulates monetary policy? (MPFA). | | |
| Central bank alone. | | 1.00 |
| Central bank participates but has little influence. | | 0.67 |
| Central bank only advises government. | | 0.33 |
| Central bank has no say. | | 0.00 |
| (b) Who has final word in the resolution of conflict? (CFRM). | | |
| The central bank has final authority in issues clearly defined in the law as its objectives. | | 1.00 |
| Government in issues not clearly defined in the law as the central bank's goals or in case of conflict within the central bank. | | 0.80 |
| A council of central bank, executive branch and legislative branch. | | 0.67 |
| The legislature, on policy issues. | | 0.40 |
| The executive branch on policy issues, subject to due process and possible protest by the central bank. | | 0.20 |
| The executive branch has unconditional priority. | | 0.00 |
| (c) Role in the government's budgetary process (CBBG). | | |
| Central bank active. | | 1.00 |
| Central bank has no influence. | | 0.00 |
| **3. Legal Objectives of the Central Bank (CBPO).** | **0.15** | |
| Price stability is the major or only objective in the Act and the CB has the final word in case of conflict with other government objectives. | | 1.00 |
| Price stability is the only objective. | | 0.80 |
| Price stability is one goal, with other compatible objectives such as a stable banking system. | | 0.60 |
| Price stability is one goal, with potentially conflicting objectives, such as full employment. | | 0.40 |
| No objectives stated in the banking charter. | | 0.20 |
| Stated objectives do not include price stability. | | 0.00 |

(Appendix 2.1 continues on the following page)

**Appendix 2.1 Continued: CWN Legal Index Code Table**

| Description of CBI Variable | **Weight** | Code |
|---|---|---|
| **4. Limitations on the Central Bank Lending to the Government (CBLC).** | | |
| (a) Advances -Limitations on securitized lending (CLGA). | **0.15** | |
| No advances permitted. | | 1.00 |
| Advances permitted but with strict limits (e.g. up to 15% of government revenue). | | 0.67 |
| Advances permitted but limitations are loose (e.g. more than 15% of government revenue). | | 0.33 |
| No legal limits on advances. Their quantity subject to periodic negotiations between government and central bank. | | 0.00 |
| (b) Securitized lending (CLGL). | **0.10** | |
| Not permitted. | | 1.00 |
| Permitted but with strict limits (e.g. up to 15% of government revenue). | | 0.67 |
| Permitted but with loose limitations (e.g. over 15% of government revenue). | | 0.33 |
| No legal limits on lending. | | 0.00 |
| (c) Terms of lending-maturity, interest and amount (CLGT). | **0.10** | |
| Controlled by the central bank. | | 1.00 |
| Specified by the central bank charter. | | 0.67 |
| Agreed between the central bank and the executive. | | 0.33 |
| Decided by the executive branch alone. | | 0.00 |
| (d )Potential borrowers from the central bank (COBF). | **0.05** | |
| Only the central government. | | 1.00 |
| All levels of government (state as well as central). | | 0.67 |
| Those mentioned above and the public enterprises. | | 0.33 |
| Public and private sector. | | 0.00 |
| (e) Limits on central bank lending defined in (CBTL). | **0.025** | |
| Currency amounts. | | 1.00 |
| Shares of central bank demand liabilities or capital. | | 0.67 |
| Shares of government revenue. | | 0.33 |
| Shares of government expenditures. | | 0.00 |
| (f) Maturity of loans (CLGM). | **0.025** | |
| Within 6 months. | | 1.00 |
| Within 1 year. | | 0.67 |
| More than a year. | | 0.33 |
| No mention of maturity in the law. | | 0.00 |
| (g) Level of interest on loans (CLRR). | **0.025** | |
| Above minimum lending rates. | | 1.00 |
| At market rates. | | 0.75 |
| Below maximum rates. | | 0.50 |
| Interest rate is not mentioned. | | 0.25 |
| No interest on government borrowing from the central bank. | | 0.00 |
| (h) CB prohibited from buying or selling government securities in the primary market (CBPM). | **0.025** | |
| Yes. | | 1.00 |
| No. | | 0.00 |

Source: Cukierman et al. (1992)[1]. (Appendix 2.1 continued from the previous page)

Notes

The code table was reproduced from the Cukierman et al. (1992) paper. We only added the 4-letter code acronyms for CBI variables.

We took the CBI variables, codes and weights as given by Cukierman et al. (1992), without modifications or extensions.

[1] Measuring the Independence of Central Banks and Its Effects on Policy Outcomes, *The World Bank Economic Review*, 6 (3): pp. 353-398.

**Appendix 2.2: GMT Index Code Table**

| Description of CBI Variable | CBI Variable Coding Criteria |
|---|---|
| **Political Independence Variables** | |
| CB governor appointment conditions. | 1 if not appointed by government, 0 otherwise. |
| CB governor term(s) of office. | 1 if explicitly appointed for more than 5 years, 0 otherwise. |
| CB board of directors appointment conditions. | 1 if majority of CB board members not appointed by govt, 0 otherwise. |
| CB board members term (s) of office. | 1 if all CB board members are appointed for more than 5 years, 0 otherwise. |
| CB government representative. | 1 if presence not compulsory, 0 otherwise. |
| Price stability as statutory objective of the CB. | 1 if at least among statutory objectives, 0 otherwise. |
| Monetary policy formulation authority. | 1 if no government approval required, 0 otherwise. |
| Legal directives for policy conflict resolution. | 1 if it strengthens the CB position, 0 otherwise. |
| **Economic Independence Variables** | |
| CB lending to government (availability). | 1 if not automatic, 0 otherwise. |
| CB lending to government (interest rate). | 1 if at market interest rate or if lending not available, 0 otherwise. |
| CB lending to government (limit amount). | 1 if the amount is explicitly limited or if lending not available, 0 otherwise. |
| CB lending to government (maturity profile). | 1 if explicitly limited to one year or less, 0 otherwise. |
| Purchase of government debt on the primary market. | 1 if the CB is not allowed to participate, 0 otherwise. |
| Discount rate setting authority. | 1 if only the CB can set discount rate, 0 otherwise. |
| CB bank supervisory role. | 2 if the CB not involved in bank supervision, 1 if responsibility is shared. |
| **Aggregate GMT Index** | **Simple Average of Political Independence and Economic Independence Sub-Indices.** |

Source: Derived from various studies on the Grilli et al. (1991) index and Grilli et al. (1991)[2].

**Appendix 2.3: Latest Central Bank Acts**

| Economy | CB Acronym | Latest Central Bank Act | Where is CBI Entrenched? |
|---|---|---|---|
| Algeria | BOA | Ordinance No. 03-11 of 26 August 2003. | CB Act only |
| Angola | BNA | National Assembly Law No. 6/97 of 11 July 1997. | CB Act only |
| Botswana | BOB | Bank of Botswana Act of 31 December 1996. | CB Act only |
| Egypt | CBE | Presidential Decree No. 64 of 2004. | CB Act only |
| Ethiopia | NBE | National Bank of Ethiopia Proclamation No. 591 of 2008. | CB Act only |
| Ghana | BOG | Bank of Ghana Act 612 of 2002. | CB Act only |
| Kenya | CBK | Central Bank of Kenya Act (491) of April 1997. | CB Act only |
| Malawi | BM | Reserve Bank of Malawi Act of 1989; Chapter 44:02 of 2002. | CB Act only |
| Mauritania | BCM | Law No.73-113. The Bank of Mauritania Act No. 34 of 2004. | CB Act only |
| Mauritius | BOM | Bank of Mauritius Act No. 34 of 2004. | CB Act only |
| Mozambique | BM | Bank of Mozambique Law No. 1/92 of January 3, 1992. | CB Act only |
| Nigeria | CBN | Central Bank of Nigeria Act No.7 of 25 May 1997. | CB Act only |
| Rwanda | NBR | Law No. 11/97 of 26 July 1997. | CB Act only |
| South Africa | SARB | South African Reserve Bank Act of 1996 and Amendment Act 57 of 2000. | National Constitution and CB Act |
| Sudan | BOS | New Bank of Sudan Act of 2002. | CB Act only |
| Tanzania | BOT | Bank of Tanzania Act No. 3 Vol. 87 of 8th June, 2006. | CB Act only |
| Tunisia | BCT | Central Bank of Tunisia Law No. 2006-26 of 15 May, 2006. | CB Act only |
| Uganda | BOU | Bank of Uganda Act of 14 May 1993 (Chapter 51). | National Constitution and CB Act |
| Zambia | BOZ | Bank of Zambia Act No. 43 of 1996. | CB Act only |
| Zimbabwe | RBZ | Reserve Bank of Zimbabwe Act [Chapter 22:15], Acts 5/1999, 22/2001. | CB Act only |

Sources: Central bank databases and Arnone et al. (2008) database on central bank laws, http://marco.arnone.googlepages.com/central bank laws.

Notes

The respective central bank Acts are as at the last day of 2008 or 31 December 2008.

[2] Grilli, V., Masciandaro, D., Tabellini, G., (1991), Political and Monetary Institutions and Public Financial Policies in the Industrial Countries, *Economic Policy*,13, pp. 341-392.

**Appendix 2.4: Original GMT Ratings (1990-2008)**

| Country | CBI Variable Acronym | South Africa | Botswana | Kenya | Ghana | Mauritius | Tanzania | Tunisia | Uganda | Zambia | Algeria | Ethiopia | Mozambique | Nigeria | Rwanda | Zimbabwe | Angola | Egypt | Malawi | Mauritania | Sudan | **Average** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Index of Political Independence** | **POLCBI** | **4** | **4** | **3** | **3** | **3** | **2** | **2** | **2** | **2** | **2** | **1** | **2** | **2** | **2** | **2** | **1** | **1** | **1** | **1** | **0** | **2** |
| Government does not appoint the CB governor | CBGA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CB governor in office is more than 5 years | CBGT | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Government does not appoint CB board members | CBBA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CB board members in office for more than 5 years | CBBT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Government participation in CB board meetings | CBBG | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Government does not approve monetary policy | MPFA | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Legal mandate of price stability primary | PSSO | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| Conflict resolution mechanism exists | LDCR | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Index of Economic Independence** | **ECOCBI** | **6** | **5** | **6** | **5** | **5** | **6** | **6** | **6** | **5** | **5** | **6** | **5** | **5** | **5** | **5** | **5** | **5** | **5** | **5** | **6** | **5** |
| Direct CB credit not automatic | CLGA | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Market interest rates are charged on CB credit | CLGI | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Temporary limited amount on CB credit | CLGL | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Maturity of loans restricted | CLGM | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Primary market participation by CB | OGDP | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Discount rate set by the central bank alone | DRSA | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Banking supervision responsibility of the CB | CBSR | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **GMT Aggregate Legal Index** | **GMT** | **10** | **9** | **9** | **8** | **8** | **8** | **8** | **8** | **7** | **7** | **7** | **7** | **7** | **7** | **7** | **6** | **6** | **6** | **6** | **6** | **7** |
| Country CBI Rank | | (1) | (2) | (2) | (3) | (3) | (3) | (3) | (3) | (4) | (4) | (4) | (4) | (4) | (4) | (4) | (5) | (5) | (5) | (5) | (5) | |

Source: Calculated from latest central bank Acts.

Notes

The figures in parentheses are the CBI cross-country rankings.

The cross-country rankings are done according to the aggregate GMT index scores.

The discount rate is the central bank's "Bank Rate" or the rate at which the central bank discounts first class bills.

We developed the 4-letter CBI variable acronyms in this study.

In this table, with original GMT scores, the aggregate GMT index is a simple summation of the Political Independence Sub-Index and the Economic Independence Sub-Index.

**Appendix 2.5: Reason (s) for Premature Termination of CB Governors' Contracts (1990-2008)**

| Name of CB Governor | Period | Name of Central Bank | CB Acronym | Termination Status | Reasons for Premature Termination of Contract |
|---|---|---|---|---|---|
| Pedro de Cunha Neto | 1990-1990 | National Bank of Angola | BNA | Dismissed | Undisclosed (unknown) reasons. |
| Fernando de Graca Teixeira | 1990-1990 | National Bank of Angola | BNA | Dismissed | Undisclosed (unknown) reasons. |
| Sebastiao Bastos Lavrador | 1992-1993 | National Bank of Angola | BNA | Reassigned | Reassigned to a government Ministerial post. |
| Generoso de Almeida | 1993-1995 | National Bank of Angola | BNA | Dismissed | Undisclosed (unknown) reasons. |
| Antonio Gomes Furtado | 1995-1996 | National Bank of Angola | BNA | Dismissed | Undisclosed (unknown) reasons. |
| Sebastiao B Lavrador | 1996-1999 | National Bank of Angola | BNA | Dismissed | Undisclosed (unknown) reasons. |
| Aguinaldo Jaime | 1999-2003 | National Bank of Angola | BNA | Reassigned | Reassigned to a government Ministerial post. |
| Amadeu de Jesus C Mauricio | 3003-2008 | National Bank of Angola | BNA | Dismissed | Dismissed. |
| Mr B Gaolathe | 1997-1998 | Bank of Botswana | BOB | Reassigned | Reassigned to a government Ministerial post. |
| Mahdi Elfaky Elshaikh | 1988-1990 | Bank of Sudan | BOS | Resigned | Undisclosed (unknown) reasons. |
| Sabir Mohammed Hassan | 1990-1993 | Bank of Sudan | BOS | Reassignment | Reassigned to a government Ministerial post. |
| Elshaik SidAhmed Elshaikh | 1993-1996 | Bank of Sudan | BOS | Dismissed | Undisclosed (unknown) reasons. |
| Abdalla Hassan Ahmed | 1996-1998 | Bank of Sudan | BOS | Reassignment | Reassigned to a government Ministerial post |
| Mahmoud Abul-Ayoun | 2001-2003 | Central Bank of Egypt | CBE | Dismissed | Failed to deliver on inflation targeting policy as stated in the CBE Act. |
| Mr Ato Sufian Ahmed | 1997-1997 | National Bank of Ethiopia | NBE | Reassigned | Reassigned to a government Ministerial post. |
| Mr Eric Kotut | 1989-1993 | Central Bank of Kenya | CBK | Resigned | Collapse of several commercial banks, high inflation and corruption scandal. |
| M Cheserem | 1993-2001 | Central Bank of Kenya | CBK | Dismissed | Undisclosed reasons and fell out favour with the State President. |
| N N Nyagah | 2001-2003 | Central Bank of Kenya | CBK | Resigned | Failed to rescue investments in pension funds deposited with a failing bank. |
| A K Mullei | 2003-2006 | Central Bank of Kenya | CBK | Dismissed | Corruption, improper tendering and abuse of office. |
| F Z Pelekamoyo | 1992-1995 | Reserve Bank of Malawi | RBM | Resigned | Failure to take a government Minister's directive, which was financially unsound. |
| Moustapha O Abeiderrahmane | 1992-1993 | Central Bank of Mauritania | BCM | Undisclosed reasons | Undisclosed (unknown) reasons. |
| Mohamedou Ould Michel | 1993-1997 | Central Bank of Mauritania | BCM | Undisclosed reasons | Undisclosed (unknown) reasons. |
| Mahfoudh Ould Mahamed Aly | 1997-2001 | Central Bank of Mauritania | BCM | Undisclosed reasons | Undisclosed (unknown) reasons. |
| Sid'E L Moctoar Ould Nagi | 2001-2002 | Central Bank of Mauritania | BCM | Undisclosed reasons | Undisclosed (unknown) reasons. |
| Yahya Ould Athighe | 2002-2003 | Central Bank of Mauritania | BCM | Undisclosed reasons | Undisclosed (unknown) reasons. |
| B A Seydou Moussa | 2003-2003 | Central Bank of Mauritania | BCM | Undisclosed reasons | Undisclosed (unknown) reasons. |
| Ahmed Salem Ould Tebakh | 2003-2004 | Central Bank of Mauritania | BCM | Undisclosed reasons | Undisclosed (unknown) reasons |
| Z O M O Zeidane | 2004-2006 | Central Bank of Mauritania | BCM | Resigned | Resigned to take up State Presidential candidacy in national elections. |
| Kane Ousmane | 2006-2008 | Central Bank of Mauritania | BCM | Resigned | Resigned to take up major mine post. |
| M D Maraye | 1996-1998 | Reserve Bank of Mauritius | BOM | Resigned | Undisclosed (unknown) reasons. |
| Gerard Niyitegeka | 1994-1995 | National Bank of Rwanda | NBR | Resigned | Personal insecurity and state army security threats. |
| D T S Ballali | 1998-2008 | Bank of Tanzania | BOT | Dismissed | Improper payment of funds from EPA account to 22 dubious companies. |
| Mohamed Ali Daouas | 2001-2004 | Bank of Tunisia | BCT | Dismissed | Leaked a paper with list of most indebted business people, linked to politicians. |
| Jacques Bussieres | 1990-1992 | Bank of Zambia | BOZ | Dismissed | Accused of pursuing previous State President's economic policies. |
| Dominic Mulaisho | 1992-1995 | Bank of Zambia | BOZ | Dismissed | Accused of the depreciation of the Kwacha and failed to rescue failing banks. |
| Jacob Mwanza | 1995-2002 | Bank of Zambia | BOZ | Dismissed | Undisclosed reasons and fell out of favour with new State President. |

Source: Central bank databases and IMF databases.

Note: In some cases, there is no clear distinction between a resignation and a dismissal. Some CB governors are diplomatically asked to resign, when the circumstances warranted a dismissal.

In some cases, reassignments may be politically motivated. They are not always for good cause.

Undisclosed reasons do not necessarily imply no reasons for dismissal but that the actual reasons are not disclosed because most likely they are politically motivated.

**Appendix 2.6: Central Bank Governors and the Periods Served (1990-2008)**

| Name of CB Governor | Country | Period Served | Name of CB Governor | Country | Period Served |
|---|---|---|---|---|---|
| Hadj Nasser | Algeria | 1990-1996 | I Ramphul | Mauritius | 1982-1996 |
| Abdelouahab Keramane | Algeria | 1996-2001 | M D Maraye | Mauritius | 1996-1998 |
| Mohammed Laksaci | Algeria | 2002-date* | R B Roi G C K | Mauritius | 1998-2006 |
| A G Furtado | Angola | 1990-1990 | R Bheenick | Mauritius | 2007-date* |
| Pedro de Cunha Neto | Angola | 1990-1990 | E Comiche | Mozambique | 1986-1991 |
| S B Lavrador | Angola | 1992-1992 | A Maleiane | Mozambique | 1991-2006 |
| Generoso de Almeida | Angola | 1993-1993 | E Gouveia | Mozambique | 2006-date* |
| A G Furtado | Angola | 1995-1995 | A A Ahmed | Nigeria | 1982-1993 |
| S B Lavrador | Angola | 1996-1999 | P Ogwuma OFR | Nigeria | 1993-1999 |
| Aguinaldo Jaime | Angola | 1999-2003 | Chief (DR) jo Sanusi CON | Nigeria | 1999-2004 |
| Amadeu C Mauricio | Angola | 2002-date* | C C Soludo, CFR | Nigeria | 2004-date* |
| H C L Hermans | Botswana | 1987-1997 | A Rundizana | Rwanda | 1985-1991 |
| B Gaolathe | Botswana | 1997-1999 | D Ntirugirimbabazi | Rwanda | 1991-1994 |
| L K Mohohlo | Botswana | 1999-date* | G Niyitegeka | Rwanda | 1994-1995 |
| Hamed | Egypt | 1986-1993 | F Mutemberezi | Rwanda | 1996-2002 |
| Hassan | Egypt | 1993-2001 | F Kanimba | Rwanda | 2002-date* |
| M Abul-Ayoun | Egypt | 2001-2003 | C Lodewyk Stals | South Africa | 1989-1999 |
| F A El B El Okdah | Egypt | 2003-date* | T T Mboweni | South Africa | 1999-date* |
| T Degefe | Ethiopia | 1990-1996 | M E Elshaikh | Sudan | 1988-1990 |
| A S Ahmed | Ethiopia | 1997-1997 | E SidA Elshaikh | Sudan | 1990-1993 |
| A T Atinafu | Ethiopia | 1998-date* | S M Hassan | Sudan | 1993-1996 |
| G K Agama | Ghana | 1988-1997 | A H Ahmed | Sudan | 1996-1998 |
| K Duffuor | Ghana | 1997-2001 | Sabir M Hassan | Sudan | 1998-date* |
| P A Acquah | Ghana | 2001-date* | G Rutihinda | Tanzania | 1989-1993 |
| E Kotut | Kenya | 1989-1993 | I M Rashidi | Tanzania | 1993-1998 |
| M Cheserem | Kenya | 1993-2001 | D Ballali | Tanzania | 1998-2008 |
| N N Nyagah | Kenya | 2001-2003 | B Ndulo | Tanzania | 2008-date* |
| A K Mullei | Kenya | 2003-2006 | M El Beji Hamda | Tunisia | 1990-2001 |
| N Ndung'u | Kenya | 2006-date* | M Ali Daouas | Tunisia | 2001-2004 |
| Hans J Lesshafft | Malawi | 1988-1992 | T Baccar | Tunisia | 2005-date* |
| F Z Pelekamoyo | Malawi | 1992-1995 | S Kiggundu | Uganda | 1986-1990 |
| M A P Chikaonda | Malawi | 1995-2000 | C N Kikonyogo | Uganda | 1990-2000 |
| E Ngalande | Malawi | 2000-2005 | E TMutebile | Uganda | 2001-date* |
| V Mbewe | Malawi | 2005-date* | J A Bussieres | Zambia | 1990-1992 |
| A O Zein | Mauritania | 1988-1992 | D Mulaisho | Zambia | 1992-1995 |
| M O Abeiderrahmane | Mauritania | 1992-1993 | J Mwanza | Zambia | 1995-2002 |
| M O Michel | Mauritania | 1993-1997 | C M Fundanga | Zambia | 2002-date* |
| M O M Aly | Mauritania | 1997-2001 | K Moyana | Zimbabwe | 1983-1993 |
| Sid'EL M O Nagi | Mauritania | 2001-2002 | L L Tsumba | Zimbabwe | 1993-2003 |
| Y O Athighe | Mauritania | 2002-2003 | G G Gono | Zimbabwe | 2003-date* |
| B A S Moussa | Mauritania | 2003-2003 | | | |
| A S O Tebakh | Mauritania | 2003-2004 | | | |
| Z O Zeidane | Mauritania | 2004-2006 | | | |
| K Ousmane | Mauritania | 2006-2008 | | | |
| S Benhameyda | Mauritania | 2008-date* | | | |

Source: Compiled from central bank databases and various other authentic databases.

Notes

*To-date refers to CB governors who were in post up to the end of the study period, 31 December 2008.

Their actual end of term of office date was therefore not yet known by the end of the study period, 31 December 2008.

**Appendix 2.7: Definition of Variables Used to Calculate CBI Indices**

| Variable Acronym | Variable Definition | Variable Type |
|---|---|---|
| CB | Central bank | |
| CBI | Central bank independence | |
| CWN | Cukierman, Webb and Neyapti index | Overall legal index |
| CBGC | Central bank governor characteristics | Sub-index |
| CBPO | Legal central bank policy objective | Sub-index |
| PFAA | Monetary policy formulating authority | Sub-index |
| CBLC | Restrictions on central bank lending to government | Sub-index |
| GTOF | Central bank governor's legal term of office | Sub-index |
| GAAT | Authority that appoints the governor | Sub-index |
| GDAT | Authority that can dismiss the governor | Sub-index |
| GOOF | Other offices that the governor can hold in government | Sub-index |
| PSOB | Central bank price stability objective | Sub-index |
| CFRM | Existence of a policy conflict resolution mechanism | Sub-index |
| CBBG | Central bank role in government budget making process | Sub-index |
| CBGA | Stringency of limits in central bank advances to government | Sub-index |
| CLGL | Stringency of limits in central bank loans to government | Sub-index |
| CLGT | Authority that determines the terms of lending central bank funds | Sub-index |
| COBF | Circle of beneficiaries of central bank funds | Sub-index |
| CBTL | Type of limits on lending central bank funds | Sub-index |
| CLGM | Maturity profile of central bank loans | Sub-index |
| CLRR | Restrictions on interest rates on central bank credit | Sub-index |
| CBPM | Explicit ban on CB participation in primary market for government securities | Sub-index |
| GMT | Grilli, Masciandaro and Tabellini index | Overall legal index |
| POLCBI | Political independence index | Sub-index |
| ECOCBI | Economic independence index | Sub-index |
| CBGA | Government does not appoint the central bank governor | Sub-index |
| CBGT | Central bank governor is in office for more than 5 years | Sub-index |
| CBBA | Government does not appoint the majority of the central bank board members | Sub-index |
| CBBT | Central bank board members is in office for more than 5 years | Sub-index |
| CBBG | Government representative participates on the CB policy meetings | Sub-index |
| MPFA | Government does not approve monetary policy | Sub-index |
| PSSO | Central bank has a legal mandate of price stability | Sub-index |
| LDCR | Existence of a conflict resolution mechanism in place | Sub-index |
| CLGA | Direct credit to government is not automatic | Sub-index |
| CLGT | Central bank credit is granted at full market interest rates | Sub-index |
| CLGL | Temporary limit amount that the central bank can lend | Sub-index |
| CLGM | Maturity limit for the central bank loans | Sub-index |
| OGDP | Central bank participates on the primary market for government securities | Sub-index |
| DRSA | Central bank sets the discount rate | Sub-index |
| CBSR | Central bank participates in bank supervision | Sub-index |
| TOR | Turnover rate of central bank governors | Factual index |
| TOO | Legal term of office of the central bank governor | |

Source: Grilli et al. (1991) and Cukierman et al. (1992).

# CHAPTER 3: EFFECTS OF CBI ON MACROECONOMIC PERFORMANCE

## 3.1 Introduction

A considerable amount of literature suggests that central bank independence (CBI) may enhance macroeconomic performance. This is because there are claims that CBI can assist countries achieve lower average inflation and reduce its variability, reduce the impact of political cycles on the economy (Nordhaus (1975)), foster fiscal discipline and enhance financial stability without any real additional costs or sacrifices in terms of reduced average output growth or an increase in output variability (Arnone et al. (2008)). This literature is broadly based on the time inconsistency theory of monetary policy (Kydland and Prescott (1977); Barro and Gordon (1983); and Rogoff (1985)), which suggests that independent central banks (CBs) are better in achieving lower and more stable inflation rates because they can resist political pressure.

Despite the good attributes that some authors associate with CBI, however, there are counter claims that high CBI might not improve macroeconomic performance as it is commonly claimed. For instance, DeBelle and Fischer (1994) argue that monetary policy might not stabilize real output if the degree of CBI is excessive. The inflation-output trade-off may be widened by high CBI. DeBelle and Fischer (1994) claim that the sacrifice ratio could be high with CBI. There is still lack of consensus on the potential positive effects of CBI on macroeconomic performance.

We measure the effects of CBI on macroeconomic performance, which we define by the means and the standard deviations in inflation, economic growth and interest rates. We ask whether CBI matters for macroeconomic performance. We do the investigation for 20 African countries over 1990-2008. The countries are Algeria, Angola, Botswana, Egypt, Ethiopia, Ghana, Kenya, Malawi, Mauritania, Mauritius, Mozambique, Nigeria, Rwanda, South Africa, Sudan, Tanzania, Tunisia, Uganda, Zambia and Zimbabwe. We use the difference-in-difference (DID) method of estimation. This approach follows Ball and Sheridan (2005), who use the DID method to investigate the effects of inflation targeting (IT) on the means and standard deviations of inflation, economic growth and interest rates for 20 OECD countries over the 1990s. Ball and Sheridan (2005) find that IT improves macroeconomic performance, but that once they control for the regression to the mean (RTM), their results do not support the hypothesis that IT matters

for macroeconomic performance. Instead of IT targeters and non-targeters in Ball and Sheridan (2005), we focus on CBI reformers and non-reformers. Instead of IT, we focus on CBI. We go beyond the 1990s and include the 2000s, up to 2008. We use several descriptive DID statistics.

The study is motivated by several factors. Firstly, there is conflicting empirical evidence on the effect of CBI on macroeconomic performance. Secondly, not much investigation has been done for African countries in the post-1989 period, which is associated with enhanced CBI. Thirdly, we take account that previous empirical findings have been plagued by several estimation problems, which partly make evidence inconclusive. These include endogeneity bias among variables, omitted variable bias associated with bivariate equations linking CBI index ratings in levels with macroeconomic variables of choice in levels (Posen (1995); Campillo and Miron (1997); DeJong (2002)), simultaneity bias, measurement error, reverse causality running from macroeconomic variables in levels to CBI ratings in levels (Posen (1993, 1995); Hayo (1998)) and subjectivity bias associated with CBI indices in levels (Forder (1996, 1998); Mangano (1998)). Subjectivity bias is associated with CBI variable choice, weights and codes.

We make several contributions to the literature. Firstly, we use a new method of investigating the effects of CBI on macroeconomic performance, which is the DID method. This method enables us to avoid measuring CBI indices in levels. Instead, we use actual changes in legal CBI. We take this approach to reduce subjectivity bias, endogeneity and measurement error associated with CBI indices in levels. Secondly, we use a recent data set covering 1990-2008. Thirdly, we investigate the effects of CBI on 6 key macroeconomic variables. Fourthly, we explore the idea that the efficiency of CBI may depend on recent pre-reform period macroeconomic performance. Fifthly, we focus on African countries, where the institutional reform of CBs is not yet complete.

The results suggest that CBI does not matter for macroeconomic performance. The observed improvements in macroeconomic performance over the study period are attributed to factors, other than CBI reform. We find that the recent past pre-reform and initial macroeconomic performance matter during reform. This is because pre-reform poor performers perform better than pre-reform high performers during reform. The results suggest some effect of the regression to the mean for inflation and interest rates. We conclude that governments in Africa need to do broader macroeconomic reforms, beyond and alongside CBI reforms. Institutional CBI per se does not seem to guarantee improved macroeconomic performance.

The rest of the paper is organized as follows. Section 3.2 presents the measurement of the effects of CBI. Section 3.3 presents related empirical literature. Section 3.4 presents the methodology and sample data. Section 3.5 presents empirical findings. Finally, section 3.6 concludes.

## 3.2 Measurement of the Effects of CBI on Macroeconomic Performance

We use the DID method of estimation for several reasons. Firstly, it reduces subjectivity bias associated with CBI indices in levels (Forder (1996, 1998); Mangano (1998); Daunfeldt and DeLuna (2008)). Subjectivity bias is associated with the choice of CBI variables, their corresponding weights and codes. Secondly, it uses period average differences in macroeconomic variables, instead of their levels. The period averages have merit in that they reduce the unobservable time-invariant and country-specific fixed effects associated with macroeconomic variables in levels. Following Ball and Sheridan (2005), we presume that the behaviour of macroeconomic variables depends on country effects, period effects, country-period effects, and possibly on CBI status in our case. Thirdly, it reduces endogeneity bias associated with the relationship between CBI indices and macroeconomic variables if they are all measured in levels. Fourthly, it reduces endogeneity bias associated with the comparison of a heterogenous group of institutions like CBs across 20 African countries. Fifthly, it assesses the causal relationship between CBI and macroeconomic variables. This is better than simple correlation analysis, which some previous studies used and acknowledged the inadequacies. Sixthly, it is a simple application in impact assessment of public policy interventions like CBI. It is more accurate in measuring CBI because it considers actual CBI changes that have been implemented.

We use the DID method mainly to avoid CBI indices in levels. Firstly, CBI indices in levels have the disadvantage that one CB can be ranked higher than another according to one criterion of CBI, but lower according to another criterion (Daunfeldt and DeLuna (2008)). As a result, aggregate ratings depend on the weights assigned to each criterion. CBI indices may rank equally independent CBs, differently. A particular CB can have different ratings, depending on the specific index used (Daunfeldt and DeLuna (2008)). Secondly, it is difficult to measure legal CBI in levels. Thirdly, the choice of CBI variables is unavoidably subjective and arbitrary (Cukierman et al. (1992); Forder (1996, 1998); Mangano (1998)). In measuring CBI by the DID method in this study, we do not attach quantitative scores as in most previous studies (DeHaan

and Van't Hag (1995); Cukierman and Webb (1995); DeHaan and Siermann (1996); Bagheri and Habib (1998)). We only establish an authentic qualitative change in legal CBI status. We do not determine the magnitude of CBI. This approach therefore reduces CBI rating inaccuracies and inconsistencies associated with the legal indices in levels.

The DID method has been used previously to investigate the effect of institutional changes on macroeconomic variables (Meyer (1995) and Ball and Sheridan (2005)). However, this method is conditional on time and group effects. It depends on the accurate determination of a CBI change and its effective date of implementation. These factors determine the extent to which the DID method reduces subjectivity bias in CBI analysis. It reduces, but does not completely eliminate subjectivity because the qualitative establishment of a CBI change is also, somewhat subjective.

### 3.3 Related Empirical Literature

There are some empirical studies that claim potential benefits of CBI for macroeconomic performance. These studies are based on empirical evidence suggesting that, on average, countries with highly independent CBs have lower inflation rates (Alesina (1988); Burdekin and Willett (1991); Grilli et al. (1991); Cukierman et al. (1992); Alesina and Summers (1993); Masciandaro and Spinelli (1993); Roll et al. (1995); Banaian (1995, 1997); Jonsson (1995); Posen (1995,1998); Campillo and Miron (1997); Fuhrer (1997); Crosby (1998); Eijffinger et al. (1998); Daunfeldt and Luna (2003); Gutierrez (2003); Jacome and Vasquez (2005); De Klomp and DeHaan (2007); Arnone et al. (2008); Cukierman (2008)). Alesina and Summers (1993) do not find any correlation between CBI and unemployment, real economic growth and real interest rates. Roll et al. (1995) support Alesina and Summers (1993) that low inflation can be achieved without real economic costs (Fujiki (1996)). These studies claim that CBI improves the likelihood of achieving a low inflation goal at no real economic costs in terms of output losses.

However, despite the claims of beneficial effects of CBI, some authors have found little or no evidence on the macroeconomic benefits of CBI (Banaian et al. (1995); Posen (1995, 1998); Campillo and Miron (1997); Fuhrer (1997); Crosby (1998)). In a study of 70 less developed countries, Cukierman et al. (1993) find no correlation between CBI and inflation. In a study of 26 former socialist countries in transition to market economies, Cukierman et al. (2002) do not find the hypothesized negative correlation between CBI and inflation, especially in the early

stages of economic liberalization. Posen (1993) argues that the observed negative correlation between the degree of CBI and inflation is illusionary because inflation and CBI are primarily determined by financial opposition to inflation. This finding suggests that CBI changes are implemented in countries where the financial sector is relatively influential. CBI change is more likely to be implemented in countries where public opposition to inflation is relatively strong (Posen (1993)). Some countries have improved macroeconomic performance before CBI reform.

There is some empirical evidence suggesting that CBI and the commitment to a low inflation rule are jointly determined by social attitudes (Posen (1993); Forder (1996); Hayo (1998)). This suggests that CBI is an endogenously determined variable. It implies that independent CBs are successful in implementing low and stable inflation because their CBI reflects social attitudes, which support low inflation. Cukierman (1994) suggests that CBI change may be implemented to maintain low inflation and as a committing device against future uncareful policy makers. This implies that political policy makers implement CBI changes when they already have achieved low and stable inflation. In comparing implementation dates of CBI change with the long-term inflation trends for 29 OECD countries, Daunfeldt and DeLuna (2008) find that price stability was achieved in most countries before their CBs became more independent. Cukierman (1994) finds that CBI change can be used as an instrument against future uncareful policy makers.

Empirical evidence on the hypothesized improved macroeconomic performance associated with CBI, is mixed and inconclusive. Empirical results vary with countries, study periods, CBI indices and methods of analysis used (Banaian and Willett (1983); Bade and Parkin (1985); Alesina (1988); Grilli et al. (1991); Cukierman (1992); Cukierman et al. (1992); Alesina and Summers (1993); Cukierman and Webb (1995); Eijffinger and DeHaan (1996); Dolmas et al. (2000); Neyapti (2003); Diana and Sidiropoulos (2003); Down and Siklos (2004)). Studies that confirm the negative relationship between CBI and inflation do so using legal indices for developed countries and factual indices for less developed countries (Cukierman (1992) and Cukierman et al. (1992)). This suggests that legal indices are appropriate in developed countries and factual indices are appropriate in less developed countries. None of these previous studies uses the DID method for the investigations. It is therefore difficult for us to compare the results from this study to these previous studies, which are based on different methods of investigation. However, the previous studies still give us some important insights on the key issues being investigated.

## 3.4 Methodology and Sample Data

We test the null hypothesis that CBI does not matter for macroeconomic performance. The alternative hypothesis is that CBI matters for macroeconomic performance. Our sample is limited to 20 African countries for several reasons. Firstly, we exclude countries that belong to monetary unions or arrangements, except lead countries like South Africa in the CMA region of Southern Africa. This is because in a monetary union or arrangement, the broad monetary policy stance is determined by the monetary grouping as opposed to individual countries. Secondly, we exclude countries that are not strategic in CBI analysis. Thirdly, we considered data availability and consistency. Our analysis starts from 1990 for several reasons. Firstly, by 1990, all the selected CBs were already operating. Secondly, CBI became more topical in the 1990s. Thirdly, before the 1990s, some of the countries had dictatorships. The concept of CBI is less plausible under dictatorship. The end of the study period, 2008, was determined by data availability on the macroeconomic variables of choice, which include inflation, economic growth and interest rates.

To determine the CBI status for each country, we use the CB Acts, Act amendments, CB official publications and country constitutions covering 1990-2008. The cited Acts are those that grant CBs, more CBI. We use country constitutions because in some countries, CBI is constitutionally granted. The effective CBI dates for each country are shown in appendix 3.1. The main sources of the Acts include CB databases and the Arnone et al. (2008) database on CB laws. This is available on http://marco.arnone.googlepages.com/centralbanklaws. The 20 CBs are listed in the Morgan Stanley Dean Witter Central Bank Directory (2004). We filled the data gaps on the legal changes in CBI through e-mail correspondence with the CBs. We used a questionnaire to obtain the missing information and to get some clarifications on some CBs. We directed the questionnaire to monetary policy and legal experts in the respective CBs. We only asked 4 key questions (See Appendix 3.4). These related to whether a legal institutional change that granted the CB, more CBI was made or not, effective date of implementation, nature of the legislative change and its sources for reference. For additional information on CBI status, we also consulted the Daunfeldt et al. (2008) database on the CBI classification of 132 countries over 1980-2005.

For the key macroeconomic variables, we measure inflation by the annualized change in the consumer price index (CPI). Although narrowly defined, the CPI is a common measure of prices that has been used in most previous studies. We measure the rate of real economic growth by the

annualized change in the real gross domestic product (GDP). We define the interest rate by the annual nominal lending rate. We measure variability in macroeconomic variables by the standard deviation of the respective macroeconomic variables. The data frequency is annual. We calculate period averages in macroeconomic variables as simple averages. We use the Bank of Ghana databases and linear interpolation to close interest rate data gaps for Ghana. The main sources for macroeconomic data are the respective CBs, African Development Bank (AfDB), International Financial Statistics (IFS) and World Bank Development Indicators (WDI) databases.

We establish the effective date of implementation of a major legal CBI change in each country. The effective date marks the legal granting of more CBI by the legislature. Following Ball and Sheridan (2005), we use the effective date of implementation as opposed to the announcement date. This is because implementation can still be delayed after announcement. We depart from the approach by Bernanke et al. (1999) and Scheater et al. (2000), who use the announcement date. We use the long date, which includes the effective month of the CBI change. We do this to ascertain the actual CBI implementation dates. We define the effective date as not less than a full quarter (3 months) from the end of the effective implementation year. This implies that countries that reformed from October to December are considered as having effectively reformed the following calendar year. This is because a late reform, say in December may only have impact in the following calendar year. This also depends on the specific macroeconomic variables of choice. The speed of impact may likely differ among inflation, interest rates and economic growth variables. The impact may also depend on the exact nature of the CBI change. Some changes do not have much impact, while others have significant impact. Some impacts take time to be realized in the general economy, while others may be realized within a short period.

We only consider legal institutional changes in CBs, which are implemented to enhance legal CBI. The relevant changes reduce the dynamic inconsistency of monetary policy and inflation bias. They formally decrease the influence of elected political authorities on the conduct of monetary policy. We focus on effective CBI changes as opposed to the probability of occurrence of such changes. This is because it is the actual change in CBI, as opposed to the probability of change that should matter for macroeconomic performance. The reforms are measured as changes in CBI as opposed to CBI index ratings in levels, which are prone to subjectivity bias and arbitrariness (Forder (1996, 1998) and Mangano (1998)). We do not consider the magnitude

of change. We only establish a reasonable and authentic claim of a change in CBI, using the established criteria. The relevant CBI changes are irreversible or only reversible with difficulty (Daunfeldt et al. (2008)). We denote the change by a qualitative CBI dummy variable ($D_i$). We identify CBI changes through reading of CB Acts, Act amendments, CB official publications and country constitutions over 1990-2008. To identify the actual CBI changes, we use the 15 CBI variables in Grilli et al. (1991) and the 16 CBI variables in Cukierman et al. (1992) as guidelines in reading the statutes. Among other CBI aspects, the relevant legal change:

- Safeguards the low inflation goal or price stability objective in CB legislation;
- Reduces the possibility for government to over-ride CB decisions on its operating targets;
- Restricts government opportunities to use CB credit to finance fiscal deficits;
- Reduces the powers and possibilities of political authorities to dismiss CB governors; and
- Increases the terms in office of the CB governors and the number of members of the CB's governing body, which is responsible for monetary policy.

We divide the sample into reformers (1) and non-reformers (0). We divide the study period into pre-reform and post-reform periods. The reformers are the policy intervention group. The non-reformers are the control group. CBI is the policy intervention. We identify CBI reform status by $D_i$ for country i, where i=1,2,3…20. $D_i$ is a binary variable, which takes value 1 if country i is a reformer and 0 if country i is a non-reformer. We assume that the accorded CBI status and the composition of reformers and non-reformers are stable throughout the study period, 1990-2008.

We make additional restrictions in the determination of CBI reform status. We classify early reformers as reformers and extend backwards, their pre-reform period by some years, to create a reasonable number of pre-reform observations. We define the cut-off year for early reformers as 2 years from the start of the study period. This implies that countries that reformed from 1990 to 1992 are classified as early reformers. We classify late reformers as non-reformers. We define the cut-off date for late reformers as 2 years before the end of the study period (2008). This implies that countries that reformed from the last quarter of 2006 to 2008 are treated as non-reformers. The 2-year cut-off date follows Ball and Sheridan (2005), who reclassify as non-targeters, 2 countries that implemented IT in 1999 and 2000, respectively when the end of the study period was 2001. We confirmed the exact implementation dates with the respective CBs.

We divide the study period into pre-reform and post-reform periods, for both reformers and non-reformers. We define the pre-reform period as the period before a major CBI change. We define the post-reform period as from the year in which the CBI change is implemented. The reform period starts from the implementation date of the CBI change. We establish a break year to divide the study period into pre-reform and post-reform periods. We define the break year as beginning from the year when a major CBI change was effectively made. For reformers, the break year is the year when CBI change was effectively implemented. For non-reformers, we calculate the break year as a simple average of the effective implementation years for the reformers. Accordingly, non-reformers have the same break year. For reformers, the pre-reform period starts from 1990 to the year before the effective reform year and the post-reform period starts from the year of reform for each country and ends in 2008. For non-reformers, the pre-reform period starts from 1990 to the year before the calculated non-reform break year and the post-reform period starts from the effective calculated break year and ends in 2008.

Preliminarily and for the derivation of some of the key descriptive statistics, we use the DID estimate to measure the effect of CBI change on macroeconomic performance. The DID estimate identifies the impact of CBI from the differential change in average macroeconomic performance between (i) reformers and non-reformers and between the (ii) pre-reform and the post-reform periods, in absolute and in percentage terms. We define the DID estimate in equation 3.1.

$$\widehat{\mathrm{DID}} = \left(\mathrm{X}_{\mathrm{t1}}^{\mathrm{reformers}} - \mathrm{X}_{\mathrm{t0}}^{\mathrm{reformers}}\right) - \left(\mathrm{X}_{\mathrm{t1}}^{\mathrm{non-reformers}} - \mathrm{X}_{\mathrm{t0}}^{\mathrm{non-reformers}}\right) \quad (3.1)$$

Where $\widehat{\mathrm{DID}}$ is the DID estimate, X is the period annual simple average macroeconomic variable of choice. The macroeconomic variables are the means and standard deviations in inflation, economic growth and interest rates. $\mathrm{X}_{\mathrm{t1}}^{\mathrm{reformers}}$ is the average performance of reformers in the post-reform period, $\mathrm{X}_{\mathrm{t1}}^{\mathrm{reformers}}$ is the average performance of reformers in the pre-reform period, $\mathrm{X}_{\mathrm{t1}}^{\mathrm{non-reformers}}$ is the average performance of non-reformers in the post-reform period and $\mathrm{X}_{\mathrm{t0}}^{\mathrm{non-reformers}}$ is the average performance of non-reformers in the pre-reform period. In percentage terms, if the DID estimate is positive, reformers perform better than non-reformers. If negative, non-reformers perform better. If 0, reformers and non-reformers perform equally the same. We calculate DID estimates for high and low pre-reform performers as part of the country sensitivity analysis, which controls for the RTM. We report the outcomes in tables 3.5 and 3.6.

### 3.4.1 Empirical Regression Equations

We measure the effects of CBI on macroeconomic performance in equations 3.2-3.5b. The target explanatory variable is $D_i$, with the target coefficient, $\alpha_1$. We estimate equations 3.2-3.4 for the whole sample, equation 3.5a for low performers and equation 3.5b for high performers.

$$X_i^{pre} - X_i^{post} = \alpha_0 + \alpha_1 D_i + \varepsilon_i \quad (3.2)$$

$$X_i^{pre} - X_i^{post} = \alpha_0 + \alpha_1 D_i + \alpha_2 X_i^{pre} + \varepsilon_i \quad (3.3)$$

$$X_i^{pre} - X_i^{post} = \alpha_0 + \alpha_1 D_i + \alpha_3 X_i^{0} + \varepsilon_i \quad (3.4)$$

$$X_{iL}^{pre} - X_{iL}^{post} = \alpha_0 + \alpha_1 D_{iL} + \varepsilon_i \quad (3.5a)$$

$$X_{iH}^{pre} - X_{iH}^{post} = \alpha_0 + \alpha_1 D_{iH} + \varepsilon_i \quad (3.5b)$$

Where $X_i^{pre}$ is pre-reform annual average macroeconomic performance in country i, $X_i^{post}$ is post-reform annual average macroeconomic performance in country i, $D_i$ is the CBI dummy variable for country i and $\varepsilon$ is the error term. $X_i^0$ is the sample average first year value of X. L and H represent low and high performers, respectively. $X_{iL}^{post}$ is the post-reform average macroeconomic performance in country i where i is a low performer. $X_{iL}^{pre}$ is the pre-reform average macroeconomic performance in country i where i is a low performer. $X_{iH}^{post}$ is the post-reform average macroeconomic performance in country i where i is a high performer. $X_{iH}^{pre}$ is the pre-reform average macroeconomic performance in country i is a high performer. $\alpha_0$ and $\alpha_1$ are the equation parameters. The coefficient on $D_i$ ($\alpha_1$) measures the effect of CBI on average macroeconomic performance ($X_i$). The null hypothesis that CBI does not matter for macroeconomic performance is rejected if $\alpha_1$ is significantly different from 0. Apriori, $\alpha_1>0$. If, the null hypothesis ($H_0$) is rejected, then CBI matters for macroeconomic performance.

The coefficient on $D_i$ ($\alpha_1$) in equation 3.2, might be spurious, produce biased parameter estimates and give an impression that CBI matters for macroeconomic performance. This is because equation 3.2 does not control for the regression to the mean (RTM), which is potentially likely because there is considerable cross-country variation in inflation and interest rate data. In this case, values above average may pull values close to the average. In addition, during CBI reform, low performers might improve macroeconomic performance by more than high performers, regardless of their current macroeconomic policies. To control for the RTM, and following Ball

and Sheridan (2005), we add $X_i^{pre}$ as an additional explanatory variable in equation 3.3, where the coefficient on $D_i$ ($\alpha_1$), now measures the effect of CBI, given $X_i^{pre}$. The null hypothesis that CBI does not matter for macroeconomic performance is rejected if $\alpha_1$ is significantly different from 0. Apriori, $\alpha_1>0$. If $\alpha_1$ is significant, then a reformer with pre-reform poor macroeconomic performance improves more than a non-reformer with equally poor pre-reform performance. This difference measures the true effect of CBI on macroeconomic performance.

Equation 3.3 may be affected by endogeneity bias. This is because $X_i^{pre}$, which appears in the dependent variable, $X_i^{pre}$-$X_i^{post}$, and is also an independent variable, might be correlated with the error term ($\varepsilon$). To reduce potential endogeneity associated with $X_i^{pre}$ in equation 3.3, we use country i's macroeconomic performance in the first year ($X_i^0$) instead of $X_i^{pre}$. This is because it is likely that some countries might have been able to improve on initial macroeconomic performance already in the later years of the pre-reform period. Unlike Ball and Sheridan (2005), we account for initial macroeconomic performance ($X_i^0$). We use $X_i^0$ to account for transitory factors on macroeconomic performance. Transitory effects disappear over time. We measure the effect of CBI on macroeconomic performance, given $X_i^0$ in equation 3.4, where the coefficient on $D_i$ ($\alpha_1$) now measures the effect of CBI on macroeconomic performance, given $X_i^0$. The first year is the initial year of the study period, 1990. The null hypothesis that CBI does not matter for macroeconomic performance is rejected if $\alpha_1$ is significantly different from 0. Apriori, $\alpha_1>0$.

Notably, $X_i^0$ may also not adequately control for the RTM. This is because some countries might have been able to improve on initial macroeconomic performance already in the later years of the pre-reform period. We go a step further in controlling for the RTM. We account for the possibility that recent pre-reform macroeconomic performance could affect the impact of CBI. Unlike Ball and Sheridan (2005), we do a country sensitivity analysis. We divide the sample into low and high performers. We reclassify countries using $X_i^{pre}$. We remove outliers first. We use $X_i^{pre}$ to determine cut-off points. We characterize low performers by pre-reform high inflation and its variability, low growth and high growth variability, high interest rate and its variability. We characterize high performers by pre-reform low inflation and its variability, high growth and low growth variability, low interest rates and its variability. We now identify countries by their CBI status and pre-reform macroeconomic performance status. We regress $D_i$ on $X_i^{pre}$-$X_i^{post}$. We estimate equations 3.5a and 3.5b for low and high performers, respectively. The null hypothesis

that CBI does not matter for macroeconomic performance is rejected if $\alpha_1$ is significantly different from 0. Apriori, $\alpha_1>0$. This measures the efficiency of CBI in the different countries.

Some literature suggests that the decision to reform a CB is potentially endogenous (Cukierman et al. (1992); Daunfeldt et al. (2008); Daunfeldt and DeLuna (2008)). Thus, the CBI dummy variable ($D_i$) in our regression estimations, might also be endogenous, resulting in biased parameter estimates. This is because the probability of a CBI reform might generally increase with pre-reform macroeconomic performance ($X_i^{pre}$), causing correlation with the error term ($\varepsilon$). To reduce potential endogeneity bias associated with $D_i$, in place of $D_i$, we could alternatively use (i) instrumental variables for $D_i$, (ii) predicted values of $D_i$ ($\widehat{D}_i$) or (iii) past legal CBI scores, $CBI^{pre}$ (Willard (2006)). However, we do not find appropriate instrumental variables for $D_i$. Following Daunfeldt et al. (2008), we experiment with the English language dummy variable ($E_i$), which takes value 1 if English is the main official language in country i, and 0 otherwise. $E_i$ is appropriate because macroeconomic performance is unlikely to be affected by language. However, we subsequently drop $E_i$ in our regression estimations because the classification of our sampled countries according to $E_i$ gives almost the same average value as with $D_i$. The sample average of $D_i$ is 0.70 and the sample average of $E_i$ is 0.72. We get almost similar results and conclusions as with $D_i$. Past CBI scores are endogenous, subjective and arbitrarily determined (Mangano (1998)). We initially avoided these problems by using $D_i$ instead of legal CBI scores in levels. Predicted values of $D_i$ imply future changes in CBI, as opposed to what has already occurred as we initially set to do. Our focus is on actual CBI changes. Given the constraints cited, we therefore do not control for $D_i$'s own potential endogeneity bias in this study. We only indicate its possible effects on our results. We leave the exploration of the suggested alternative possibilities for any further research on the effects of CBI on macroeconomic performance.

### 3.4.2 Regression Estimation Technique

We estimate cross-country regression equations. We use period average macroeconomic variables, denoted by, $X_i$. These include the means and standard deviations in inflation, real economic growth and interest rates. The original data frequency is annual. The length of the average periods depends on the pre-reform and post-reform periods for each country. We estimate average inflation (and its variability), average interest rate (and its variability) and economic growth variability equations with the dependent variable defined by $X_i^{pre}$-$X_i^{post}$.

We estimate the average economic growth equation with the dependent variable defined by $X_i^{post}$-$X_i^{pre}$. We do the estimations in these formats in accordance with what the sample data suggests. For our sample data, inflation (and its variability), interest rate (and its variability) and economic growth variability are higher in the pre-reform period than in the post-reform period. Average economic growth is higher in the post-reform period than in the pre-reform period.

Given the constraints in identifying suitable instrumental variables to control for potential endogeneity of $D_i$ in the regression estimations, we then treat $D_i$ as exogenous. In the regression equations in table 3.7, we do not use other covariates in addition to $D_i$, $X_i^{pre}$ and $X_i^0$. We follow Daunfeldt et al. (2008), who argue that other covariates are potentially plagued by a number of estimation problems. These include measurement error, missing data, outliers and endogeneity bias, which are common in such data for African countries. In addition to our small samples, we limit estimations to univariate and bivariate regressions. While Ball and Sheridan (2005) use the both Ordinary Least Squares and Weighted Least Squares, and weighted average macroeconomic variables, we use Ordinary Least Squares and simple averages of the macroeconomic variables.

## 3.5 Presentation and Analysis of Results

Out of the 20 countries, we identify 14 reformers (70%) and 6 non-reformers (30%). The reformers are Algeria, Botswana, Egypt, Ghana, Kenya, Mauritius, Mozambique, Nigeria, South Africa, Tanzania, Tunisia, Uganda, Zambia and Zimbabwe. The non-reformers are Angola, Ethiopia, Malawi, Mauritania, Rwanda and Sudan. The calculated break year for non-reformers, which coincides with the sample median year and the sample break year, is 1998. These outcomes hold, with and without the outliers. Some countries had once-off institutional changes while others had several. For example, Kenya and Nigeria had several legislative reforms. We only report major ones. Notably, the Reserve Bank of Zimbabwe was granted financial or fiscal independence in 1995. It was given its own budget and independence to manage it. The Bank of Uganda and the South African Reserve Bank were granted constitutional CBI in 1993 and 1996, respectively. In most other countries, CBI is not constitutionally granted, posing risk of potential violation. In a related previous study, Daunfeldt et al. (2008) find that 89 out of 132 CBs (64.42%) implemented CBI reforms in the period 1980-2005. This outcome confirms our finding of wide-spread CBI reforms in recent years (Arnone et al. (2008)). Table 3.1 shows the effective CBI reform years for the 20 countries and the detailed legislation is cited in appendix 3.1.

Table 3.1: Central Bank Independence Effective Reform Calendar (1990-2008)

| Country | Algeria | Uganda | Zimbabwe | Tanzania | Kenya | South Africa | Zambia | Botswana | Angola | Ethiopia | Malawi | Mauritania | Rwanda | Sudan | Nigeria | Ghana | Mozambique | Egypt | Mauritius | Tunisia |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | *** | | | | | | | | | | | | | | | | | | | |
| 1991 | | | | | | | | | | | | | | | | | | | | |
| 1992 | | | | | | | | | | | | | | | | | | | | |
| 1993 | | *** | | | | | | | | | | | | | | | | | | |
| 1994 | | | | | | | | | | | | | | | | | | | | |
| 1995 | | | *** | *** | | | | | | | | | | | | | | | | |
| 1996 | | | | | *** | *** | | | | | | | | | | | | | | |
| 1997 | | | | | | | *** | *** | | | | | | | | | | | | |
| 1998### | | | | | | | | | *** | *** | *** | *** | *** | *** | | | | | | |
| 1999 | | | | | | | | | | | | | | | *** | | | | | |
| 2000 | | | | | | | | | | | | | | | | | | | | |
| 2001 | | | | | | | | | | | | | | | | | | | | |
| 2002 | | | | | | | | | | | | | | | | *** | | | | |
| 2003 | | | | | | | | | | | | | | | | | *** | *** | | |
| 2004 | | | | | | | | | | | | | | | | | | | *** | |
| 2005 | | | | | | | | | | | | | | | | | | | | *** |
| 2006 | | | | | | | | | | | | | | | | | | | | |
| 2007 | | | | | | | | | | | | | | | | | | | | |
| 2008 | | | | | | | | | | | | | | | | | | | | |

Sources: Central bank Acts, Act amendments, country constitutions, e-mails to central banks and other relevant central bank publications.

Notes

*** denotes the effective date of a major CBI change. 1998 ### denotes the sample break year.

The sample break year is 1998, where the sample mean year coincides with the sample median year.

To adjust for the difference between the announcement and the effective dates of CBI change, we shift the effective implementation dates for Botswana from 1996 to 1997, Mauritius from 2004 to 2005, Nigeria from 1998 to 1999 and Zambia from 1996 to 1997. In addition, some CBI classifications require some qualifications. We still classify Tunisia that reformed at the beginning of 2006 as a reformer. This is because the CBI change became effective in May 2006. This was before the last quarter of 2006 according to the criteria defined in this paper. We classify Tunisia as a late reformer. We classify Algeria as an early reformer because the CBI change was effected in April 1990. Accordingly, we extend the pre-reform period for Algeria backwards to 1984. We do the backward extension to generate a reasonable number of observations for the pre-reform period. However, we exclude the Algeria pre-1990 observations from the graphical illustrations because we do not include pre-1990 observations for the other countries. The classification of countries into reformers and non-reformers is shown in appendix 3.3. Table 3.2 shows the pre-reform and post-reform periods for the 20 countries.

Table 3.2: Pre-Reform and Post-Reform Periods (1990-2008)

| Country | Effective CBI Reform Year | Pre-Reform Period | Post-Reform Period | CBI Reform Status |
|---|---|---|---|---|
| Algeria | 1990 | 1984-1989 | 1990-2008 | Reformer |
| Uganda | 1993 | 1990-1993 | 1994-2008 | Reformer |
| Tanzania | 1995 | 1990-1994 | 1995-2008 | Reformer |
| Zimbabwe | 1995 | 1990-1994 | 1995-2008 | Reformer |
| Kenya | 1996 | 1990-1995 | 1996-2008 | Reformer |
| South Africa | 1996 | 1990-1995 | 1996-2008 | Reformer |
| Zambia | 1997 | 1990-1996 | 1997-2008 | Reformer |
| Botswana | 1997 | 1990-1997 | 1998-2008 | Reformer |
| Angola | 1998 | 1990-1997 | 1998-2008 | Non-Reformer |
| Ethiopia | 1998 | 1990-1997 | 1998-2008 | Non-Reformer |
| Malawi | 1998 | 1990-1997 | 1998-2008 | Non-Reformer |
| Mauritania | 1998 | 1990-1997 | 1998-2008 | Non-Reformer |
| Rwanda | 1998 | 1990-1997 | 1998-2008 | Non-Reformer |
| Sudan | 1998 | 1990-1997 | 1998-2008 | Non-Reformer |
| Nigeria | 1999 | 1990-1998 | 1999-2008 | Reformer |
| Ghana | 2002 | 1990-2001 | 2002-2008 | Reformer |
| Egypt | 2003 | 1990-2002 | 2003-2008 | Reformer |
| Mozambique | 2003 | 1990-2002 | 2003-2008 | Reformer |
| Mauritius | 2005 | 1990-2004 | 2004-2008 | Reformer |
| Tunisia | 2006 | 1990-2005 | 2006-2008 | Reformer |
| Sample Average=Sample Median | 1998 | | | |

Source: Derived from central bank Acts, Act amendments, country constitutions and other central bank publications.

Table 3.2 shows that non-reformers have an equal post-reform period, 1998-2008. This is because they have the same individual break year, 1998. However, one major drawback associated with the DID method of measuring CBI is that the CBI dummy variable ($D_i$) classifies 2 very different forms of CBI change and assigns them the same value 1, and thus treats them as being equal in the estimations. We note that in practice, CBI changes vary in terms of magnitude and dimension. Some such changes are likely to be more effective than others in influencing macroeconomic performance, although they are all classified as major CBI changes. The variations in the dimensions of change potentially matter. Some CBI changes, though legislatively major, may not have much economic impact. As noted by Daunfeldt and DeLuna (2008), in a study of 29 OECD countries, there is still some element of subjectivity involved in the dating of the relevant CBI reforms. The effectiveness of CBI reforms may also partly depend on the design of the reform, its management, competence of the CB board of directors, quality of the CB economic research department, external shocks to the economy and the CB's reactions to them and the strength of respect of the CB laws by the political authorities. CBI reform and its management may not be adequate in tackling the underlying causes of macroeconomic performance like unsustainable fiscal deficits, which are prevalent in most African countries.

### 3.5.1 Key Descriptive Statistics (1990-2008)

In terms of inflation, economic growth and interest rates, we identified 2 outliers, Zimbabwe and Angola. Zimbabwe had negative annual average real economic growth for the entire study period. Both countries had outlying inflation and interest rate figures. They had 3-digit annual average levels, which could distort analysis if included in the estimations. We excluded the 2 outliers from the key descriptive statistics and the regression estimations. The exclusion of the outliers reduced the total sample size to 18 countries, 13 reformers and 5 non-reformers. Table 3.3 shows the classification criteria for high and low macroeconomic performers for the macroeconomic variables of choice after dropping the outliers. Since dropping the 2 outliers does not completely eliminate the wide cross-country variations in inflation and interest rate data, we expect the regression estimations to be affected by regression to the mean (RTM), where values above average tend to pull values close to the average. Accordingly, we control for the RTM.

Table 3.3: Classification Criteria for High and Low Pre-Reform Performers (1990-2008)

| Macroeconomic Variable of Choice | Pre-Reform Average ($X^{pre}$) | High Macroeconomic Performers | Low Macroeconomic Performers |
|---|---|---|---|
| Average inflation | 27.0% | <27.0% | ≥27.0% |
| Inflation variability | 10.0% | <10.0% | ≥10.0% |
| Average economic growth | 3.0% | ≥3.0% | <3.0% |
| Economic growth variability | 2.7% | <2.7% | ≥2.7% |
| Average interest rate | 23.0% | <23.0% | ≥23.0% |
| Interest rate variability | 3.4% | <3.4% | ≥3.4% |

Source: Derived from sample data.

Although not shown in table 3.3, the classification of countries into high or low macroeconomic performers varies across the macroeconomic variables of choice. However, there are some countries that are either high or low macroeconomic performers consistently across all the macroeconomic variables of choice.

Table 3.4 shows macroeconomic performance for (i) all the countries, (ii) reformers and (iii) non-reformers, for the pre-reform and the post-reform periods. We also show the first year macroeconomic performance for all the variables. We show the changes in macroeconomic performance in absolute and in percentage terms. We define macroeconomic performance by the means and the standard deviations in the macroeconomic variables of choice. These include inflation, real economic growth and interest rates. We compare macroeconomic performance between the sub-groups of the countries and the sub-periods of the study period.

Table 3.4: Means and Standard Deviations of Macroeconomic Variables of Choice (1990-2008)

| Macroeconomic Variable of Choice | All Countries | | | | Reformers | | | | Non-Reformers | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Overall Mean | Percentage Change | s.d. | Percentage Change | Reform Mean | Percentage Change | s.d. | Percentage Change | Non-Reform Mean | Percentage Change | s.d. | Percentage Change |
| Pre-reform inflation | 26.60 | | 10.05 | | 25.13 | | 8.79 | | 27.36 | | 10.58 | |
| Post-reform inflation | 10.16 | -61.82 | 6.39 | -36.44 | 9.57 | -61.92 | 5.56 | -36.71 | 9.29 | -66.06 | 9.06 | -14.33 |
| Average inflation performance | 16.60 | | 4.94 | | 15.48 | | 7.09 | | 17.85 | | 9.78 | |
| First year inflation | 65.00 | | 16.60 | | 27.92 | | 10.28 | | 18.60 | | 5.60 | |
| Pre-reform economic growth | 3.25 | | 2.72 | | 3.84 | | 1.50 | | 2.67 | | 4.98 | |
| Post-reform economic growth | 5.73 | 76.65 | 1.72 | -36.82 | 5.35 | 39.51 | 1.18 | -21.14 | 6.97 | 161.38 | 2.87 | -42.32 |
| Average economic growth performance | 4.73 | | 2.14 | | 4.62 | | 2.72 | | 4.93 | | 3.87 | |
| First year economic growth | 2.89 | | 2.25 | | 4.23 | | 1.47 | | 0.00 | | 3.93 | |
| Pre-reform interest rate | 23.01 | | 3.82 | | 24.86 | | 3.42 | | 18.52 | | 2.20 | |
| Post-reform interest rate | 19.39 | -15.77 | 2.70 | -29.29 | 19.02 | -23.49 | 2.79 | -18.43 | 20.33 | 9.76 | 1.91 | -12.99 |
| Average interest rate performance | 20.72 | | 3.01 | | 21.09 | | 3.09 | | 19.56 | | 2.05 | |
| First year interest rate | 20.24 | | 4.66 | | 20.04 | | 4.32 | | 14.03 | | 2.66 | |
| Average CBI Dummy Variable ($D_i$) | 0.70 | | 0.30 | | | | | | | | | |
| Number of countries (n) | 18 | | | | 13 | | | | 5 | | | |

Source: Calculated from the sample data.

Notes

s.d. is the standard deviation of the macroeconomic variable of choice.

The standard deviation measures the variability in the macroeconomic variable of choice, namely inflation, economic growth and interest rates.

The first year is 1990. It is the first year of the study period.

The averages are calculated as simple averages, without weighting.

All countries exclude the 2 extreme outliers, Angola and Zimbabwe.

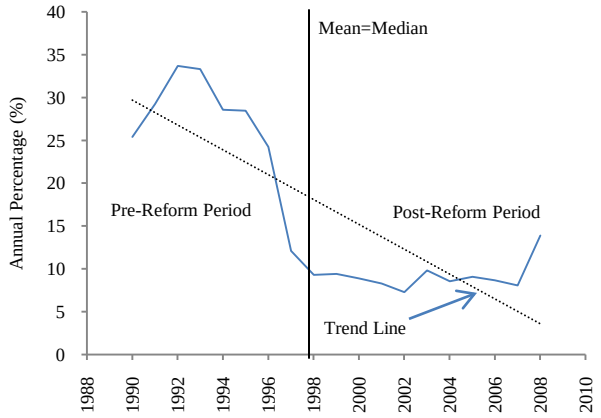
The overall mean is the mean for all the countries included in the calculations, after removing the 2 outliers, Angola and Zimbabwe.

Table 3.4 shows that all the countries, reformers and non-reformers, reduced average inflation (and its variability), increased average economic growth (and reduced its variability), reduced average interest rate (and its variability). Non-reformers performed better than reformers in reducing average inflation, in increasing economic growth and reducing its variability. Reformers performed better than non-reformers in reducing variability in inflation and interest rates. Average interest rates declined for reformers but they increased for non-reformers. In overall terms, macroeconomic performance improved because it is higher in the post-reform period than in the pre-reform period. This outcome gives an impression that CBI matters for macroeconomic performance. In a related previous study, Daunfeldt et al. (2010) find that CBI reform reduced average inflation by 3.95% to 4.68% in 89 out of 132 countries over 1980-2005.

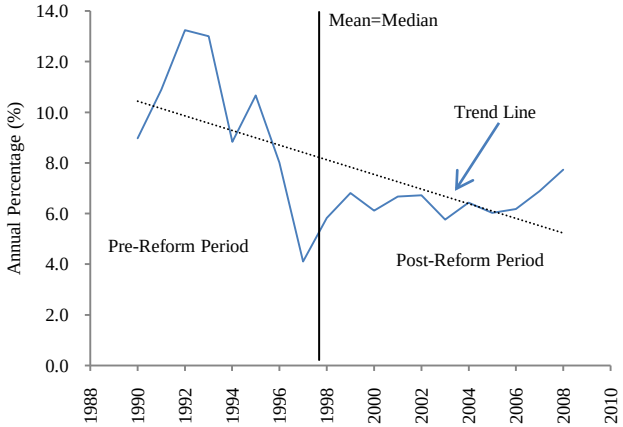
Panels 3A-3F show trends in macroeconomic performance for all the countries for the whole study period. The dotted line in panels 3A-3F is the trend line. The solid vertical line is the sample break year, 1998. Panels 3G-3R show the changes in macroeconomic performance for the (i) reformers and non-reformers and for the (ii) high and low pre-reform performers, for the pre-reform and the post-reform sub-periods. The solid vertical line in panels 3G-3R is the sample break year, 1998. At the break year, the sample mean year and the sample median year coincide. For each reformer, the individual break year is either before or after the sample break year. For the each non-reformer, the individual break year coincides with the sample break year.

For robustness checks on the determination of the sample break year, we follow the rule of thumb by Daunfeldt et al. (2008), who suggest that the median sample year could alternatively be used as an additional sample break year. For our data, since the sample mean and median coincide, this takes account of the robustness check concerns. In this case, the mean and the median are systematically determined by the sample data (See panels 3A-3R). We avoided picking the break year randomly because CBI reform dates are not randomly determined figures. In addition, given our relatively small sample size, it is not feasible to establish several plausible sample break years because the break year determines the length of both the pre-reform and post-reform periods. The established sub-periods have to be of reasonable length for meaningful analysis of the effects of CBI on macroeconomic performance. The sub-periods have to qualify the reform criteria that we established for the analysis. Given the sample data features, we therefore present the results using one break year, 1998.

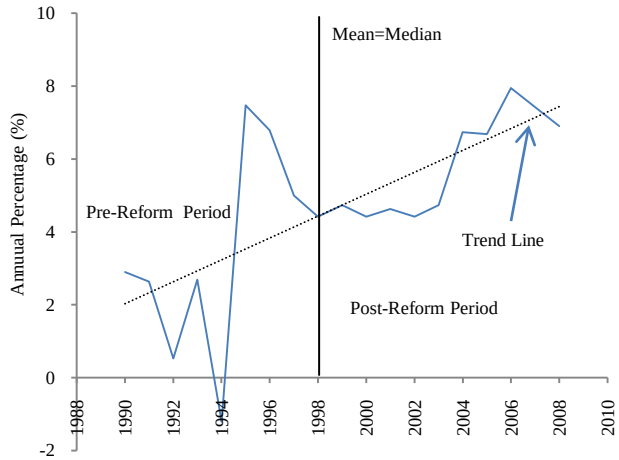
3A: Average Inflation



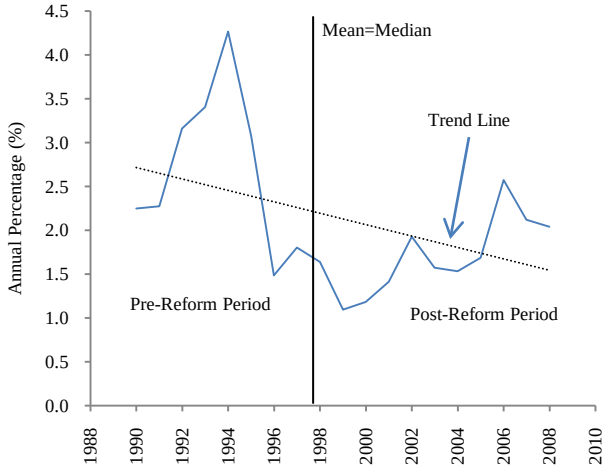

3B: Inflation Variability



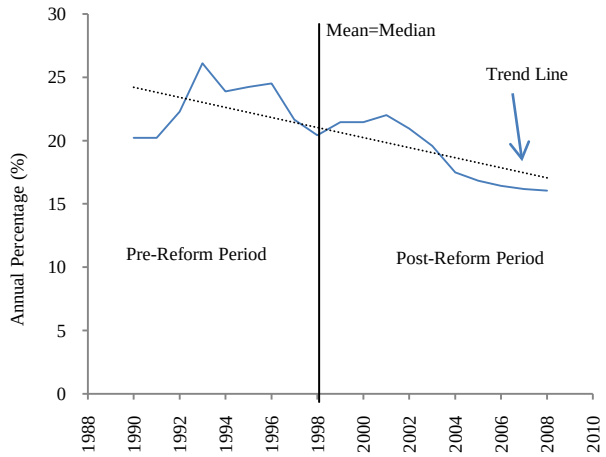

3C: Average Economic Growth



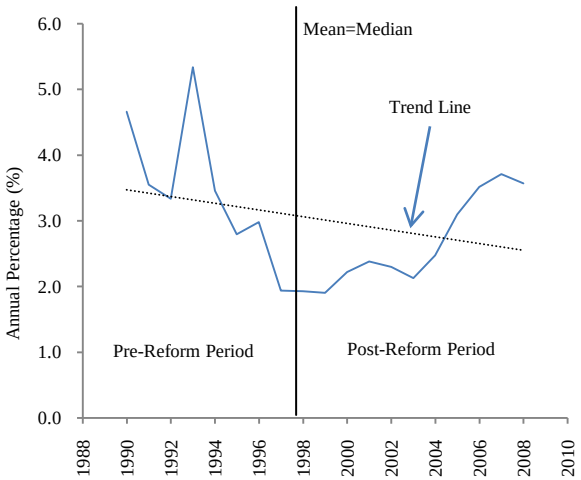

3D: Economic Growth Variability



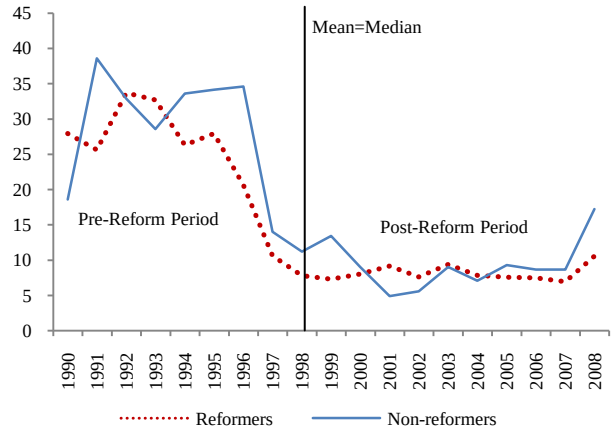

3E: Average Interest Rate



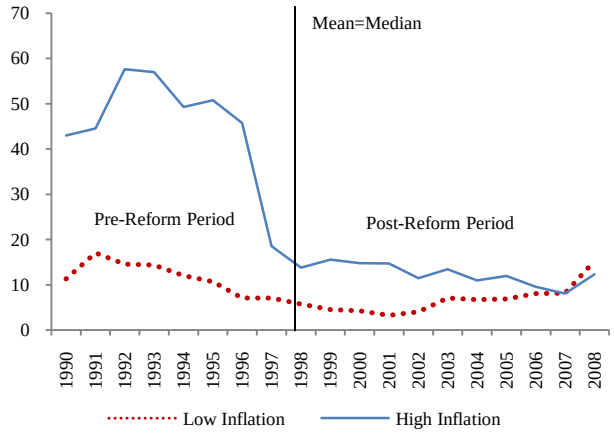

3F: Interest Rate Variability



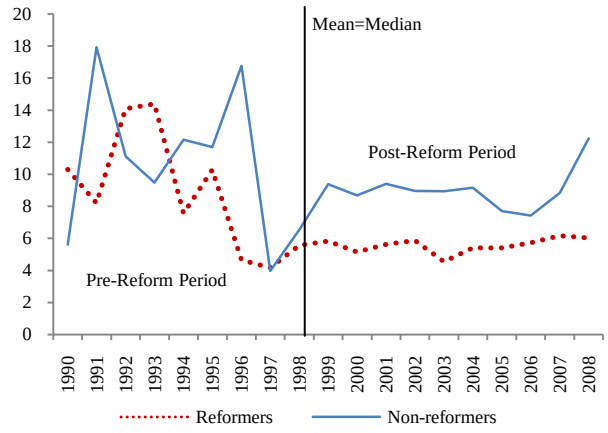
3G: Average Inflation (%)



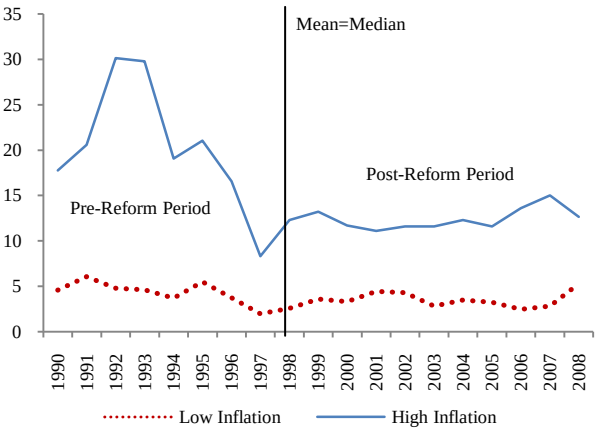

3H: High and Low Average Inflation (%)



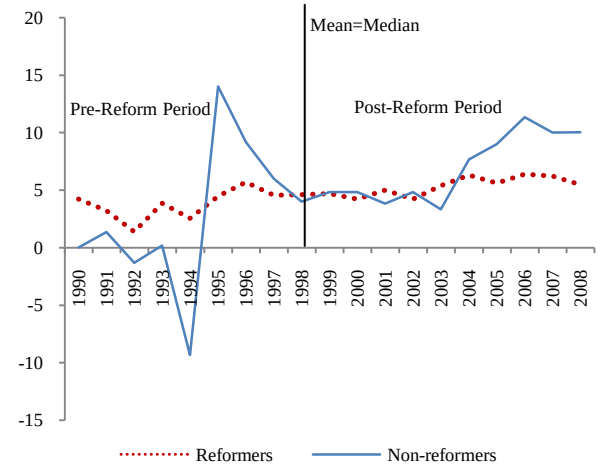

3I: Average Inflation Variability (%)



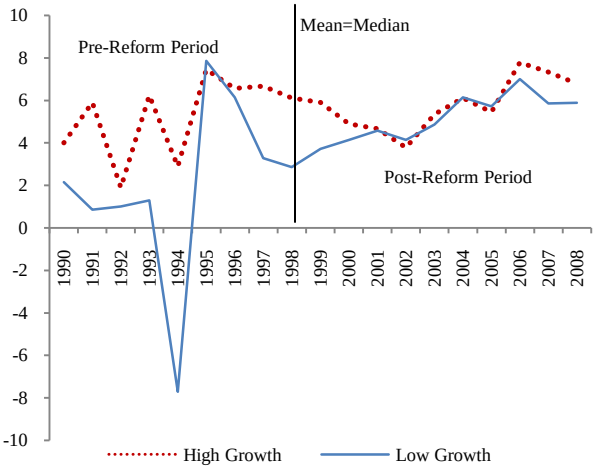

3J: High and Low Inflation Variability (%)



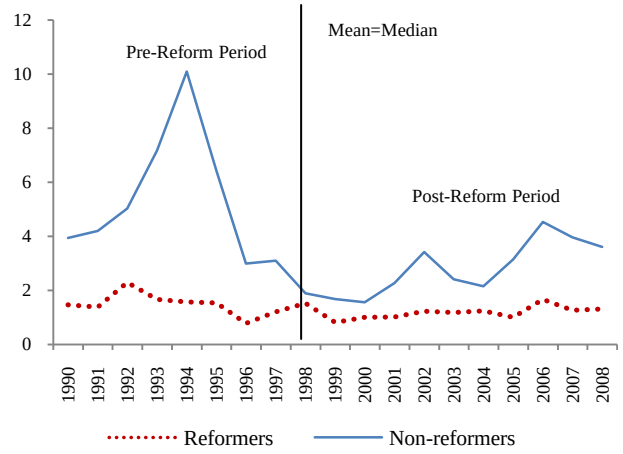

3K: Average Economic Growth (%)



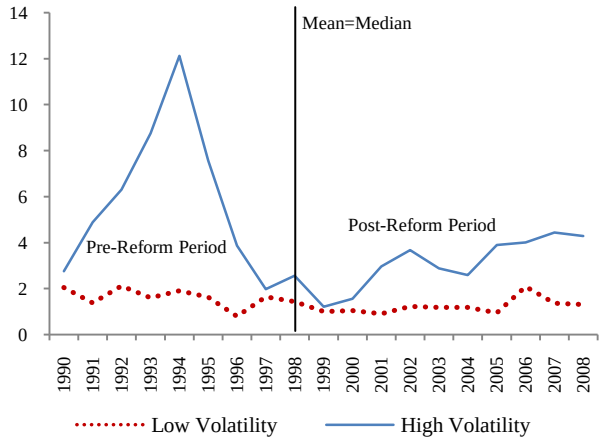

3 L: High and Low Average Growth (%)



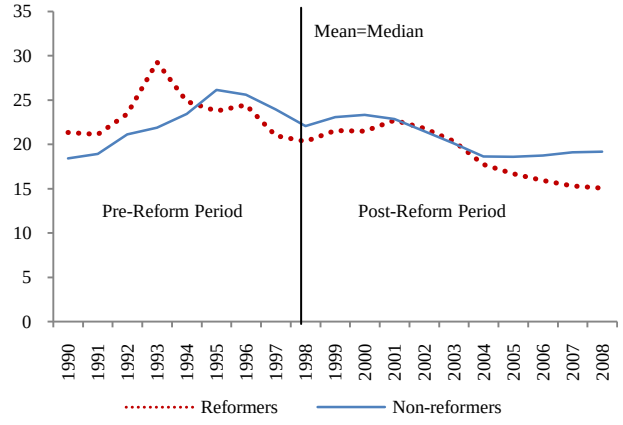
3M: Average Growth Variability (%)



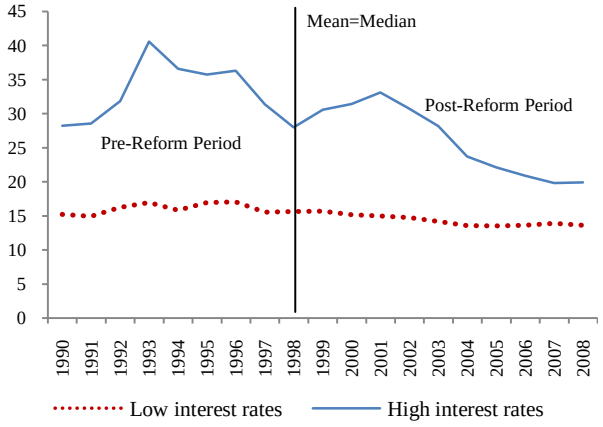

3N: High and Low Growth Variability (%)



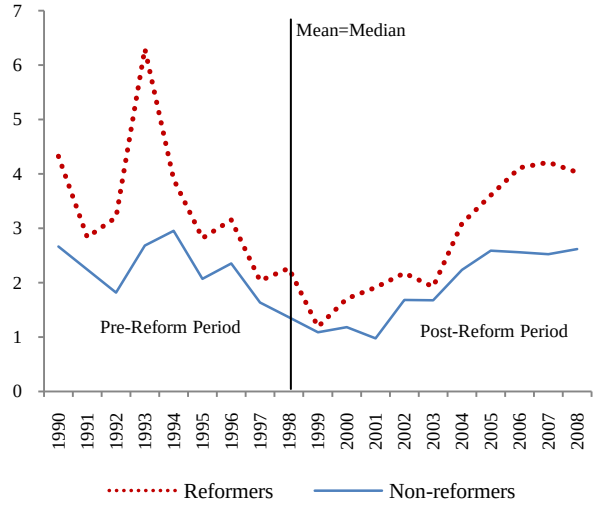

3O: Average Interest Rate (%)



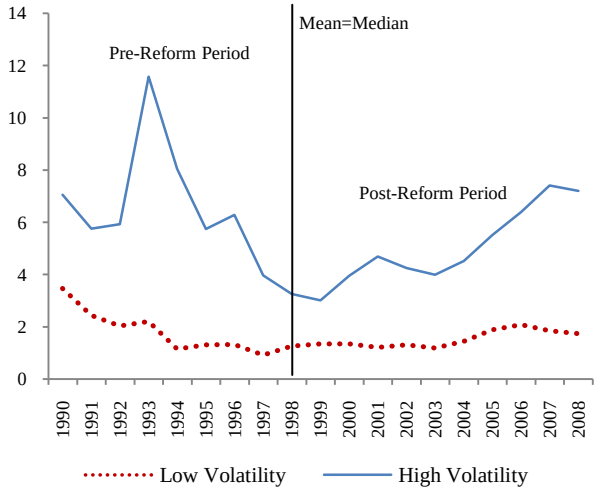

3P: High and Low Average Interest (%)




3Q: Average Interest Variability (%)




3R: High and Low Interest Variability (%)



Panels 3A-3R and tables 3.4 and 3.6 show that all the countries reduced average inflation and its variability, increased average economic growth and reduced its variability, reduced average interest rate and its variability. Generally, (i) non-reformers performed better than reformers and (ii) low pre-reform performers performed better than pre-reform high performers. Reformers reduced average interest rates while interest rates increased for non-reformers. High interest rate countries performed better than low interest rate countries in reducing average interest rates and its variability. For inflation and interest rates, there is a clearer difference in macroeconomic performance between low and high performers than between reformers and non-reformers. This difference is reduced for economic growth variables and is possibly explained by wide cross-country variations in inflation and interest rate variables. The graphs suggest improvements in macroeconomic performance, which is higher in the post-reform period for most countries and for most macroeconomic variables. Tables 3.5 and 3.6 show the performance of reformers against non-reformers and low performers against high performers, respectively.

Table 3.5: DID Estimates for Reformers and Non-Reformers (1990-2008)

| Macroeconomic Variable of Choice (%) | Reformers | | | Non-Reformers | | | Absolute DID Estimate ($\widehat{DID}$) |
|---|---|---|---|---|---|---|---|
| | Post-Reform | Pre-Reform | Absolute Difference | Post-Reform | Pre-Reform | Absolute Difference | |
| Average inflation | 10.0 | 25.0 | -15.0 (60%) | 9.0 | 27.0 | -18.0 (67%) | 3.0 (-7%) |
| Inflation variability | 6.0 | 9.0 | -3.0 (33%) | 9.0 | 11.0 | -2.0 (18%) | -1.0 (15%) |
| Average economic growth | 5.0 | 4.0 | 1.0 (25%) | 7.0 | 3.0 | 4.0 (133%) | -3.0 (-108%) |
| Economic growth variability | 1.0 | 1.0 | 0.0 (0%) | 3.0 | 5.0 | -2.0 (40%) | 2.0 (-40%) |
| Average interest rate | 19.0 | 21.0 | -2.0 (10%) | 20.0 | 19.0 | 1.0 (-5%) | -3.0 (15%) |
| Interest rate variability | 2.8 | 3.4 | -0.6 (18%) | 1.9 | 2.2 | -0.3 (14%) | -0.3 (4%) |
| Average in percentage terms | Improvement | | (24%) | Improvement | | (44%) | (-20%) |

Source: Calculated from sample data using equation 3.1.

Table 3.6: DID Estimates for High and Low Pre-Reform Performers (1990-2008)

| Macroeconomic Variable of Choice (%) | High Pre-Reform Performers | | | Low Pre-Reform Performers | | | Absolute DID Estimate ($\widehat{DID}$) |
|---|---|---|---|---|---|---|---|
| | Post-Reform | Pre-Reform | Absolute Difference | Post-Reform | Pre-Reform | Absolute Difference | |
| Average inflation | 8.0 | 10.0 | -2.0 (20%) | 13.0 | 47.0 | -34.0 (72%) | 32.0 (-52%) |
| Inflation variability | 3.0 | 4.0 | -1.0 (25%) | 12.0 | 22.0 | -10.0 (45%) | 9.0 (-20%) |
| Average economic growth | 6.0 | 5.0 | 1.0 (20%) | 5.0 | 2.0 | 3.0 (150%) | -2.0 (-130%) |
| Economic growth variability | 1.0 | 2.0 | -1.0 (50%) | 3.0 | 6.0 | -3.0 (50%) | 2.0 (0%) |
| Average interest rate | 14.0 | 16.0 | -2.0 (13%) | 26.0 | 34.0 | -8.0 (24%) | 6.0 (-11%) |
| Interest rate variability | 5.0 | 6.0 | -1.0 (17%) | 2.0 | 2.0 | - 0.0 (0%) | -1.0 (17%) |
| Average in percentage terms | Improvement | | (24%) | Improvement | | (57%) | (-33%) |

Source: Calculated from sample data using equation 3.1.

Notes: Percentage changes (improvements) in macroeconomic performances are shown in parenthesis for both tables 3.5 and 3.6.

Table 3.5 shows that reformers performed better than non-reformers in reducing inflation variability, average interest rate and its variability. Non-reformers performed better than reformers in reducing average inflation, increasing economic growth and reducing its variability. In overall terms, non-reformers performed better than reformers. Non-reformers improved macroeconomic performance by larger magnitudes. This outcome suggests that CBI does not matter for macroeconomic performance. It gives an impression that non-reformers may have been more aggressive in taking strategies, policies or programmes that improved macroeconomic performance over the relevant period, than reformers did. This implies that improved macroeconomic performance could have resulted from factors, other than CBI.

Table 3.6 shows that low pre-reform performers performed better than high pre-reform performers in reducing average inflation and its variability, in reducing average interest rates and in increasing economic growth. Low and high pre-reform performers did equally well in reducing growth variability. High pre-reform performers performed better in reducing interest rate variability than low pre-reform performers. In overall terms, low pre-reform performers performed better than high pre-reform performers. They improved macroeconomic performance by larger magnitudes. This outcome suggests that pre-reform macroeconomic performance matters for macroeconomic performance during reform. It gives an impression that low performers may have been more aggressive in taking strategies, policies or programmes that improved macroeconomic performance over the relevant period than did pre-reform high macroeconomic performers. The results suggest that pre-reform performance matters in this case.

The key descriptive statistics suggest that macroeconomic performance improved over the study period in all the countries. We use regression analysis to measure the contribution of CBI change to macroeconomic performance, if any. Table 3.7 shows the regression results. In table 3.7, equation 3.2 measures the effects of CBI on macroeconomic performance without controlling for the RTM. Equation 3.3 measures the effects of CBI on macroeconomic performance, given pre-reform macroeconomic performance ($X_i^{pre}$). Thus, in equation 3.3, we use $X_i^{pre}$ to control for the RTM. Equation 3.4 measures the effects of CBI on macroeconomic performance, given first year macroeconomic performance ($X_i^0$). Thus, in equation 3.4, we use $X_i^0$ to control for the RTM. We investigate whether CBI matters for macroeconomic performance. We examine the influence of past and initial macroeconomic performance on performance during CBI reform.

### 3.5.2 Regression Results on Effects of CBI on Macroeconomic Performance (1990-2008)

Table 3.7: Effects of CBI on Macroeconomic Performance (1990-2008)

| Equation Target Estimate | $D_i$ | $X^{pre}$ | $X^0$ |
|---|---|---|---|
| **Average Inflation** | **Equation 3.2** | **Equation 3.3** | **Equation 3.4** |
| Intercept ($\alpha_0$) | 19.8 (1.68) | 3.32 (0.62) | -8.19***(-4.18) |
| CBI dummy variable ($\alpha_1$) | -4.64 (-0.33) | -12.36*(-2.07) | 0.25 (0.13) |
| Pre-reform average ($\alpha_2$) | | 0.89*(8.54) | |
| First year (1990) average inflation ($\alpha_3$) | | | 0.92***(27.75) |
| R-Squared | 0.01 | 0.98 | 0.83 |
| Adjusted R-Squared | -0.06 | 0.98 | 0.81 |
| **Inflation Variability** | **Equation 3. 2** | **Equation 3.3** | **Equation 3.4** |
| Intercept ($\beta_0$) | 2.22 (0.89) | -0.57 (-0.43) | -2.83**(-2.39) |
| CBI dummy variable ($\beta_1$) | 1.99 (0.68) | -0.31 (-0.21) | 2.67**(2.19) |
| Pre-reform inflation variability ($\beta_2$) | | 0.50***(6.91) | |
| First year (1990) inflation variability ($\beta_3$) | | | 0.45***(8.79) |
| R-Squared | 0.03 | 0.84 | 0.77 |
| Adjusted R-Squared | -0.03 | 0.82 | 0.74 |
| **Average Economic Growth** | **Equation 3.2** | **Equation 3.3** | **Equation 3.4** |
| Intercept ($\lambda_0$) | 4.05***(4.16) | 4.05***(4.13) | 5.82***(5.93) |
| CBI dummy variable ($\lambda_1$) | -2.27 (-1.93) | -1.59 (-1.13) | -1.50 (-1.50) |
| Pre-reform average economic growth ($\lambda_2$) | | -0.16 (-0.90) | |
| First year (1990) economic growth ($\lambda_3$) | | | -0.71***(-3.08) |
| R-Squared | 0.18 | 0.49 | 0.22 |
| Adjusted R-Squared | 0.13 | 0.42 | 0.12 |
| **Economic Growth Variability** | **Equation 3.2** | **Equation 3.3** | **Equation 3.4** |
| Intercept ($\gamma_0$) | 2.45***(3.53) | 1.61 (1.23) | -1.93***(-2.90) |
| CBI dummy variable ($\gamma_1$) | -2.12**(-2.53) | -1.58 (-1.43) | 0.93 (1.64) |
| Pre-reform average growth variability ($\gamma_2$) | | 0.21 (0.76) | |
| First year (1990) growth variability ($\gamma_3$) | | | 0.84***(7.59) |
| R-Squared | 0.29 | 0.91 | 0.32 |
| Adjusted R-Squared | 0.25 | 0.90 | 0.23 |
| **Average Interest Rate** | **Equation 3.2** | **Equation 3.3** | **Equation 3.4** |
| Intercept ($\tau_0$) | -1.82 (-0.57) | -8.48**(-2.35) | -9.06***(-2.75) |
| CBI dummy variable ($\tau_1$) | 7.54*(2.01) | 3.46 (0.99) | 5.10 (1.69) |
| Pre-reform average interest rate ($\tau_2$) | | 0.47***(2.75) | |
| First year (1990) average interest rate ($\tau_3$) | | | 0.39*** (3.36) |
| R-Squared | 0.21 | 0.54 | 0.47 |
| Adjusted R-Squared | 0.15 | 0.48 | 0.40 |
| **Interest Rate Variability** | **Equation 3.2** | **Equation 3.3** | **Equation 3.4** |
| Intercept ($\mu_0$) | 0.92 (0.86) | -1.74 (-1.37) | -0.87 (-1.24) |
| CBI dummy variable ($\mu_1$) | 0.28 (0.22) | 0.87 (0.82) | -0.07 (-1.00) |
| Pre-reform interest rate variability ($\mu_2$) | | 0.48***(2.91) | |
| First year (1990) interest rate variability ($\mu_3$) | | | 0.54***(5.60) |
| R-Squared | 0.00 | 0.68 | 0.37 |
| Adjusted R-Squared | -0.06 | 0.63 | 0.28 |
| Number of countries (n= 18) | | | |

Source: Calculated by author.

The t-values are in parenthesis. *, ** and ** denote statistical significance at 10%, 5% and 1%, respectively. $X^0$ is 1990 average performance.

Equation 3.2 in table 3.7 shows that the coefficient on the CBI dummy ($\alpha_1$) is statistically insignificant for most of the variables. Equation 3.2 is not robust partly because it does not control for the RTM. Equation 3.2 shows that CBI is only significant in showing that CBI improved economic growth for non-reformers and reduced average interest rates for reformers. In equation 3.3, CBI is only significant in showing that non-reformers reduced average inflation, given pre-reform average inflation ($X_i^{pre}$). In equation 3.4, CBI is only significant in showing that reformers reduced inflation variability, given first year performance ($X_i^0$).

Equations 3.3 and 3.4, which control for the RTM, suggest some effect of the RTM in the inflation and interest rate variables. The equations show that while the coefficient on the CBI dummy variable is statistically insignificant, the coefficients on the pre-reform average and the first year values are statistically significant. The equations improve with the addition of control variables for the RTM, namely $X_i^{pre}$ and $X_i^0$. Equation 3.3 suggests the effect of the RTM on inflation and interest rates. The economic growth equations do not suggest much effect of the RTM. The cross-country variations in economic growth are lower than for inflation and interest rates. Generally, the results suggest that CBI does not matter for macroeconomic performance. Instead, pre-reform and initial macroeconomic performances seem more important.

Table 3.8: Sensitivity Analysis for Low and High Pre-Reform Performers (1990-2008)

| Country Macroeconomic Performance Status | Pre-Reform Macroeconomic Performance Status | CBI Dummy Variable Estimate |
|---|---|---|
| **Average Inflation** | | $(\widehat{\alpha 1})$ |
| High performers | Low average inflation countries | 1.74 (0.50) |
| Low performers | High average inflation countries | -19.15 (-0.75) |
| **Inflation Variability** | | $(\widehat{\beta 1})$ |
| High performers | Low inflation variability countries | 1.50 (1.09) |
| Low performers | High inflation variability countries | 4.50 (0.97) |
| **Average Economic Growth** | | $(\widehat{\lambda 1})$ |
| High performers | High average economic growth countries | -3.57*(-2.24) |
| Low performers | Low average economic growth countries | 0.85 (0.99) |
| **Economic Growth Variability** | | $(\widehat{\gamma 1})$ |
| High performers | Low growth variability countries | -0.06 (-0.11) |
| Low performers | High growth variability countries | -1.25 (-0.29) |
| **Average Interest Rate** | | $(\widehat{\tau 1})$ |
| High performers | Low average interest rate countries | 1.65 (0.60) |
| Low performers | High average interest rate countries | 21.30*(2.32) |
| **Interest Rate Variability** | | $(\widehat{\mu 1})$ |
| High performers | Low interest rate variability countries | -0.99***(-4.71) |
| Low performers | High interest variability countries | 2.52 (0.63) |

Source: Calculated from the sample data. The t-values are in parenthesis. *, ** and *** denote statistical significance at 10%, 5% and 1%, respectively.

Table 3.8 suggests that CBI only had significant positive effect in high average interest rate countries. Generally, the results suggest that CBI does not matter for macroeconomic performance. On average, pre-reform poor performers improved macroeconomic performance by larger magnitudes than pre-reform high performers.

The overall results suggest that macroeconomic performance improved over the study period. The key descriptive statistics suggest that on average, (i) non-reformers did better than reformers and (ii) low pre-reform performers did better than high pre-reform performers in improving macroeconomic performance. The results suggest that CBI does not matter for macroeconomic performance. The improvements in macroeconomic performance seem to have resulted from factors, other than CBI. In some countries, macroeconomic performance improved well before the reforms and even began deteriorating in the later years of the reform, for some of the macroeconomic variables. The results suggest that past pre-reform period and initial macroeconomic performance have impact on macroeconomic performance during reform. The general improvement in macroeconomic performance may have possibly resulted from a number of macroeconomic convergence and stabilization programmes, which promote reductions in inflation and fiscal deficits, among other macroeconomic objectives. For example, the Bank of Ghana and the South African Reserve Bank are already inflation targeters, which support CBI objectives like price stability. These programmes and institutional arrangements like IT may have complemented CBI efforts. In addition, CBI is slow-moving process, some of its benefits may be realized over longer periods of time. CBI is generally considered less plausible where CB laws are weak. As pointed out by Cukierman et al. (1992), institutional CBI may not guarantee independent monetary policy in practice. The legal CBI status of the CBs, which we link to the macroeconomic variables of choice, may differ significantly from actual practices, resulting in an unsystematic and insignificant link between CBI and the macroeconomic variables.

## 3.6 Conclusion

We measured the effects of CBI on macroeconomic performance in 20 selected African countries over 1990-2008 using the DID method. The results suggest that CBI does not matter for macroeconomic performance. We conclude that African governments need to do broader macroeconomic reforms, alongside and beyond CBI reforms. Other possible factors that could be explaining the trends in macroeconomic performance need investigation in future research.

## 3.7 Appendices

**Appendix 3.1: Major Central Bank Independence Reform Legislation**

| Country | Acronym | Year | Sources of CBI Reform Legislation | Major CBI Reform Legislation |
|---|---|---|---|---|
| Algeria | BOA | 1990 | (http://www.bank-of-algeria.dz) and e-mail | Bank of Algeria Act of April 1990 |
| Uganda | BOU | 1993 | (http://www.bou.or.ug) and e-mail | Bank of Uganda Statute of May 1993 |
| Tanzania | BOT | 1995 | (http://www.bot-tz.org) and e-mail | Bank of Tanzania Act of February 1995 |
| Zimbabwe | RBZ | 1995 | (http://www.rbz.co.zw) and e-mail | Reserve Bank of Zimbabwe Act of January 1995 |
| Botswana | BOB | 1996 | (http://www.bankofbotswana.bw) and e-mail | Bank of Botswana Act of December 1996 |
| Kenya | CBK | 1996 | (http://www.centralbank.go.ke) and e-mail | Central Bank of Kenya Act of 14 April 1996 |
| South Africa | SARB | 1996 | (http://www.reservebank.co.za) and e-mail | Act No. 108 of March 1996 |
| Zambia | BOZ | 1996 | (http://www:boz.zm) and e-mail | Bank of Zambia Act No. 43 of December 1996 |
| Nigeria | CBN | 1998 | (http://www.cenbank.org) and e-mail | Decree No. 38 of 1998 and Decree no.37 of Dec. 1998 |
| Ghana | BOG | 2002 | (http://www.bog.gov.gh) and e-mail | Bank of Ghana Act of January 2002 (Act 612) |
| Egypt | CBE | 2003 | (http://www.cbe.org.eg) and e-mail | Law No. 88 of July 2003 |
| Mozambique | BM | 2003 | (http://www.bancomc.mz) and e-mail | Law No. 1/92 of January 2003 |
| Mauritius | BOM | 2004 | (http://www.bom.intnet.mu) and e-mail | Bank of Mauritius Act of October 2004 |
| Tunisia | BCT | 2006 | (http://www.bct.gov.tn) and e-mail | Law No. 2006-26 of 15 May 2006 |
| Angola | BNA | None | (http://www.bna.ao) and e-mail | None (Non-reformer) |
| Ethiopia | NBE | None | (http://www.nbe.gov.net) and e-mail | None (Non-reformer) |
| Malawi | RBM | None | (http://www.rbm.mw) and e-mail | None (Non-reformer) |
| Mauritania | BCM | None | (http://www.bcm.mr) and e-mail | None (Non-reformer) |
| Rwanda | NBR | None | (http://www.bnr.rw) and e-mail | None (Non-reformer) |
| Sudan | BOS | None | (http://www.bankofsudan.org) and e-mail | None (Non-reformer) |

Sources: Central banks databases and e-mail correspondence.

Notes

We only report the major CBI-enhancing legislation. Over the study period, even some of the non-reformers changed CB legislation, but some of the changes were not related to CBI or were not CBI-enhancing and are therefore not reported for this purpose. For countries that implemented several CBI changes, we reported the instrumental changes.

**Appendix 3.2: Effective Central Bank Independence Change Dates**

| Country | Year of Announcement | Quarterly Date | Full Date of Announcement | Effective Year of CBI Reform |
|---|---|---|---|---|
| Algeria | 1990 | 1990:2 | 14-Apr-1990 | 1990 |
| Uganda | 1993 | 1993:2 | 14-May-1993 | 1993 |
| Tanzania | 1995 | 1995:1 | 17-Feb-1995 | 1995 |
| Zimbabwe | 1995 | 1995:1 | Jan-1995 | 1995 |
| Botswana | 1996 | 1996:4 | 19-Dec-1996 | 1997 |
| Kenya | 1996 | 1996:2 | 14-Apr-1996 | 1996 |
| South Africa | 1996 | 1996:1 | 15-Mar-1996 | 1996 |
| Zambia | 1996 | 1996:4 | 12-Dec-1996 | 1997 |
| Nigeria | 1998 | 1998:4 | Dec-1998 | 1999 |
| Ghana | 2002 | 2002:1 | 24-Jan-2002 | 2002 |
| Egypt | 2003 | 2003:3 | 16-Jul-2003 | 2003 |
| Mozambique | 2003 | 2003:1 | Jan-2003 | 2003 |
| Mauritius | 2004 | 2004:4 | 10-Oct-2004 | 2005 |
| Tunisia | 2006 | 2006:2 | 15-May-2006 | 2006 |

Sources: Central bank Acts, Act amendments, country constitutions and e-mail correspondence.

**Appendix 3.3: List of Reformers and Non-Reformers (1990-2008)**

| Country | Name of Central Bank | Central Bank Acronym | CBI Dummy Variable ($D_i$) | CBI Reform Status |
|---|---|---|---|---|
| Algeria | Bank of Algeria | BOA | 1 | Reformer |
| Angola | National Bank of Angola | BNA | 0 | Non-reformer |
| Botswana | Bank of Botswana | BOB | 1 | Reformer |
| Egypt | National Bank of Egypt | NBE | 1 | Reformer |
| Ethiopia | Central Bank of Ethiopia | CBE | 0 | Non-reformer |
| Ghana | Bank of Ghana | BOG | 1 | Reformer |
| Kenya | Central Bank of Kenya | CBK | 1 | Reformer |
| Malawi | Reserve Bank of Malawi | RBM | 0 | Non-reformer |
| Mauritania | Central Bank of Mauritania | BCM | 0 | Non-reformer |
| Mauritius | Bank of Mauritius | BOM | 1 | Reformer |
| Mozambique | Bank of Mozambique | BM | 1 | Reformer |
| Nigeria | Central Bank of Nigeria | CBN | 1 | Reformer |
| Rwanda | National Bank of Rwanda | NBR | 0 | Non-reformer |
| South Africa | South African Reserve Bank | SARB | 1 | Reformer |
| Sudan | Bank of Sudan | BOS | 0 | Non-reformer |
| Tanzania | Bank of Tanzania | BOT | 1 | Reformer |
| Tunisia | Bank of Tunisia | BCT | 1 | Reformer |
| Uganda | Bank of Uganda | BOU | 1 | Reformer |
| Zambia | Bank of Zambia | BOZ | 1 | Reformer |
| Zimbabwe | Reserve Bank of Zimbabwe | RBZ | 1 | Reformer |
| Sample Average | | | 0.70 | |

Sources: Central bank Acts, Act amendments, country constitutions and e-mail correspondence.

Notes

Following literature we assume that the CBI reform status remains stable throughout the study period, 1990-2008 (See Daunfeldt et al. (2008)).

**Appendix 3.4: Questionnaire to Central Banks**

Q1: Did your government make any central bank legislative (institutional) change (s) that granted your central bank, more legal independence in the period 1990-2008?

Answer: Yes ☐ or No ☐

(Please tick the applicable ☑ Option).

Q2: If the answer to Q1 is yes, in which year was the legislative change effectively implemented? Give the date in full using the format DD/MM/YYYY.

Q3: If the answer to Q1 is yes, what was the exact nature of the central bank legislative change?

Q4: If the answer to Q1 is yes, give us the sources of this information.

Q5: You are free to provide any details on the issues covered in questions, Q1-Q4.

# CHAPTER 4: FISCAL DOMINANCE AND CENTRAL BANK INDEPENDENCE

## 4.1 Introduction

The relationship between monetary and fiscal policies is key in the conduct of monetary policy. This is because monetary and fiscal authorities operationally can compete for dominance, a practice which can easily result in sub-optimal monetary policy outcomes (Alesina (1988, 1989) and Forder (1998)). In some African countries, this relationship is argued to be commonly characterized by fiscal dominance (FD) of monetary policy. FD seems to be a key policy theme in the conduct of monetary policy in most African countries (Fry (1998)). FD refers to the extent to which fiscal deficits condition the rate of growth of money supply (Fischer (1998)). FD implies the subordination of monetary policy to fiscal policy (Fry (1998)). This is because under FD, monetary policy is largely driven by fiscal policy requirements (King and Plosser (1985)). The FD hypothesis implies that any arbitrary fiscal policy has to be accommodated by monetary policy, to ensure the solvency of the public sector (Grilli et al. (1991)).

FD is generally considered to be high in Africa. This practice is explained by several factors. Firstly, the ability to obtain government revenues through the fiscal system is generally weak. Secondly, domestic financial markets are typically shallow. Thirdly, access to international credit lines is limited by low international credit ratings (Maxfield (1997)). As a result of these constraints, the financing of fiscal deficits is partly done through money creation by the central bank (CB). Some governments in Africa use their CBs as fiscal milk cows (Chandavarkar (1996)). Consequently, seigniorage revenue requirements tend to rise with growing fiscal deficits. Following Sargent and Wallace (1981), there has been debate that even an independent CB can be overwhelmed by excessive fiscal policies into monetization of fiscal deficits (Grilli et al. (1991)). Fiscal deficits are considered unfavourable for monetary policy. This is because it is generally understood that sooner or later the government will resort to money creation to finance the growing fiscal deficits (Miller (1983); Neyapti (2003); Mukhatar and Muhammad (2010)).

There are claims that money creation can distort the distinction between monetary and fiscal policies, increase average inflation and its variability, increase average interest rate and its variability, reduce average economic growth and increase its variability (Neyapti (2003)). There

are also contrary claims that this may not always be the case (Burdekin and Wohar (1990)). These conflicting claims are subject to our investigation in the case of Africa.

There are empirical studies that find that fiscal deficits are indeed monetized and have effect on macroeconomic variables (Dornbusch and Fischer (1981); Demopoulos et al. (1987); Burdekin and Laney (1988); DeHaan and Zelhorst (1990); Edwards and Tabellini (1991); Shabbir and Ahmed (1994); Metin (1998)). There are also studies that find that fiscal deficits are not monetized or find very little evidence of monetization of fiscal deficits. Such studies find that fiscal deficits do not have effect on macroeconomic variables (Joines (1985); King and Plosser (1985); Giannaros and Kolluri (1985); Protopapadakis and Siegil (1987); Banhart and Darrat (1988); Bilquees (1988); Burdekin and Wohar (1990); DeHaan and Zelhorst (1990); Karass (1994); Brown and Yousefi (1996); Sikken and Haan (1998)). Miller (1983) argues that even if not monetized, fiscal deficits are still bad for macroeconomic performance through crowding out of private investment. Empirical evidence on the monetization of fiscal deficits is mixed and inconclusive (Gordon (1977); King and Plosser (1985); Burdekin (1987); Demopoulos et al. (1987); Protoprapapadikis and Siegel (1987); Banhart and Darrat (1988); Willet et al. (1988); Burdekin (1989)). Empirical evidence on the degree of FD and its effects on CBI and macroeconomic performance is also mixed and inconclusive (Neyapti (2003)). Much of the evidence is from developed countries. Evidence from Africa only may differ to some extent.

We investigate 3 main FD issues in this study. Firstly, we measure the degree of FD in 20 African countries, over 1990-2008. The selected countries are Algeria, Angola, Botswana, Egypt, Ethiopia, Ghana, Kenya, Malawi, Mauritania, Mauritius, Mozambique, Nigeria, Rwanda, Sudan, South Africa, Tanzania, Tunisia, Uganda, Zambia and Zimbabwe. We benchmark against 15 Asian and 11 Latin American countries. Secondly, we measure the effect of FD on CBI. Thirdly, we measure the effect of FD on macroeconomic performance. We measure macroeconomic performance by the means and standard deviations in inflation, real economic growth and interest rates. We argue that CBI may not be sustained if FD prevails. This is because of potential government pressure on the CB, to monetize the fiscal deficits (Cukierman et al. (1992); DeHaan and Sturm (1992); Pollard (1993); Fry (1998)).

This study is motivated by several factors. Firstly, there is mixed and inconclusive evidence on the degree of FD in Africa, its effects on CBI and macroeconomic performance (Neyapti (2003)).

Secondly, since the early 1990s, most African countries have reformed their CBs in a bid to boost legal CBI. High CBI may not be sustained if FD prevails. This is because dependent CBs may not be able to resist government pressure to monetize fiscal deficits (Grilli et al. (1991)). If governments realize that there are only loose limits on their ability to monetize fiscal deficits, they may not limit fiscal deficit spending (Pollard(1993)). Thirdly, a number of African countries are muting inflation targeting (IT) as part of the disinflationary institutional arrangements. IT may not be feasible if FD prevails. Fourthly, in investigating the relationship between FD and macroeconomic variables, previous studies have not focused much on the role of institutional variables like CBI (Neyapti (2003)). Fifthly, previous studies have not focused much on African countries, which have relatively high fiscal deficits. Previous studies have focused more on developed countries, particularly OECD countries (Dwyer (1982); Giannaros and Kolluri (1985); Darrat (1985); Ahking and Miller (1986)). We seek to close some of these gaps in the literature.

We make several empirical contributions to the literature. Firstly, we use recent data covering 1990-2008. Secondly, we use an updated comprehensive set of 5 CBI indices to investigate the relationship between FD and CBI. Following Grilli et al. (1991), we measure CBI in political and in economic terms. Following Cukierman et al. (1992), we measure CBI in legal (de jure) and in factual (de facto) terms. In this case, CBI accounts for the institutional aspects of a CB. Thirdly, we use 6 key measures of macroeconomic performance. Fourthly, we use the 2-step system generalized method of moments (GMM) in dynamic panel data (DPD) for the regression estimations. This method is associated with Arellano and Bover (1995) and Blundell and Bond (1998). System GMM has several merits in this case. This method controls for unobserved country-specific fixed effects, controls for endogeneity bias among variables, persistence in variables, serial autocorrelation and heteroscadasticity of an unknown form, among other advantages (Roodman (2009)). Fifthly, we use multivariate, instead of bivariate regressions, which are prone to omitted variable bias, among other estimation problems.

The results suggest that on average, fiscal deficits are prevalent in Africa. They are relatively higher than what attains in Asian and Latin American countries. There are wide cross-country variations, however. We do not find evidence that fiscal deficits are monetized over the study period. FD does not have significant effects on CBI and macroeconomic performance. It seems that CBI and macroeconomic performance are affected by factors, other than FD.

The rest of the paper is organized as follows. Section 4.2 presents common measures of FD. Section 4.3 presents related literature. Section 4.4 presents the methodology and sample data. Section 4.5 presents empirical findings. Finally, section 4.6 concludes with some policy remarks.

## 4.2 Common Measures of Fiscal Dominance

Common measures of FD include the (i) fiscal balance in percent of GDP, (ii) seigniorage revenue in percent of GDP, (iii) net CB credit to government in percent of GDP, and (iv) inflation tax (Fry (1998)). The FD hypothesis is premised on that both the size of the fiscal deficit and its financing methods, determine the degree of CBI in most less developed countries (Fry (1998)). FD can be indicated by evidence of monetization of fiscal deficits through a strict causal link running from the fiscal deficit measure to base money (Fry (1998)). This is because CBs commonly finance fiscal deficits by expanding base money. Fiscal deficits are more likely to have impact on CBI and macroeconomic performance if they are monetized (Fry (1998)).

The first measure of FD is the fiscal balance, measured in percent of GDP. This measure is commonly used for several reasons. Firstly, it measures the size of the fiscal position. It reflects fiscal policy stance and fiscal discipline. Secondly, the fiscal balance generates a requirement for financing government expenditure. This is because permanent fiscal deficits have to be financed. This measure therefore reflects the public sector borrowing requirement (PSBR). In most African countries, the overall balance is a fiscal deficit. Although there is no standard rule, in general, the fiscal deficit-to-GDP ratio is considered high if it is more than 5% of GDP (Gupta (1992)).

The second measure of FD is seigniorage revenue, measured in percent of GDP. Seigniorage revenue is generated by the creation of money. It is measured as the change in base money in percent of GDP (Masson et al. (1997)). Base money is the sum of currency in circulation (C) and total reserves (R) held by banks at the CB. The higher the level of seigniorage revenue, the higher the level of FD, and the lower the degree of CBI (Cukierman et al. (1992) and Fry (1998)). In practice, seigniorage revenue generation occurs because base money costs only a small fraction of its face value to produce. Alternative sources of implicit fiscal deficit financing are not easy to measure in most African countries. They are usually relatively too small to finance growing fiscal deficits. The alternatives include revenues and operating profits of CBs. The link between the inability of government to raise required revenue from conventional

sources and its recourse to seigniorage is prevalent in most African countries (Cukierman et al. (1992)). This practice is linked to the weak structural features of most African countries. These include concentrated and unstable sources of tax revenue, poor tax collection procedures, skewed income distribution, shallow domestic financial markets and the tendency to abuse seigniorage revenue, particularly in times of economic crisis (DeBelle et al. (1998)). There is general consensus that high inflation is often caused by government requirements to raise seigniorage revenue to finance growing fiscal deficits (Sargent (1982); Dornbusch and Fischer (1986); Van Wijnbergen (1989); Buiter (1990); Easterly and Schmidt-Hebbel (1994)).

The third measure of FD is the increased net CB credit to government. African countries with high FD tend to rely more on their CBs for financing fiscal deficits (Chandavarkar (1996)). This is because CB financing of fiscal deficits is relatively cheaper than market-based financing methods. Most CB governors in Africa are subservient. Subservience implies that the CB can easily extend cheap credit to the Treasury. Interest rates charged are generally lower than market interest rates. To avoid expensive credit, the Treasury of a less developed country will usually put pressure on the interest rate setting monetary policy board of the CB or MPC not to raise interest rates, but instead print money and buy Treasury bills with printed money (Fry (1998)).

The fourth measure of FD is inflation tax. Inflation tax is the reduction in the real value of the stock of base money, due to inflation. It is the product of the growth rate of base money and real money balances, in percent of GDP. Real money balances are base money in constant prices. Inflation tax is a cheap tax to collect. It is prone to misuse by fiscally-indisciplined governments.

Fiscal deficits are financed in several ways. The government can (i) borrow from the CB at no cost, (ii) obtain finance from the CB at a cost below market interest rates, (iii) obtain finance from abroad in foreign currencies, or (iv) borrow from the domestic private sector at market interest rates. If FD is high, there is general tendency for the government to rely more on the CB to finance the deficits cheaply (Sargent (1982); Dornbusch and Fischer (1986); Van Wijnbergen (1989); Buiter (1990); Easterly and Schmidt-Hebbel (1994); Fry (1998)). Literature suggests that even where the size of the fiscal deficit is modest, its financing can be crucial (Fry (1998)). In addition, each method of financing the fiscal deficit has economic implications. CB financing involves printing of money, which expands base money, increases the growth rate of money supply and inflation, and distorts the distinction between monetary policy and fiscal policy.

Domestic bond issues increase money market interest rates. With the exception of South Africa, most SSAs have thin domestic bond markets. They cannot continuously issue bonds to finance growing fiscal deficits. In addition, the public may not be able or willing to buy government bonds. Foreign financing increases the external debt burden. Lastly, some financing sources are only available under certain conditions, which some African countries may not always satisfy.

## 4.3 Related Theoretical and Empirical Literature

The dynamic inconsistency theory of monetary policy explains why at times, decisions about the monetary base could be dominated by fiscal authorities instead of monetary authorities. The FD hypothesis is based on the interaction between monetary policy and fiscal policy as well as their effects on price stability and other macroeconomic variables. The FD hypothesis is associated with the quantity theory of money (QTM) and the fiscal theory of the price level (FTPL). The QTM is associated with Sargent and Wallace (1981)'s Some Unpleasant Monetarist Arithmetic. The FTPL is associated with Woodford (2001). These theories suggest that inflation and other macroeconomic variables are determined by both monetary and fiscal policies. In the monetarist framework, fiscal deficits are inflationary only to the extent that they are monetized. According to the FTPL, money creation may not be the only channel through which fiscal policy becomes dominant and the fiscal deficit causes inflation. Fiscal policy may directly jeopardize the price stability objective even when there is a strongly committed CB that does not accommodate the government financing requirements or employment objectives through the printing of money.

The QTM argues that the monetarist arithmetic might be misleading because it ignores the fact that governments are constrained by their inter-temporal budget. According to the QTM tight money may lead to an unsustainable debt financing process and thus, higher inflation in the long-run. In the FTPL, there is virtually no role for money in the determination of prices in a non-Ricardian world. Inflation is a fiscally-driven monetary phenomenon and nominal monetary growth is endogenously determined by the need to finance an exogenously given fiscal deficit to satisfy the budget constraint. According to the FTPL, prices adjust to the increases in nominal private sector wealth resulting from bond-financed deficits. In this non-Ricardian world, inflation is a symptom of too much nominal wealth chasing too few goods. The FTPL does not deny the possibility that fiscal disturbances may affect money supply. As noted by Woodford (2001), the monetary accommodation of inflation, resulting from fiscal deficits is a story that is consistent

with the FTPL. That is, the causality is not from the fiscal deficit to money supply and then from money supply to prices as in Sargent and Wallace (1981), but instead it is from to prices and then from prices to money supply in the FTPL.

In terms of empirical literature, there are studies that confirm the negative relationship between fiscal deficits and CBI (Bade and Parkin (1987); Burdekin and Laney (1988); Cukierman (1992); Cukierman et al. (1992); DeHaan and Sturm (1992); Lucotte (2009)). There are also studies that refute the hypothesized negative relationship (Masciandaro and Tabellini (1988); Grilli et al. (1991); Fry (1998); Sikken and DeHaan (1998)). The effect of fiscal policy on CBI and macroeconomic variables is argued to be more magnified in developing and transitional economies (Fry (1998)). Table 4.1 summarizes some of the related previous empirical evidence on the relationship between FD and CBI. The different studies have used different methods of analysis as indicated in table 4.1.

Table 4.1 suggests that the hypothesis that fiscal deficits result in low CBI is weakly supported by empirical evidence. Some of the results are ambiguous or statistically insignificant. Possible reasons for the weak outcomes include endogeneity bias in variables, which some previous authors do not control for (Lucottee (2009)). The results seem to depend on specific CBI indices used, methodology of analysis, countries investigated and study periods. Table 4.1 shows that the most commonly used indices are the aggregate GMT index, following Grill et al. (1991) and the legal CWN index, following Cukierman et al. (1992). LL is a sub-index of both legal CWN and aggregate GMT indices, which focuses on CB lending restrictions to government. The VUL index refers to the annual average turnover rate of CB governors, which occur within 6 months after a major political change. Such changes include the change of the State President, Minister of Finance, Cabinet or the government. Empirically, the LL, TOR and VUL indices have been used least. Notably, the TOR index has been used mostly in studies which include less developed countries, where it is generally found to be more appropriate (Cukierman et al. (1992); DeHaan (2001); Dreher et al. (2007); DeHaan and Klomp (2010)). The TOR and VUL are factual indices. LL is a legal index. Table 4.1 shows that most empirical studies have focused more on developed countries, particularly the OECD countries. Empirical evidence from Africa only may differ to some extent because both the macroeconomic policy environment and the status of CBI are different from what is common in developed countries or other regions.

Table 4.1: Empirical Literature on Fiscal Deficits and Central Bank Independence

| Author (s) and Year of Study | Number and Group of Countries | Study Period | CBI Index | Methodology of Analysis | Relation between CBI and Fiscal Deficits |
|---|---|---|---|---|---|
| Lucottee (2009) | 78 less developed countries | 1995-2004 | CWN & TOR Indices | Panel data regression analysis HT and FE models | Negative and insignificant for CWN in LDCs. Negative and significant for TOR in LDCs. |
| D'Amato et al. (2009) | 55 countries 23 OECD & 32 non-OECD | 1980-1989 | CWN (1992) de jure index | OLS regression analysis | Weakly negatively significant for the whole sample. Negatively significant for non-OECD countries. Negatively insignificant for OECD countries. |
| Sikken and DeHaan (1998) | 30 less developed countries | 1950-1994 & sub-periods | TOR, LL &VUL Indices | Regression analysis | Ambigous and insignificant results. Establish that CBI has no link with the size of the fiscal deficit. |
| Benassy-Quere and Psani-Ferry (1994) | 20 OECD countries | 1978-1992 | CWN & GMT Indices | Correlation analysis | Negative and not econometrically assessed. |
| Pollard (1993) | 16 OECD countries | 1973-1989 | Alesina and Summers (1993) Index | Correlation analysis | Negative and insignificant results. |
| Alesina and Summers (1993) | 16 countries | 1973-1989 | GMT Index | Correlation analysis | Negative and insignificant results. |
| DeHaan and Sturm (1992) | 18 OECD countries | 1961-1987 & sub-periods | 5 Legal CBI Indices | Correlation analysis | Negative. Significance depends on CBI index. |
| DeLong and Summers (1992) | 16 countries | 1973-1989 | GMT Index | Correlation analysis | Negative and insignificant results. |
| Cukierman et al.(1992) | 72 countries (less developed & developed countries) | 1950-1989 | CWN &TOR Indices | Panel data regression analysis | Negative and significant, especially TOR |
| Grill et al.(1991) | 18 OECD countries | 1950-1989 & sub-periods | GMT Index | Cross-sectional regressions | Negative and insignificant results. |
| Burdekin and Laney (1988) | 12 OECD countries | 1960-1983 & sub-periods | Dummy Variable | Correlation analysis | Negative and significant results. |
| Bade and Parkin (1987) | 12 industrial countries | 1955-1983 | GMT Index | Correlation analysis | Negative and significant results. |
| Masciandaro and Tabellini (1987) | 5 industrial countries | 1970-1985 | GMT Index | Correlation analysis | Negative and not statistically measured. |

Source: Compiled from the various empirical papers and Lucotte (2009).

Notes

HT is Haussmann-Taylor models.

FE is fixed effects models.

The rest of the variables are as previously defined.

GMT is the overall legal index, following Grilli et al. (1991). The GMT overall index has political and economic sub-indices, POLCBI and ECOCBI, respectively.

There is some evidence suggesting that fiscal deficits increase inflation (Allen and Smith (1983); Edwards and Tabellini (1991); Hondroyiannis and Papapetrou (1997); M$^{c}$Millin (1986); Neyapti (2003)). There is also some evidence suggesting that the positive relationship between fiscal deficits and inflation is not easily found in the data (Barro (1987); Blanchard and Fischer (1989); Burdekin and Wohar (1990); Smithin (1994); King (1995); Abizadeh and Yousefi (1998)). On the contrary, there is some evidence suggesting that fiscal deficits reduce inflation in LDCs (Choudary and Parai (1991) and Metin (1998)). Using simple correlations and bivariate regression analysis, Baldini and Ribeiro (2008) find a negative relationship between fiscal deficits and inflation in 22 SSA countries over 1980-2004. There is evidence that fiscal deficits are inflationary in high-inflation countries but that this evidence is weak if low-inflation countries are included in the samples (Fischer et al. (2003); Catao and Terrones (2005)). There is some evidence suggesting that fiscal deficits are driven by, and do not drive inflation (Montiel (1989) and Dornbusch et al. (1990)). Dwyer (1982) and Joines (1985) find that high inflation contributes to large fiscal deficits. Gavin and Perotti (1997) suggest that FD can aggravate macroeconomic instability, reduce the effectiveness monetary policy and increase inflation.

There is considerable empirical literature that examines the relationship between fiscal policy and economic growth (Kormendi and Meguire (1985); Landau (1986); Skinner (1987); Ram (1986); Koester and Kormendi (1989); Grier and Tullock (1989); Barro (1989, 1991); Levine and Renelt (1992); Engen and Skinner (1992); Easterly and Rebelo (1993); Easterly, et al. (1993); Lin (1994)). Fiscal policies may explain the observed differences in growth rates across countries (Barro (1990); King and Rebelo (1990); Rebelo (1991); Barro and Sala-i-Martin (1992); Mendoza et al. (1995)). Authors use different fiscal variables to measure fiscal policy stance in aggregated and disaggregated terms. Gupta et al. (2005) find that on average, fiscal adjustments have not been harmful to economic growth. Their evidence suggests that in low-income countries, fiscal consolidations are not harmful for either long-run or short-run economic growth.

There are studies that confirm that fiscal deficits increase interest rates (Wachtel and Young (1987); Miller and Russek (1990); Gupta (1992); Elmendorf (1993); Kuehlwein and Samalapa (1999); Canzoneri et al. (2002); Gale and Orszag (2003); Laubach (2003); Shapiro (2004); Dai and Phillipon (2004); Dellas et al. (2005); Aisen and Hauner (2008)). Aisen and Hauner (2008)

find that the increase in interest rates due to fiscal deficits is higher if financial markets are shallow, financial depth is low, capital markets are not fully liberalized, fiscal deficits are high and are mostly domestically-financed or interact with high domestic debt, financial openness is low and interest rates are liberalized. Dellas et al. (2005) find that the effect of fiscal deficits on interest rates increases with financial openness. There are also studies that refute that fiscal deficits increase interest rates (Evans (1987); Plosser (1987); Barth et al. (1991); Anyawu (1998); Elmendorf and Mankiw (1999); Chakraborty (2002); Kirchner (2007)). Goyal (2004) finds feed-back relationships between fiscal deficits and interest rates. Bhalla (1995) finds that causation runs from interest rates to fiscal deficits. Anyawu (1998) finds that fiscal deficits do not increase interest rates, but that financing methods increase interest rates, leading to his conclusion that focus should be on financing methods, rather than the size of the fiscal deficits.

## 4.4 Methodology and Sample Data

In this chapter, we develop 2 hypotheses, namely 4.1 and 4.2.

Hypothesis 4.1 is on the effect of fiscal dominance on central bank independence.

$H_0$: Fiscal dominance does not matter central bank independence.

$H_1$: Fiscal dominance matters for central bank independence.

Hypothesis 4.2 is on the effect of fiscal dominance on macroeconomic performance.

$H_0$: Fiscal dominance does not matter for macroeconomic performance.

$H_1$: Fiscal dominance matters for macroeconomic performance.

The sample is limited to 20 African countries for several reasons. Firstly, we exclude countries that belong to monetary unions or arrangements, except the lead countries like South Africa in the CMA region of Southern Africa. This is because in such arrangements, the broad monetary policy stance is determined by the grouping as opposed to the individual countries. Secondly, we exclude countries that are not strategic in CBI analysis. Thirdly, we considered data availability and consistency. Analysis starts from 1990 for several reasons. Firstly, by 1990, all the selected CBs were already operating. Secondly, CBI became more topical in the 1990s. Thirdly, before

the 1990s, some of the countries had dictatorships. CBI is less plausible under dictatorship. The end of the study period (2008) was determined by data availability on macroeconomic variables.

In terms of data, we use CBI indices, the FD measure and the macroeconomic variables of choice. We use annual panel data. The main data sources for the key macroeconomic variables include the AfDB, IFS, WDI and the respective CB databases. We annualize the CBI indices to generate their time series data. We measure FD by the fiscal balance in percent of GDP. This approach follows several authors (Darrat (1985); Easterly and Schmidt-Hebbel (1994) Burdekin and Wohar (1990); Choudhary and Parai (1991); Grilli et al. (1991); DeHaan and Sturm (1992); Alesina and Summers (1993); Pollard (1993); Bhalla (1995); Metin (1998); Sikken and DeHaan (1998); Chakraborty (2002); Neyapti (2003); Catao and Terrones (2005); Aisen and Hauner (2007, 2008); and D'Amato et al. (2009)).

Our choice of the fiscal balance to measure FD was determined by several factors. Firstly, data on this measure is available from the AfDB databases. Secondly, data constraints on alternative measures of FD limited choice to this measure. The data constraints limited the use of seigniorage revenue, net CB credit to government and inflation tax. The data constraints include lack of consistent GDP data for Ghana and Uganda, 4-digit outliers in base money and net CB credit to government for Nigeria and Rwanda, data gaps in base money for most countries as the series start late in the study period. Data on domestic debt, a common robustness check measure of FD, is not available for most countries. Excluding countries with these data constraints would have further reduced the sample size. Instead, we decided to drop these alternative FD measures.

Despite its availability, the fiscal balance measure is not without some limitations. Firstly, the fiscal balance only measures the size of the fiscal position. It does not indicate how the fiscal deficit is financed. A fiscal deficit can exist but it can be financed in ways that are harmful or not harmful to CBI or macroeconomic performance. Secondly, countries finance fiscal deficits in different ways. Measures that indicate the nature of financing would have been more informative if data were available. Thirdly, the fiscal balance measure is prone to potential measurement error. This is because countries measure fiscal deficits in different ways. In some African countries, the central government fiscal deficit figure excludes quasi-fiscal deficits, which can be substantial in some of the countries. Quasi fiscal deficits include CB losses, local government and public enterprise deficits. The exclusion of quasi-fiscal deficits understates the actual size of

the overall fiscal deficit. Quasi-fiscal deficits have the same effects on CBI and macroeconomic variables as the central government fiscal deficits. These measurement errors may result in a lack of a systematic relationship among fiscal deficits, CBI indices and macroeconomic variables. The overall fiscal balance, which we use instead of the primary balance, is prone to endogeneity bias because the overall fiscal deficit includes interest payments, which link past to current fiscal deficits. This tends to create serial correlation in the errors terms. Data on the most appropriate variable, the primary balance, measured on a cash basis, is not available for most of the selected countries. The primary balance has less endogeneity (Benassy-Quere and Psani-Ferry (1994) and Neyapti (2003)). Because of these data problems, we interpret the results with some caution.

We test if the fiscal deficits are monetized. This is because fiscal deficits are more likely to have impact on CBI and macroeconomic performance if they are monetized (Fry (1998)). In the monetarist framework, fiscal deficits are inflationary only to the extent that they are monetized. They proxy FD more closely, if monetized. We use indicative statistics. Firstly, we correlate the FD measure with the monetary aggregate, M. A high positive correlation between FD and M suggests monetization, a negative correlation suggests lack of monetization and a zero correlation suggests that FD and M are independent. Secondly, we use contemporaneous Granger causality tests between FD and M. Because of the limited sample size, we do not use the inter-temporal Granger causality tests. The lags would further reduce the sample size and the degrees of freedom. Monetization implies that changes in the monetary aggregate have to react to the FD measure (Fry (1998) and Fischer (1998)). The test follows Sargent and Wallace (1981)'s Some Unpleasant Monetarist Arithmetic, which suggests that FD implies a positive correlation between the fiscal deficit and the rate of growth of M. This relationship assumes that the fiscal shock precedes the monetary aggregate shock. It assumes that the government projects the size of the fiscal deficit and then requests the CB to monetize the fiscal deficit. The most appropriate monetary aggregate is the Treasury component of base money (Fry (1998)). We use the growth rate of money supply, M because of data gaps in the Treasury component of base money for most countries. A strict Granger-causal link from FD to M suggests monetization, dual causation does not necessarily suggest monetization and lack of a causal link from either direction suggests that FD and M are independent. According to the monetary accommodation hypothesis, not only are the fiscal deficit and the growth rate of money positively correlated, but the higher fiscal deficits also unidirectionally causes higher monetary growth and generates inflation, high interest

rates and low economic growth. However, Miller (1983) argues that fiscal deficits can cause inflation, whether or not they are monetized. They will increase inflation through crowding out of private investment due to high interest rates associated with the deficits.

Following Arellano and Bond (1995) and Blundell and Bond (1998), we measure the effects of FD on CBI and macroeconomic performance in equation 4.1. The target explanatory variable is the FD measure with coefficient $\alpha_1$. We measure the effects in country i, where i=1, 2, 3...20 in period t, where t=1990-2008.

$$Y_{i,t} = \alpha_0 + \alpha_1 FD_{i,t} + \beta_1 Y_{i,t-1} + \cdots + \beta_n Y_{i,t-n} + X'_{i,t}\gamma + \mu_{i,t} \quad (4.1)$$

$$\mu_{i,t} = v_i + \varepsilon_{i,t} \quad (4.2)$$

Where $v_i \sim iid(0, \sigma_v^2)$ and $\varepsilon_{i,t} \sim iid(0, \sigma_t^2)$ are independent of each other. $Y_{i,t}$ is the macroeconomic variable or CBI index of choice for country i at time t, $FD_{i,t}$ is the fiscal dominance measure for country i at time t, $Y_{i,\,t-1}$ is the first-period lagged value of the dependent variable with unknown coefficient $\beta_1$. $Y_{i,t-n}$ is the n-period lagged value of the dependent variable with an unknown coefficient $\beta_n$. $Y_{i,t}$ is persistent and partly depends on its past levels. $\beta$ is an autoregressive parameter with $|\beta| < 1$. $X'_{i,t}$ is a set of non-fiscal variables in country i at time t and $\mu_{i,t}$ is the error term for country i at time t. $X'_{i,t}$ variables are the observed part of heterogeneity. We assume that variables in $X'_{i,t}$ are weakly exogenous because $X'_{i,t}$ may contain strictly exogenous, endogenous and predetermined explanatory variables. Variables in $X'_{i,t}$ variables are uncorrelated with future realization of the error term. In equation 4.2, we decompose the error term ($\mu_{i,t}$) into unobserved country-specific fixed effects ($v_i$) and observation-specific errors ($\varepsilon_{i,t}$). $v_i$ contains omitted variables, which are constant over time for country i. $v_i$ captures country-specific fixed effects, which induce unobserved heterogeneity, is unobservable, not directly measurable and time-invariant. $\varepsilon_{i,t}$ captures the remaining omitted variables and is assumed homoscadastic.

The null hypothesis that FD does not matter for CBI and macroeconomic performance is rejected if the coefficient on the FD measure ($\alpha_1$) is significantly different from 0. For average inflation and its variability, average interest rate and its variability, apriori $\alpha_1>0$. For average economic growth, apriori $\alpha_1<0$. For economic growth variability, apriori $\alpha_1>0$. For the legal CBI indices, apriori $\alpha_1<0$. For the factual CBI index, the annual average TOR of CB governors, apriori $\alpha_1>0$.

For the CBI dependent variable in equation 4.1, we use the updated comprehensive set of 5 CBI indices we developed in chapter 2. These include the CWN, GMT, TOR, POLCBI and ECOCBI indices, as previously described. Our choice of the CBI indices follows empirical literature that investigates the relationship between fiscal deficits and CBI indices (Masciandaro and Tabellini (1987); Bade and Parkin (1988); Burdekin and Laney (1988); Grilli et al. (1991); DeLong and Summers (1992); DeHaan and Sturm (1992); Alesina and Summers (1993); Benassy-Quere and Psani-Ferry (1994); Sikken and DeHaan (1998); D'Amato et al. (2009); Lucottee (2009)). We go beyond previous studies by disaggregating the overall GMT index into its political and economic sub-indices. We use multiple indices as a robustness check on the results because each index is a noisy indicator of actual CBI. The multiple indices enable us to account for the multidimensional aspect of CBI, minimize measurement error and possible bias associated with each index (Cukierman et al. (1992); Neyapti (2003); Jacome and Vazquez (2008); and Lucottee (2009)).

Since the macroeconomic variables have an annual time series frequency, we annualize the CBI indices by generating their annual time series data. We identify years in which there were significant actual changes in CBI legislation in each country through reading CB Acts, Act amendments and country constitutions over 1990-2008. We recalculate legal CBI whenever there is a major change in CBI legislation and carry over the same figure till there is a new change. We repeat the TOR figure for each year over the periods in which it was originally reported till there is a new turnover in each country. This procedure follows previous authors (DeHaan and Sturm (2000); Neyapti (2003); Dreher et al. (2007); Arnone et al. (2008)). We run the CBI regression 5 times, with 1 CBI index each time. Firstly, we seek to avoid potential multicollinearity among the indices. Secondly, we examine how each index reacts to FD changes. The impact may differ per index because they each measure a different aspect of CBI. This approach follows previous studies (Neyapti (2003); Arnone et al. (2008)); Jacome and Vazquez (2008) and Lucotte (2009)).

For the CBI dependent variable in equation 4.1, the non-fiscal determinants of CBI include political instability, level of economic development, openness of the economy and past inflation. Following D'Amato et al. (2009), we measure the level of economic development by the growth rate of real GDP. We define political instability by a combination of political events that potentially affect the commitment of monetary authorities to the price stability objective of the CB. It is a dummy variable with value 1 for years with CBI relevant political disturbances and 0,

otherwise. Following Dreher et al. (2007), we measure openness of the economy by the sum of exports and imports, in percent of GDP. For the non-fiscal determinants of CBI, we use some of the 8 variables in D'Amato et al. (2009), who investigate 55 countries, OECD and non-OECD, over 1980-1989. We use only those of their variables that are relevant, available or measurable for our sample. We use variables in D'Amato et al. (2009) because it is a recent comprehensive study that links CBI to its potential determinants, which include fiscal deficits.

For the inflation dependent variable in equation 4.1, we measure inflation by the annualized consumer price index (CPI). As a robustness check on the regular inflation variable, we use transformed inflation to reduce heteroscadasticity of the error term and to increase the efficiency of the estimators. This is because regular inflation may give undue weight to inflationary outliers in the sample (Cukierman et al. (1992); DeHaan and Kooi (2000); Neyapti (2003); Jacome and Vazquez (2008); Arnone et al. (2008)). We define transformed inflation (D) by the regular inflation rate, divided by one plus the regular inflation rate, $D=\pi/(1+\pi)$. Transformed inflation measures the real rate of depreciation in money balances. Its values range 0-1. The non-fiscal determinants of inflation in this study include past inflation, international inflation, rate of growth of broad money supply, rate of growth of real GDP, exchange rate depreciation against the US dollar and the CBI indicator. We use the US CPI inflation rate to proxy international inflation. For regression estimations, we use the broad definition of money (M2) only because the narrow definition of money (M1) has extreme outliers. Removing outliers would reduce the sample size and the degrees of freedom. We run the inflation regression with the FD measure and the monetary aggregate separately because these variables are potentially collinear. We do not follow any specific study to define inflation variables. We only report robust results.

For the real economic growth rate dependent variable in equation 4.1, we measure average economic growth by the annualized growth rate of real GDP. The non-fiscal variables are derived from general empirical literature on economic growth (Barro (1991, 1995, 1996, 2003); Mankiw et al. (1992); Levine and Renelt (1992); Fischer (1993); Easterly and Rebelo (1993); Benhabib and Spiegel (1994); Borensztein et al. (1995); Easterly and Bruno (1995); Easterly and Levine (1997); Sala-i-Martin (1997)). The non-fiscal determinants of real economic growth include past real economic growth, inflation, rate of growth of broad money (M2), foreign direct investment in percent of GDP, gross fixed capital information in percent of GDP and changes in

terms of trade. We proxy domestic investment by gross fixed capital formation, in percent of GDP. As a robustness check, we use transformed inflation in place of regular inflation, as explained before. Because of too many data gaps on primary and secondary education enrollment rates in percent of GDP figures for the selected countries, we fail to use these variables to account for human capital development in economic growth. We only report the robust results.

For the interest rate dependent variable in equation 4.1, we measure interest rate by the annualized nominal and real lending rates. We use short-term interest rates. Our choice was determined by data availability. The non-fiscal determinants of interest rates include past interest rate, international interest rate, expected domestic inflation, expected exchange rate depreciation against the US dollar, rate of growth of broad money supply (M2) and real GDP growth. We proxy international interest rates by the US interest rate. We close the interest rate data gaps for Ghana through linear interpolation. Because of data constraints on expected values in these variables, we use actual values of FD, inflation and exchange rate depreciation in place of their expected values as suggested by theory and empirical literature. This creates expectational errors, but system the GMM estimator controls for such errors. We run the regression with the FD measure and the monetary aggregate separately to avoid potential collinearity. For the non-fiscal determinants, we use most of the variables in Aisen and Hauner (2008), which is a recent similar study that uses the same estimation technique, system GMM in panel data. Because of data constraints, we do not include the fiscal deficit financing interaction variables that they use.

### 4.4.1 Regression Estimation Technique

Following Arellano and Bover (1995) and Blundell and Bond (1998), we use the 2-step system generalized method of moments (GMM) in dynamic panel data (DPD). We estimate 2 equations, one in levels and the other in first differences. Each equation has specific instrumental variables (IVs). Recently, GMM estimators have been used in previous related studies. Neyapti (2003) uses difference GMM in DPD to investigate effects of fiscal deficits on inflation in 54 countries over 1970-1989. Aisen and Hauner (2008) use system GMM to investigate effects of fiscal deficits on interest rates in 60 countries over 1970-2006. Several other authors have used the GMM estimator to examine effects of fiscal deficits on economic growth (Anshasy et al. (2005); Gupta et al. (2005); Afonso and Juan (2008); Anshasy (2008); Abdullah et al. (2009)). The GMM estimator is a recent movement away from correlation analysis and VAR models.

Given our sample, panel data regression estimation has several merits. Firstly, it reduces endogeneity bias. Secondly, it is suitable for our small sample size as it generates more data through NxT, where N is the number of cross-sections and T is the study period. After dropping outliers, Angola and Zimbabwe, we use 18 cross-sections over 19 years, which generates 342 total annual panel observations. The sample is characterized by T>N, which is suitable for macroeconomic panel data models. We dropped the outliers because panel data models perform badly in their presence. Thirdly, by combining time series and cross-sectional data, it gives the data more variation, less collinearity, more degrees of freedom, improves data quality, provides better prediction of the behaviour of variables, has more reliable and more efficient parameter estimates. Fourthly, it enables analysis of dynamic adjustments, allows for testing of common dynamic trends, which cannot be done in cross-sectional data. It is better than cross-sectional data in analysing dynamics of change in short time series data, which characterises our sample. Fifthly, panel data can take explicit account of country-specific heterogeneity in data (Arellano and Bover (1995); Balgati (1995); Blundell and Bond (1998); Bond (2002); Roodman (2006)).

We use a linear DPD model by adding at least one lagged dependent variable to the explanatory variables. We use this model for several reasons. Firstly, we allow for dynamic effects in the models. Secondly, we use lags to account for persistence in the variables. Thirdly, we account for delayed partial adjustments through lagged variables. Fourthly, we account for country-specific fixed effects through orthogonal deviations data transformation. Fifthly, we account for feed-back from current or past shocks in variables. Some exogenous shocks may have continous effects over time. Sixthly, we control for autocorrelation in error terms through the lagged dependent variables. Seventhly, we examine inter-temporal behaviour among the variables.

We use the GMM estimator for several reasons. Firstly, it controls for endogeneity bias and persistence in variables, it accommodates time-invariant regressors, serial autocorrelation and heteroscadasticity of an unknown form, and controls for unobserved country-specific fixed effects. The GMM estimator uses orthogonality conditions to allow for efficient estimation in the presence of heteroscadasticity of an unknown form. Secondly, the GMM system checks for improved model performance and serial correlation. Thirdly, the GMM estimator is robust because it does not require strong distributional assumptions on the data and errors. Fourthly, it accommodates models that are partially specified. Fifthly, the GMM estimator is consistent even

in presence of measurement error (Gupta et al. (2005)). Sixthly, the GMM estimator can correct for rational expectational errors. Seventhly, the GMM system draws IVs from within the GMM system, has formal checks on their validity and makes relatively weak assumptions about the IVs. GMM estimators gain efficiency by using as IVs, all available lags of the explanatory variables. IVs control for potential endogeneity of other variables, which are different from the lagged dependant variables. Eighthly, the GMM estimator allows for the inclusion of lagged dependent variables as regressors. Ninthly, GMM is appropriate for multivariate regressions, caters for joint determination of variables and accounts for cross-country heterogeneity in data.

Despite its several merits, the GMM estimator has its own conditions and limitations. The validity of the GMM estimator depends on the absence of second order autocorrelation in error terms, absence of outliers in the data, valid IVs and imposed moment conditions. Weak IVs make point estimates, hypothesis tests and confidence intervals unreliable. The GMM estimator is subject to small sample bias if the IVs are weak. The GMM estimator can be weak in finite samples if more moment conditions are added, which do not add much information to the models (Bond et. al. (1995); Altonji and Segal (1996); Staiger and Stock (1997) and Roodman (2006)).

We use system GMM in preference to difference GMM for several reasons. Firstly, lagged levels of the regressors, associated with difference GMM, are poor IVs for the first-differenced regressors if the variables are close to a random walk. Secondly, first differences magnify data gaps if panels are unbalanced. Thirdly, difference GMM is associated with standard errors that are biased downwards. Fourthly, difference GMM performs poorly if the sample size is small. Preferably, system GMM has better small sample properties. System GMM is a consistent estimator in short samples and can accommodate a small number of cross-sections. Fifthly, by adding the second equation in system GMM, additional IVs are obtained. The variables in levels in the second equation are instrumented with their own first differences. Sixthly, by using more IVs than difference GMM, system GMM increases estimation efficiency. Seventhly, system GMM allows for predetermined explanatory variables and is better at modelling non-stationary data. Eighthly, system GMM controls for inertia in variables, which generates biased and inconsistent estimations if not accounted for. Estimation problems of the first-differenced GMM estimator are related to the weak correlation between the current differences of the regressors and the lagged levels of the IVs. The difference GMM estimator gets weaker with the degree of

persistence in the autoregressive process because as persistence increases, lagged levels become less correlated with current first-differences. Ninthly, we follow recent literature, which suggests that the efficiency of the first-differenced GMM estimator can be improved by using system GMM (Arellano and Bover (1995); Blundell and Bond (1998) and Blundell et al. (2000)).

We use forward orthogonal deviations data transformation to remove country-specific fixed effects. This does not in itself remove the endogeneity of $Y_{i,\,t-1}$, but it allows for the use of lags of $Y_{i,t-1}$ as valid IVs since they are not correlated with the transformed error term (Arellano and Bond (1991); Arellano and Bover (1995); Baltagi (2005)). Using this data transformation method, IV creation is based on group mean deviations instead of first differences (Arellano and Bover (1995)). By definition, orthogonal deviation data transformation subtracts the mean of the remaining future observations available in the sample from the current observation. The deviations are calculated for all observations except the last one and a weighting matrix is introduced to equalize variances. The advantages of this data transformation method are that orthogonal deviations (i) prevent serial correlation and preserve (ii) sample size by minimizing data losses if panels are unbalanced, (iii) homoscadasticity, (iv) orthogonality between transformed variables and lagged regressors, and (v) degrees of freedom, among other factors (Arellano and Bover (1995) and Roodman (2006)).

Following some literature, we do not use the fixed effects option because it removes variables that do not vary much over time within some cross-sections (Neyapti (2003); Dreher et al. (2008); Lucottee (2009)). These include legal CBI indices and dummy variables in our sample. For the legal CBI indices, our study period is not long enough to have much variation in these indices because CB laws are not changed frequently in most African countries. For example, the Reserve Bank of Malawi Act was last changed in 1989, implying relatively static legal CBI indices over the 19 years. Fixed effects models would give inconsistent estimates in this case.

To account for potential heteroscadasticity associated with the cross-sectional component of the panel data, we use White (1980) adjusted robust standard errors and covariance matrices. The 2-step estimator uses residuals from the first step to estimate the covariance matrix. The White (1980) standard errors allow fitting of a model that contains heteroscadastic residuals and are robust to serial correlation within cross sections and changing time. We use the n-step White (1980) period GMM weights with no degrees of freedom adjustments.

We use IVs to control for endogeneity and measurement error in the independent variables. We only use IVs that are internal in the GMM system. We could not identify valid and strong external IVs for our models because most variables that have an effect on included endogenous variables also have a direct effect on the dependent variables. As IVs for the differenced equation, we use the lagged dependent variables and the standard GMM-type differenced level independent variables, lagged once. As IVs for the levels equation, we use the GMM-type lagged differenced dependent variables. We define the IV set by Z, which comprises the second lag of the dependent variables, a single lag in both transformed and non-transformed explanatory variables. The GMM system automatically adds the constant term to the IV list.

Our relatively small sample size (N), with 18 cross-sections precludes the use of all the IVs in the GMM system. We therefore use only a subset of the whole IV set. This is because if the number of IVs exceeds N, the weighting matrix becomes singular and the 2-step estimator cannot be computed because the optimal weighting matrix has a rank of N at most (Roodman (2006)). The Sargan (1958) tests become weaker with too many IVs. Since theory does not specify an optimum number of IVs, following Roodman (2006), we use a common practical rule of thumb to limit IV count. Firstly, we restrict the number of IVs to the number of cross-sections or less. Secondly, we reduce lag depth because deeper lags tend to be weak IVs, which do not add more information to the models. Thirdly, we collapse the IV set by reducing the number of endogenous variables in the models. Fourthly, we use at least one IV for each variable instrumented. To avoid multicollinearity among IVs, we reduce the number of IVs when the IV matrix in the GMM system becomes singular. We do not use period dummy variables because the 19 annual observations potentially create too many dummy variables, which may cause multicollinearity or dummy variable trap. In addition, we do not identify time events over the study period that could be represented by the time dummy variables.

Since we use lagged variables, we use lag length to infer the length of recent past history of the dependent variable, which still influences the current dependent variable. We select lag length following the Hansen (1982) and Arellano-Bond (1991) guidelines. We restrict the number of lags on the dependent variables for several reasons. Firstly, since the sample size is small, deeper lags would further reduce the sample size and the degrees of freedom. Secondly, we avoid over-fitting the endogenous variables in the models. To determine optimum lag length, we use the

statistical significance of the coefficient of each additional lagged dependent variable on the RHS of the equations. We start with a single period or one-year lag length to reflect the annual nature of the data. Given annual data, we consider a single or one-year lag, reasonable to capture significant past effects. We experiment with deeper lags and each time, check on the robustness of results for each lag added in the model. We only report robust outcomes.

### 4.4.2 Pre-Estimation Diagnostic Tests and Data Treatment

It is procedural to test time series panel data for stationarity to ensure valid and statistically unbiased regression estimates. However, we do not use panel data stationarity tests for several reasons. Firstly, the unit root in time series data is removed by the forward orthogonal deviation data transformation in the 2-step system GMM. Secondly, using variables in first differences for stationarity purposes and also applying orthogonal deviations data transformation as part of the estimation technique would over-process the data. Thirdly, given the relatively small sample size, further first-differencing would reduce the sample size to inestimable levels. Fourthly, CBI indices, particularly the legal indices are highly persistent. Fifthly, stationarity tests in small CBI samples like in this study would not be statistically plausible (Cukierman (2010)). In related analysis, a number of previous studies have not used the panel data stationarity tests for some, but not all of the reasons we state (Fischer et al. (1996) over 1992-1994; DeMelo et al. (1996, 1997) over 5 years; Hernandez-Cata (1999) over 1990-1996 and Cukierman et al. (2000) over 1989-1996)). These studies use annual panel data with 25, 28, 26 and 26 cross-sections, respectively. Some related previous studies are silent on stationarity tests. Presumably, they do not use the stationarity tests in relatively small CBI samples. In addition, most previous CBI studies have used the Cukierman et al. (1992) data sets, which Cukierman (2010) considers relatively small for plausible stationarity testing. The Cukierman et al. (1992) data set covers 1950-1989 on a decade-wise basis. Recently, Inoue (2005) tests annual panel data for stationarity using the Im, Pesaran and Shin (IPS, 2003) test. He estimates a panel data inflation model with CBI, fiscal balance in percent of GDP and lagged inflation as some of the key explanatory variables. The model is estimated in first differences over 1995-2003, using generalized least squares (GLS). For his set of countries, the CBI indices were only stationary at first differences.

We run panel data regressions for the whole sample because the sample size is relatively small and we focus on one group of African countries. Unlike most previous panel data studies, we do

not average the panel data. Firstly, averaging would reduce the dynamic effects in the models. Secondly, averaging would reduce variability in legal CBI indices. Thirdly, since we use lagged variables, we consider a year adequate to capture dynamic adjustments. Fourthly, when a model for macroeconomic panel data includes lagged dependent explanatory variables, the GMM estimation procedure is asymptotically valid only when T is large. Thus, averaging would reduce T. For robustness checks in regression estimations, we estimate the regression equations in EViews and in Stata. We get similar results and conclusions. We finally report EViews results.

### 4.4.3 Post-Estimation Diagnostic Test Statistics

We test the models for IV overidentifying restrictions (OIRs). We use the Sargan (1958) J-Statistic to test the joint null hypothesis that the (i) IV models are correctly specified, (ii) OIRs are valid and (iii) IVs are valid and are correctly excluded from estimated equations. The null hypothesis implies no correlation between the IVs and the residuals. The Sargan J-Statistic is robust to heteroscadasticity and autocorrelation within the panels. The degree of OIRs is defined by the IV rank (s) less the number of regressors (k). The smaller the J-Statistic, the better the model. We calculate the panel data GMM Sargan J-Statistic by $J=\chi^2_{(s-k)}$. The critical J-Statistic is asymptotically distributed with s-k degrees of freedom, $\chi^2_{(s-k)}$. The null hypothesis of valid OIRs is accepted if $J_{calculated}<J_{critical}$. We reject the model specification if the J-Statistic is statistically significant. Following Roodman (2006), we only apply the Sargan test for OIRs in overidentified models as defined by s>k. We assume regressors are endogenous or weakly exogenous variables. We calculate the Sargan p-value by scalarpval=$@\chi^2$ (J, s-k). The higher the p value, the better the model. The p values higher than the 0.05 threshold support the null hypothesis that the IVs are valid. Low p values below the 0.05 threshold suggest inappropriate IVs (Bowsher (2002)).

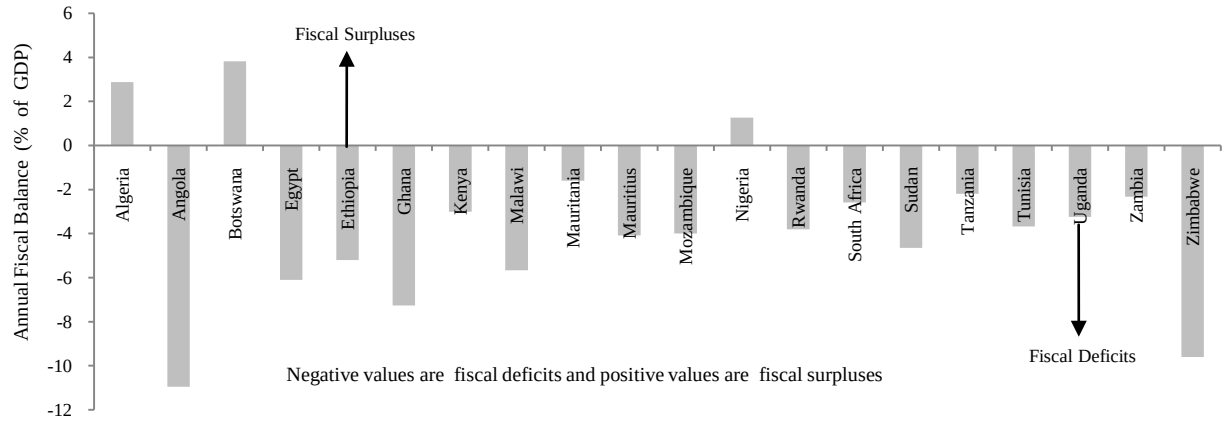
## 4.5 Presentation and Analysis of Results

### 4.5.1 Key Descriptive Statistics (1990-2008)

We measured FD by the size of the fiscal balance in percent of GDP. The results suggest that, on average, fiscal deficits are high in the selected African countries. The sample average is a fiscal deficit of -3.60% of GDP. Countries with high average fiscal deficits in excess of 5% of GDP include Angola (-10.95%), Zimbabwe (-9.60%), Ghana (-7.26%), Egypt (-6.11%), Ethiopia (-

5.21%) and Malawi (-5.67%). Countries with average surplus fiscal balances include Botswana (3.82%), Algeria (2.88%) and Nigeria (1.27%). The sample range is an average surplus balance of 3.82% of GDP in Botswana to an average deficit balance of -10.95% of GDP in Angola. The average figures suggest that fiscal policy is expansionary in the selected African countries. Several factors explain the surplus balances reported in only 3 of the selected countries. Botswana's fiscal surpluses are explained by diamond revenues, marked gains in mineral tax revenue, increased interest income on high foreign exchange reserves and restraints in government spending. The Government of Botswana operates with a fiscal policy rule, which restricts annual government expenditure to 40% of GDP. Algeria's fiscal surpluses are explained by high oil revenues and favourable hydro-carbon exports, which resulted in increased fiscal revenues and accumulation of foreign exchange reserves. Nigeria's fiscal surpluses are explained by oil revenues. Figure 4.1 shows the sample average fiscal balance in percent of GDP.

Figure 4.1: Fiscal Balance as a Percentage of GDP (1990-2008)



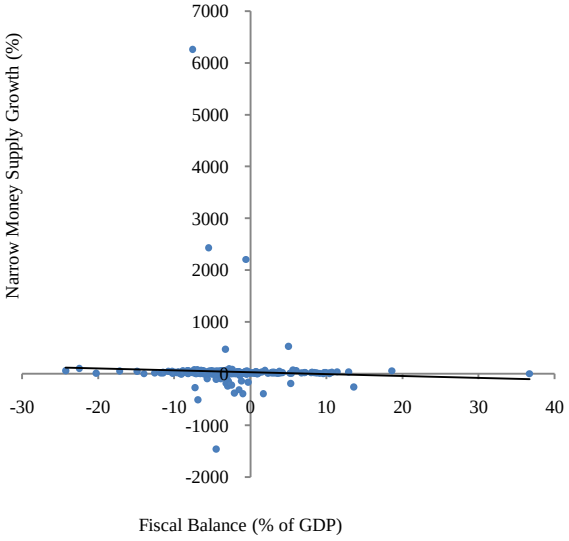

Source: African Development Bank databases (AfDB (2009)).

After dropping the outliers, Angola and Zimbabwe, the sample average fiscal balance in percentage of GDP drops from -3.60% of GDP to -2.86% of GDP. The sample average then ranges from a surplus balance of 3.82% of GDP in Botswana to a deficit balance of -7.26% of GDP in Ghana. After dropping outliers, Ghana has the highest fiscal deficit. The average sample fiscal deficit is below 5%. This implies low average fiscal deficits (Gupta (1992)). There is likely measurement error in the reported fiscal deficit data. Some countries only include central government fiscal deficits. They exclude quasi-fiscal deficits, which can be substantial in some of the countries. Their possible omission could understate the actual size of the overall fiscal

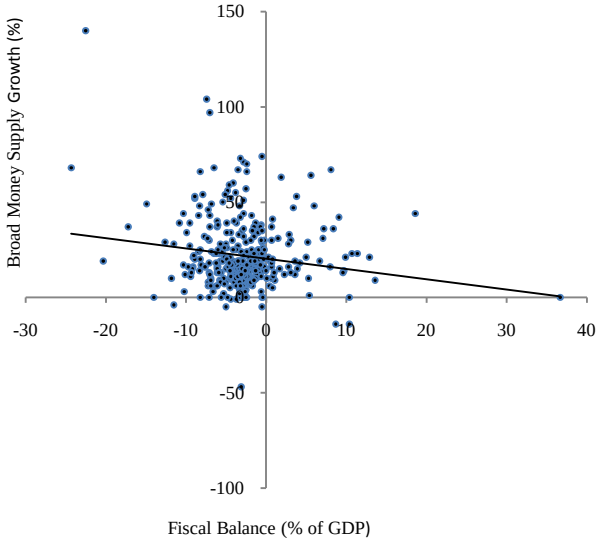
deficit. For countries that are under the highly indebted poor countries (HIPC) programme, the size of the fiscal deficit may be understated. The HIPC countries are Angola, Ethiopia, Ghana, Kenya, Malawi, Mauritania, Mozambique, Rwanda, Sudan, Tanzania, Uganda and Zambia. For instance, Malawi treats donor funds as government revenue, thus understating the overall fiscal deficit. On a comparative basis, the sample average fiscal balance of -3.60% of GDP for the 20 countries over 1990-2008, compares with an average fiscal balance of -0.77% of GDP in 11 Latin American countries and -0.67% of GDP in 15 Asian countries over 1990-2008. For Latin American countries, the fiscal balance ranges from -2.89% of GDP in Nicaragua to 2.89% of GDP in Chile. For Asian countries, the fiscal balance ranges from -6.89% of GDP in Sri-Lanka to 11.67% of GDP in Singapore. These results suggest that fiscal deficits are relatively higher in Africa than Asia and Latin America. In 39 ESAF-supported and PRGF-supported countries over 1990-2000, Gupta et al. (2005) find an average fiscal deficit of 6.30% of GDP.

Panels 4A and 4B show the trend line between the FD measure and the monetary aggregates. Panels 4C-4H show the trend line between the FD measure and the CBI indices. Panels 4H-4M show the trend line between the FD measure and the macroeconomic variables. The graphs show the trends in the variables of choice under fiscal deficit (left) and surplus (right) scenarios.

4A. FD and Narrow Money Supply Growth (M1)



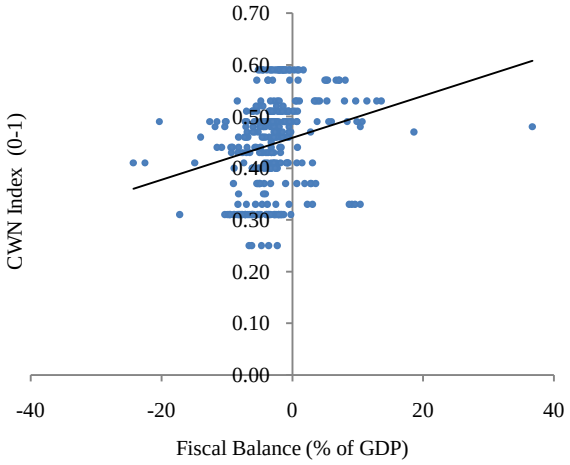

4B. FD and Broad Money Supply Growth (M2)

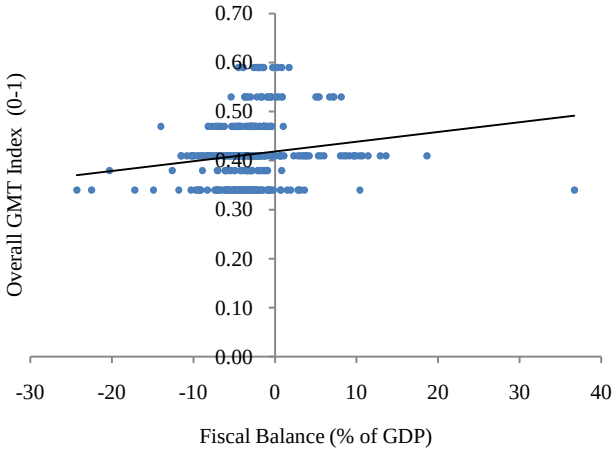



Source: Calculated from sample data. The scatter graphs are drawn from annual panel data.

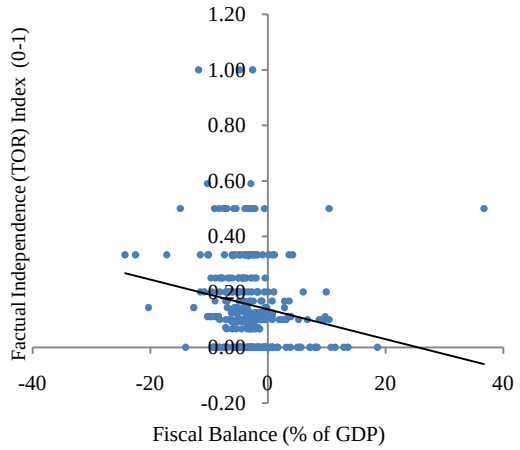
4C: FD and CWN Index

4D: FD and Aggregate GMT Index

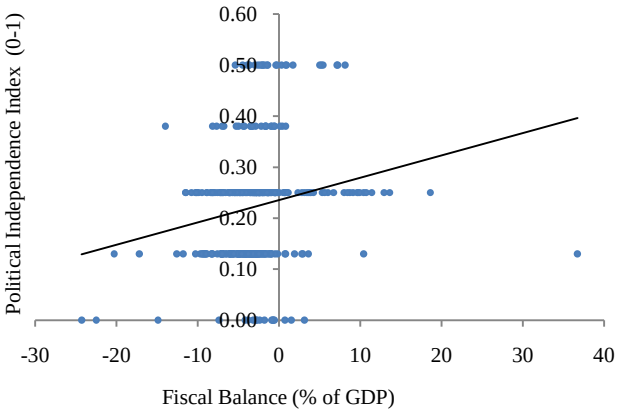


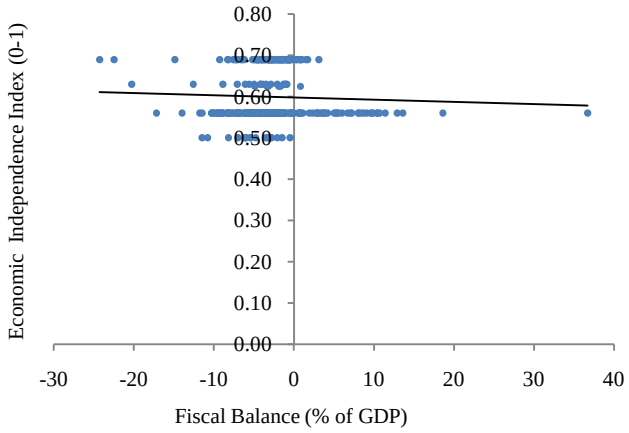

4E: FD and Factual Independence Index




4F: FD and Political Independence Index

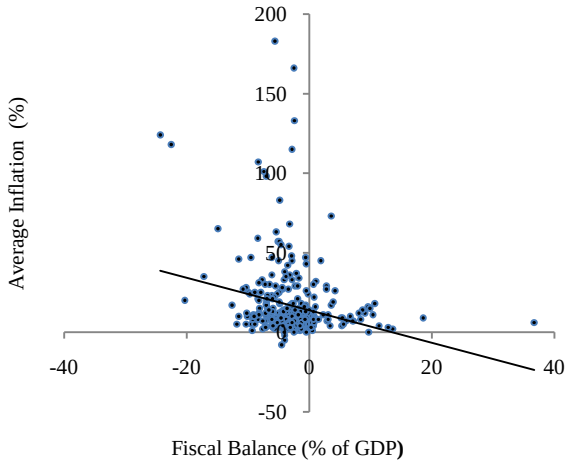



4G: FD and Economic Independence Index

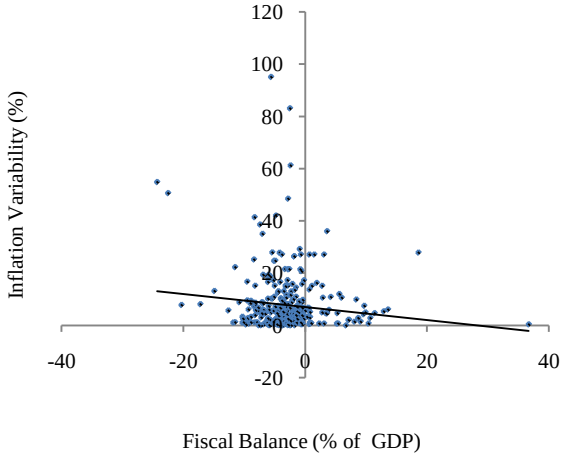



Source: Calculated from sample data. The scatter graphs are drawn from annual panel data.

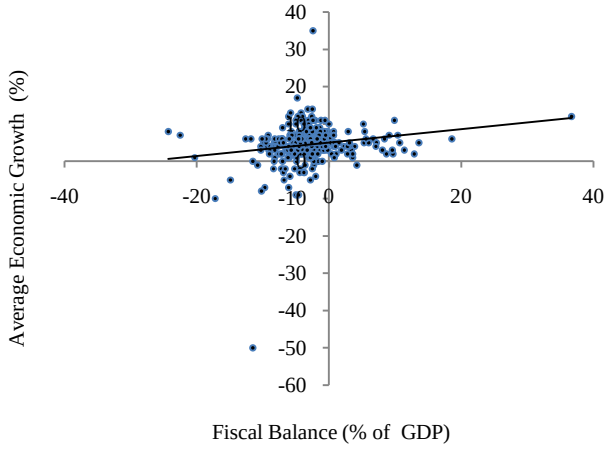
4H: Fiscal Dominance and Average Inflation



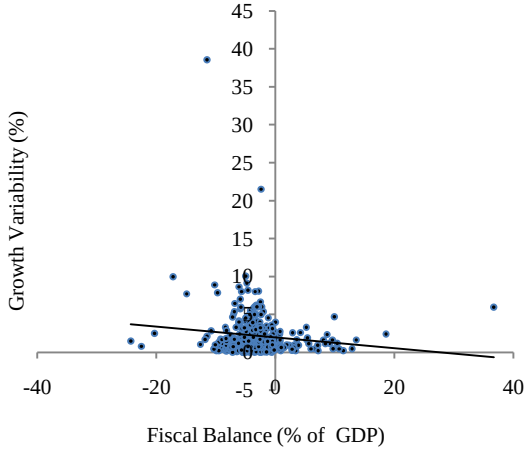

4I: Fiscal Dominance and Inflation Variability



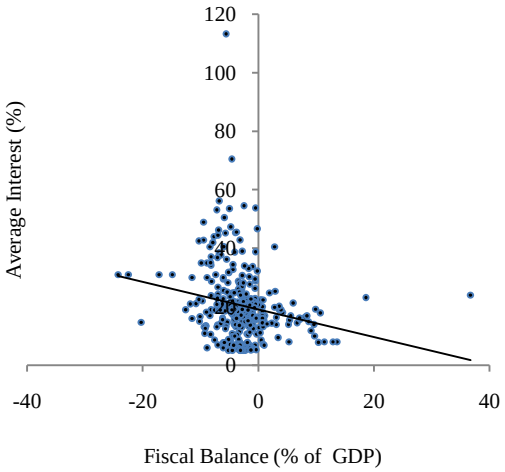

4J: Fiscal Dominance and Average Economic Growth



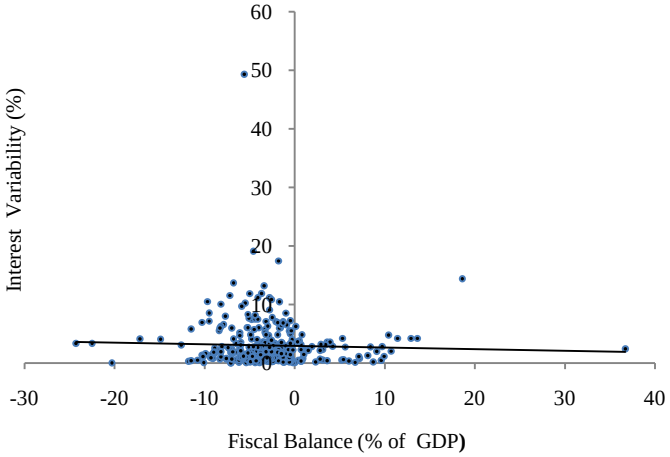

4 K: Fiscal Dominance and Economic Growth Variability




4L: Fiscal Dominance and Average Interest Rate




4M: Fiscal Dominance and Interest Rate Variability




Source: Calculated from sample data. The scatter graphs are drawn from annual panel data.

Panels 4A and 4B suggest that fiscal deficits are associated with high monetary growth while surpluses are associated with low monetary growth. The M1 relationship is, however, weak. For the CBI indices, panels 4C-4F suggest that as the fiscal deficit reduces, the level of CBI increases. Panel 4G, however, suggests that as the fiscal deficit reduces, economic independence declines. This relationship is, however, very weak. The legal CBI indices are relatively static. They do not vary much within and across countries. The overall GMT index and its sub-indices are typically static. The factual CBI index (TOR) has relatively more variation than the legal indices. These outcomes are consistent with results in previous studies (Cukierman et al. (1992); Neyapti (2003); Lucottee (2009)). Panels 4H-4M suggest that fiscal deficits are associated with high average inflation and its variability, low economic growth and high growth variability, low average interest rates and its variability. Fiscal surpluses are associated with low inflation and its variability, high economic growth and low growth variability, low average interest rate and its variability. For the selected macroeconomic variables, the results confirm theory in all the cases.

Panels 4A-4M suggest that the selected African countries typically operate more with average fiscal deficits and less with surpluses. This outcome implies that although fiscal surpluses are good for monetary stability and macroeconomic performance, this benefit is low for the selected African countries, which on average, operate with fiscal deficits (see figure 4.1). Tables 4.2-4.4 show the correlation coefficients between the FD measure and monetary aggregates, CBI indices and the macroeconomic variables of choice.

Table 4.2: Fiscal Dominance and Monetary Aggregates Correlation Matrix (1990-2008)

| Correlation Pair | FD Measure | M1 Aggregate | M2 Aggregate |
|---|---|---|---|
| FD Measure | 1.0000 | | |
| M1 Aggregate | -0.0489 | 1.0000 | |
| M2 Aggregate | -0.0032 | 0.0471 | 1.0000 |

Source: Calculated from sample data.

Table 4.3: Fiscal Dominance and CBI Correlation Matrix (1990-2008)

| Correlation Pair | FD Measure | CWN Index | GMT Index | TOR Index | POLCBI Index | ECOCBI Index |
|---|---|---|---|---|---|---|
| FD Measure | 1.0000 | | | | | |
| CWN Index | 0.2515 | 1.0000 | | | | |
| GMT Index | 0.1630 | 0.4881 | 1.0000 | | | |
| TOR Index | -0.1780 | -0.1141 | -0.3055 | 1.0000 | | |
| POLCBI Index | 0.2033 | 0.4586 | 0.8817 | -0.2734 | 1.0000 | |
| ECOCBI Index | -0.0453 | 0.1608 | 0.4137 | -0.0973 | -0.0340 | 1.0000 |

Source: Calculated from sample data.

Table 4.4: Fiscal Dominance and Macroeconomic Variables Correlation Matrix (1990-2008)

| Correlation Pair | FD Measure | Average Inflation | Inflation Variability | Average Growth | Growth Variability | Average Interest | Interest Variability |
|---|---|---|---|---|---|---|---|
| FD Measure | 1.0000 | | | | | | |
| Average Inflation | -0.2328 | 1.0000 | | | | | |
| Inflation Variability | -0.1183 | 0.8117 | 1.0000 | | | | |
| Average Growth | 0.1683 | -0.1030 | 0.0116 | 1.0000 | | | |
| Growth Variability | -0.1240 | 0.0322 | -0.0277 | -0.3438 | 1.0000 | | |
| Average Interest Rate | -0.2116 | 0.5973 | 0.4904 | -0.0880 | -0.0420 | 1.0000 | |
| Interest Rate Variability | -0.0388 | 0.4007 | 0.4336 | -0.0565 | 0.0087 | 0.5283 | 1.0000 |

Source: Calculated from sample data.

Table 4.2 shows that the FD measure is negatively correlated with the monetary aggregates, M1 and M2. This outcome suggests that fiscal deficits result in a reduction in monetary growth, contrary to theory. The correlations are low, suggesting a weak negative link between the fiscal deficits and monetary growth. The negative correlation between the FD measure and the monetary aggregates suggests that fiscal deficits are not monetized. The results refute the FD hypothesis. This outcome suggests that FD may not have adverse effects on CBI and macroeconomic variables. This outcome, however, is not expected of the selected countries.

Table 4.3 shows that the relationship between FD and CBI appears to depend on the CBI index. The indices CWN, GMT, TOR and POLCBI have wrong correlation coefficient signs. They suggest that FD increases CBI. Only the economic independence index weakly supports that FD reduces legal CBI. The correlation coefficient is, however, low. As argued by Cukierman (1992), the correlation between FD and CBI indices may not be perfect because the CBI indices may not capture some other informal and behavioural aspects of the relationship between fiscal and monetary authorities. Such behavioural aspects include the power of tradition, evolved informal norms, power politics, quality of the CB economic research department, quality of the CB board of directors and personalities of key individuals governing the CBs. The negative correlation between FD and factual CBI could possibly imply that subservient CB governors are not dismissed where FD is high. The results on legal CBI indices could imply that what is written in the CB Acts deviates from actual practices. Table 4.4 shows that macroeconomic variables have wrong signs. The results refute theory because they suggest that FD improves macroeconomic performance. These results support the lack of evidence on monetization of fiscal deficits, which is suggested in table 4.2. Since correlation analysis is not adequate for conclusive evidence on these relationships, we complement these outcomes with the Granger causality analysis results.

Table 4.5: Fiscal Dominance, CBI and Macroeconomic Performance (1990-2008)

| Null Hypothesis | Total Annual Panel Observations | F-Statistic | Probability |
|---|---|---|---|
| M1 does not Granger Cause FD | 306 | 0.0093 | 0.9908 |
| FD does not Granger Cause M1 | | 0.3884 | 0.6784 |
| M2 does not Granger Cause FD | 306 | 1.1173 | 0.3285 |
| FD does not Granger Cause M2 | | 0.7608 | 0.4682 |
| CWN does not Granger Cause FD | 306 | 4.2810*** | 0.0147 |
| FD does not Granger Cause CWN | | 0.2054 | 0.8144 |
| GMT does not Granger Cause FD | 306 | 0.3779 | 0.6856 |
| FD does not Granger Cause GMT | | 0.0543 | 0.9472 |
| TOR does not Granger Cause FD | 306 | 4.4039*** | 0.0130 |
| FD does not Granger Cause TOR | | 0.7074 | 0.4938 |
| POLCBI does not Granger Cause FD | 306 | 0.3886 | 0.6783 |
| FD does not Granger Cause POLCBI | | 0.0242 | 0.9761 |
| ECOCBI does not Granger Cause FD | 306 | 0.0583 | 0.9434 |
| FD does not Granger Cause ECOCBI | | 0.1934 | 0.8243 |
| Average inflation does not Granger-cause fiscal dominance | 306 | 0.0760 | 0.9268 |
| Fiscal dominance does not Granger-cause average inflation | | 2.0314** | 0.1329 |
| Inflation variability does not Granger-cause fiscal dominance | 306 | 0.3061 | 0.7365 |
| Fiscal dominance does not Granger-cause inflation variability | | 0.7236 | 0.4859 |
| Transformer inflation does not Granger-cause fiscal dominance | 306 | 0.1131 | 0.8931 |
| Fiscal dominance does not Granger-cause transformed inflation | | 0.6293 | 0.6293 |
| Average growth does not Granger-cause fiscal dominance | 306 | 1.3480 | 0.2613 |
| Fiscal dominance does not Granger-cause average growth | | 0.1609 | 0.8515 |
| Growth variability does not Granger-cause fiscal dominance | 306 | 0.1713 | 0.8427 |
| Fiscal dominance does not Granger-cause growth variability | | 2.2105** | 0.1114 |
| Average interest does not Granger-cause fiscal dominance | 306 | 0.9435 | 0.3904 |
| Fiscal dominance does not Granger-cause average interest | | 2.8492*** | 0.0595 |
| Interest variability does not Granger-cause fiscal dominance | 306 | 0.5393 | 0.5837 |
| Fiscal dominance does not Granger-cause interest variability | | 0.9011 | 0.4072 |
| Real interest rate does not Granger-cause fiscal dominance | 306 | 0.5559 | 0.5742 |
| Fiscal dominance does not Granger-cause real interest rate | | 0.7539 | 0.4717 |
| Number of Lags: 2### | | | |

Source: Calculated in E-Views 7.0.

*, ** and *** denote statistical significance level at the 10%, 5% and 1%, respectively. ### We could not use deeper lags because of sample size concerns.

Table 4.5 suggests that there is no strict contemporaneous Granger causality from the FD measure to monetary aggregates, M1 and M2. We do not find evidence of monetization of fiscal deficits. There is lack of empirical support for the accommodation of fiscal deficits hypothesis. The relationships could be inter-temporal. The CWN index and the factual CBI index Granger-cause FD. These 2 indices have more variation than others, within and across panels. The TOR is typically more appropriate in measuring CBI in less developed countries. FD Granger-causes average inflation, growth variability and average interest rate, despite lack of monetization of fiscal deficits. This outcome is consistent with findings in Miller (1983) that fiscal deficits may increase inflation even if they are not monetized through crowding out of private investment.

## 4.5.2 Panel Data Regression Results (1990-2008)

Table 4.6: Effects of Fiscal Dominance on Central Bank Independence (1990-2008)

| Dependent variable | Legal CWN Index | Overall GMT Index | Factual Independence Index (TOR) | Political Independence Index (POLCBI) | Economic Independence Index (ECOCBI) |
|---|---|---|---|---|---|
| Legal CWN (-1) | 0.71***(8.53) | | | | |
| Overall GMT (-1) | | 0.90***(3.47) | | | |
| TOR (-1) | | | 0.59***(42.31) | | |
| POLCBI (-1) | | | | 0.83***(18.30) | |
| ECOCBI (-1) | | | | | 0.64***(14.43) |
| Fiscal dominance (FD) measure^^^ | 0.0001 (0.25) | 0.0001 (1.23) | -0.003***(-7.12) | -0.0002***(-3.15) | 0.00002 (0.32) |
| Past domestic inflation | -0.0002**(-2.48) | 0.0001 (0.63) | 0.001***(5.71) | -2.41E-05 (-0.21) | -0.0000 (-0.10) |
| Level of economic development | 0.001***(5.28) | 0.0003 (0.58) | 0.001***(21.7) | 0.001***(8.60) | -1.92E-06 (-0.11) |
| Political instability | 0.002**(2.28) | 0.003 (0.68) | 0.20**(2.35) | -0.0004 (-0.26) | 0.002***(14.48) |
| Openness of the economy | -0.009**(-2.22) | 0.0004 (0.03) | -0.001 (-0.03) | -0.01***(-3.00) | -0.0002 (-0.43) |
| Total panel observations | 288 | 288 | 288 | 288 | 288 |
| Number of countries | 18 | 18 | 18 | 18 | 18 |
| Instrumental variable (IV) rank | 18 | 18 | 18 | 19 | 18 |
| OIRs (d.f.^###^) or (s-k) | 12 | 12 | 12 | 12 | 12 |
| Sargan J-Statistic (Calculated Value) | 15.68 | 7.28 | 13.20 | 19.94 | 1.80 |
| Sargan J-Statistic (Critical Value) | 18.31 | 18.31 | 18.31 | 18.31 | 18.31 |
| Sargan P-Value | 0.21 | 0.84 | 0.35 | 0.07 | 0.99 |

Source: Calculated from sample data.

Notes

The t-values are in parenthesis.

The t-values are based on White (1980) roust standard errors.

*, ** and *** denote statistical significance at 10%, 5% and 1%, respectively.

OIRs is overidentifying restrictions. (d.f.^###^) is the degrees of freedom at 5% level of significance.

^^^ is the target explanatory variable.

s-k is the degrees of freedom defined as the instrumental variable rank (s) less the number of regressors (k).

Table 4.7: Effects of Fiscal Dominance on Inflation Outcomes (1990-2008)

| Dependent variable | Average Inflation | Average Inflation | Average Inflation | Average Inflation | Inflation Variability | Inflation Variability | Inflation Variability | Inflation Variability |
|---|---|---|---|---|---|---|---|---|
| Average inflation (-1) | 0.66***(55.3) | 0.64***(6.1) | 0.67***(121.3) | 0.60***(75.2) | | | | |
| Average inflation (-2) | | 0.08***(2.2) | | 0.06***(4.6) | | | | |
| Inflation variability (-1) | | | | | 0.25***(90.1) | 0.27***(12.5) | 0.27***(188.4) | 0.26***(40.1) |
| Inflation variability (-2) | | | | | | 0.10***(4.6) | | 0.08***(6.6) |
| Fiscal dominance (FD) measure^^^ | -0.32**(-2.1) | 0.40 (0.2) | | | -0.16***(-3.0) | 0.20 (1.0) | | |
| Money supply growth | | | -0.09***(-7.4) | -0.07 (-1.6) | | | -0.04***(-10.6) | -0.04***(-2.5) |
| International inflation | 1.44**(2.3) | 8.18 (0.5) | 1.59***(3.8) | -2.54 (-0.6) | 0.29 (0.7) | 4.60 (1.3) | 0.57**(2.1) | 0.57 (0.7) |
| Output growth | -0.37***(-4.6) | -0.20 (-0.7) | -0.36***(-5.4) | -0.20**(-2.2) | -0.06**(-2.3) | 0.02 (0.2) | -0.06**(-4.5) | 0.08 (1.9) |
| Exchange rate depreciation | 0.05***(21.1) | 0.06***( 6.5) | 0.06***(22.8) | 0.05***(10.9) | 0.03***(19.5) | 0.03***(7.8) | 0.03***(101.8) | 0.03***(42.9) |
| Total panel observations | 306 | 288 | 306 | 288 | 306 | 288 | 306 | 288 |
| Number of countries | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Instrumental variable (IV) rank | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| OIRs (d.f.###) or (s-k) | 13 | 12 | 13 | 12 | 13 | 12 | 13 | 12 |
| Sargan J-Statistic (Calculated Value ) | 13.75 | 10.98 | 15.29 | 12.66 | 16.45 | 9.89 | 15.77 | 14.17 |
| Sargan J-Statistic (Critical Value) | 18.30 | 18.30 | 18.30 | 18.30 | 18.30 | 18.30 | 18.30 | 18.30 |
| Sargan P-Value | 0.39 | 0.53 | 0.29 | 0.39 | 0.23 | 0.63 | 0.26 | 0.29 |

Source: Calculated from sample data.

Notes

The t-values are in parenthesis.

The t-values are based on White (1980) robust standard errors.

*, ** and *** denote statistical significance at 10%, 5% and 1%, respectively.

OIRs is overidentifying restrictions.

(d.f.###) is the degrees of freedom at 5% level of significance.

^^^ is the target explanatory variable.

s-k is the degrees of freedom defined as the instrumental variable rank (s) less the number of regressors (k).

Table 4.8: Effects of Fiscal Dominance on Economic Growth Outcomes (1990-2008)

| Dependent variable | Average Growth | Average Growth | Average Growth | Average Growth | Growth Variability | Growth Variability | Growth Variability | Growth Variability |
|---|---|---|---|---|---|---|---|---|
| Average growth (-1) | -0.13***(-8.9) | -0.16***(-8.4) | -0.10***(-6.71) | -0.13***(-6.39) | | | | |
| Average growth (-2) | | -0.13***(-2.74) | | -0.12***(-3.30) | | | | |
| Growth variability (-1) | | | | | 0.37***(22.28) | 0.43***(15.90) | 0.37***(11.09) | 0.44***(6.65) |
| Growth variability (-2) | | | | | | -0.13 (-1.60) | | -0.15**(-2.01) |
| Fiscal dominance (FD) measure^^^ | 0.08 (0.83) | 0.13 (0.69) | | | 0.05 (0.48) | 0.03 (0.28) | | |
| Money supply growth | | | 0.03 (1.92) | 0.03**(2.23) | | | 0.00 (0.13) | 0.00 (-0.32) |
| Domestic inflation | -0.04***(-4.99) | -0.04***(-5.26) | -0.05***(-4.08) | -0.05***(-4.91) | 0.02***(3.89) | 0.02***(2.89) | 0.01***(2.36) | 0.02****(2.77) |
| Foreign Direct Investment | -0.26 (-0.33) | -0.58 (-0.56) | -0.35 (-0.53) | -0.45 (-0.45) | -1.09 (-1.49) | -1.28 (-1.67) | -1.04 (-1.40) | -1.21 (-1.65) |
| Domestic Investment | 0.34 (0.53) | 0.63 (0.71) | 0.33 (0.53) | 0.46 (0.51) | 0.94 (1.47) | 1.08*(1.71) | 0.88 (1.42) | 1.01 (1.54) |
| Terms of trade | 0.02***(3.09) | 0.001 (0.93) | 0.02***(3.48) | 0.02**(2.11) | -0.01 (-1.59) | -0.01 (-0.94) | -0.01 (-1.47) | -0.01 (-0.89) |
| Total observations | 306 | 288 | 306 | 288 | 306 | 288 | 306 | 288 |
| Number of countries | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Instrumental variable (IV) rank | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| OIRs (d.f.###) or (s-k) | 12 | 11 | 12 | 11 | 12 | 11 | 12 | 11 |
| Sargan J-Statistic (Calculated Value ) | 14.78 | 14.72 | 14.55 | 14.64 | 11.31 | 11.5 | 11.20 | 11.5 |
| Sargan J-Statistic (Critical Value) | 18.30 | 18.30 | 18.30 | 18.30 | 18.30 | 18.30 | 18.30 | 18.30 |
| Sargan P-Value | 0.25 | 0.20 | 0.27 | 0.20 | 0.50 | 0.40 | 0.51 | 0.40 |

Source: Calculated from sample data.

Notes

The t-values are in parenthesis.

The t-values are based on White (1980) robust standard errors.

*, ** and ***denote statistical significance at 10%, 5% and 1%, respectively.

OIRs is overidentifying restrictions.

(d.f.###) is the degrees of freedom at 5% level of significance.

^^^ is the target explanatory variable.

s-k is the degrees of freedom defined as the instrumental variable rank (s) less the number of regressors (k).

Table 4.9: Effects of Fiscal Dominance on Interest Rate Outcomes (1990-2008)

| Dependent variable | Average nominal interest rate | Average nominal interest rate | Average real interest rate | Average real interest rate | Nominal interest rate variability | Nominal interest rate variability |
|---|---|---|---|---|---|---|
| Average interest (-1) | 0.53***(25.02) | 0.52***( 53.79) | -0.04***(-4.40) | -0.03***(-3.51) | | |
| Interest rate variability (-1) | | | | | 0.33***(16.07) | 0.33***(14.11) |
| Fiscal dominance (FD) measure^^^ | 0.17 (0.78) | | -0.10***(-3.65) | | 0.15***(2.47) | |
| Money supply growth | | 0.01 (0.61) | | 0.03***(3.13) | | -0.001 (-0.14) |
| Domestic inflation | 0.16***(5.08) | 0.16***(10.10) | -0.80***(-160.3) | -0.79***(-151.51) | 0.06***(9.31) | 0.06***(6.25) |
| International interest rate | 0.13 (0.58) | 0.15 (1.62) | 0.26 (1.98) | 0.16 (1.02) | -0.12 (-1.71) | -0.03 (-0.25) |
| Output Growth | 0.02 (0.57) | 0.05 (1.37) | -0.26***(-13.76) | -0.30***(-11.59) | 0.05 (1.62) | 0.07 (1.72) |
| Exchange rate depreciation | 0.006 (1.67) | 0.004 (0.94) | -0.01***(-9.69) | -0.01***(-4.62) | -0.001 (-0.47) | -0.001 (-0.57) |
| Total panel observations | 306 | 306 | 306 | 306 | 306 | 306 |
| Number of countries | 18 | 18 | 18 | 18 | 18 | 18 |
| Instrumental variable rank | 18 | 18 | 18 | 18 | 18 | 18 |
| OIRs (d.f.###) or (s-k) | 12 | 12 | 12 | 12 | 12 | 12 |
| Sargan J-Statistic (Calculated Value) | 10.10 | 14.01 | 12.98 | 12.55 | 12.90 | 13.43 |
| Sargan J-Statistic (Critical Value) | 18.31 | 18.31 | 18.31 | 18.31 | 18.31 | 18.31 |
| Sargan P-Value | 0.61 | 0.30 | 0.37 | 0.40 | 0.38 | 0.34 |

Source: Calculated from sample data.

Notes

The t-values are in parenthesis.

The t-values are based on White (1980) robust standard errors.

*, ** and ***denote statistical significance at 10%, 5% and 1%, respectively.

OIRs is overidentifying restrictions.

(d.f.###) is the degrees of freedom at 5% level of significance.

^^^ is the target explanatory variable.

s-k is the degrees of freedom defined as the instrumental variable rank (s) less the number of regressors (k).

The models are overidentified in the range 11 to 13 degrees of freedom. The Sargan tests suggest that the OIRs are valid, the models are correctly specified and the IVs are appropriate. Based on the specification and statistical significance tests, we accept one-lag equations for CBI and up to two-lag equations for inflation, economic growth and interest rates. The statistically significant coefficients on lagged dependent variables confirm persistence in the dependent variables. Table 4.6 suggests that FD only matters for factual and political CBI indices. All the CBI indices respond positively and significantly to their immediate past (one-lag) levels, which implies persistence. The coefficients on lagged dependent variables are high or at least greater than 0.50 for all the indices. Past inflation only significantly affects the legal CWN and the TOR indices. The overall CBI results are not robust as expected. These results are similar to those in previous studies cited in table 4.1 (Masciandaro and Tabellini (1987); Bade and Parkin (1987); Burdekin and Laney (1988); Grilli et al. (1991); DeLong and Summers (1992); DeHaan and Sturm (1992); Alesina and Summers (1993); Pollard (1993); Benassy-Quere and Psani-Ferry (1994); Sikken and DeHaan (1998); D'Amato et al. (2009); Lucottee (2009)). As noted by Cukierman (2002), it is not easy to explain CBI as some of its determinants are not easy to quantify.

The lack of robustness in CBI results is partly explained by the relative static nature of the legal CBI indices. The variation is low as shown by the low standard deviations in appendix 4.1 and the scatter graphs 4C-4G. The factual and the political CBI indices have better variations than the other indices. The variations in the political CBI index are explained by the fact that since 1990, a number of countries have established conflict resolution mechanisms and redefined the price stability objective as the primary or only objective of the CBs. The economic CBI index is more static because although there has been tightening in CB lending restrictions, the improvements are still within the previous parameters. The higher variation in the factual index is explained by high turnover rates in countries like Angola and Mauritania. The factual index is more variable over time and across countries than the legal indices. Cukierman et al. (1992) and Neyapti (2003) also found the factual index to have higher variation and better regression results for less developed countries. Legal indices have low variation because CB legislation is not changed frequently in most African countries. For instance, by the end of 2008, the Reserve Bank of Malawi was still guided by the 1989 Act. The relative static nature of the legal CBI indices makes it difficult to establish any systematic link between legal CBI indices and their potential determinants. It is not generally clear what determines CBI apart from the past CBI levels.

Table 4.7 suggests that FD only matters for inflation variability when inflation variability is lagged by one period. Table 4.8 suggests that FD does not matter for average economic growth and its variability. Average growth responds to its past levels, domestic inflation and changes in terms of trade. Growth variability responds positively to its past levels and domestic inflation. Table 4.9 shows that FD does not matter for average interest rate but matters for its variability. Average interest rate responds positively to its one period lag and domestic inflation. Interest rate variability responds positively to FD, its past level and domestic inflation. Exchange rate depreciation significantly affects real interest rates. All the macroeconomic variables respond significantly to their past levels. Domestic inflation significantly affects economic growth and interest rates. Average inflation has higher persistence than its variability. Growth variables have low persistence with growth variability having higher persistence than average economic growth. Interest rate variables have moderate persistence with average interest having higher persistence than interest variability. Several reasons could explain these outcomes for the selected countries.

Firstly, in some African countries, fiscal deficit data is commonly measured with error. In most cases, the overall fiscal deficit is understated. The overall deficit figures may exclude quasi-fiscal deficits, which are substantial in some of the countries. Quasi-fiscal deficits include CB losses, parastatal deficits and local government deficits. Quasi fiscal deficits have the same effects on macroeconomic variables as the central government fiscal deficits. In addition, some of the CB losses are transferred to Treasury after some years. These figures may not reflect in the overall central government deficit figures till transfer. At times, there are delays in interest payments on government debt, resulting in incorrect fiscal deficit figures. Some of the countries are HIPC. The size of the deficit and its effects partly depends on how the HIPC funds are treated and used.

Secondly, CBs that face huge fiscal deficits usually tighten monetary policy to eliminate the liquidity effects on macroeconomic variables. They sterilize or neutralize the impact of fiscal deficit liquidity injections into the economy, through liquidity mopping up operations. However, excessive mopping up can be costly and unsustainable in the long-run. These anti-inflation strategies can conceal the full effects of fiscal deficits on macroeconomic variables. Elsewhere, anti-inflationary monetary policy tightening has resulted in reduced inflation growth despite high fiscal deficits. The respective countries include Malaysia in 1975, Japan in 1975, Barbados in 1976 and 1984, Honduras in 1984, Belgium in 1985 and Greece in 1988 (Neyapti (2003)).

Thirdly, increased pressures for monetization of fiscal deficits may not affect inflationary expectations of the public for some time. In the short-run, fiscal deficits can be financed through an increase in government debt without necessarily generating much effect on inflation. In addition, these effects may operate with a time lag. The contemporaneous fiscal deficit may not reflect the permanent or general fiscal policy stance. Fourthly, the effect of fiscal deficits on macroeconomic variables may depend on how government funds are used. If the deficits are incurred in financing productive expenditure, which boots output, inflation may not rise. On the other hand, unproductive expenditures may accelerate inflation and reduce economic growth. To create an impression of good economic performance, some governments with a short planning horizon, may lower budgetary spending and increase extra budgetary spending (Neyapti (2003)).

Fourthly, some of the CB governors in African countries are subservient. Operationally, subservience implies that the CB would grant ready, automatic and cheap access to credit to the government. As a result, interest rates may have to be kept low so as to reduce the cost to Treasury, of financing growing fiscal deficits. To avoid high credit cost, a Treasury of an African country may put pressure on the interest rate setting monetary policy board of the CB or MPC not to raise interest rates, but instead print money and buy Treasury bills with printed money.

## 4.6 Conclusion

We measured FD and its effects on CBI and macroeconomic performance. We used the 2-step system GMM in DPD for estimations. We do not find evidence that fiscal deficits are monetized. The fiscal deficits do not seem to cause monetary expansion. The results suggest that FD generally does not matter for CBI and macroeconomic performance. Domestic inflation, which is explained by exchange rate depreciation, is a major determinant of factual CBI, economic growth and interest rates. It is generally not clear what determines legal CBI. The relative static nature of legal CBI indices, due to the infrequent changes in CB legislation in African countries, makes it difficult to establish a link between legal indices and their potential determinants. Our findings suggest that stabilization policy for macroeconomic variables should shift from fiscal deficit reduction to other determinants of macroeconomic variables. It may be government expenditure and not the fiscal deficit that affects macroeconomic variables. The relationships could be explained by the financing methods as supposed to the size of the fiscal deficit.

## 4.7 Appendices

**Appendix 4.1: Key Descriptive Annual Panel Statistics (1990-2008)**

| Macroeconomic Variable | Mean Value | Maximum Value | Minimum Value | Standard Deviation | Total Annual Panel Observations |
|---|---|---|---|---|---|
| Aggregate legal CWN index | 0.45 | 0.59 | 0.25 | 0.09 | 342 |
| Aggregate GMT index | 0.41 | 0.59 | 0.34 | 0.07 | 342 |
| Factual independence index (TOR) | 0.15 | 1.00 | 0.00 | 0.16 | 342 |
| Political independence index | 0.22 | 0.50 | 0.00 | 0.12 | 342 |
| Economic independence index | 0.60 | 0.69 | 0.50 | 0.06 | 342 |
| Fiscal dominance measure | -2.86 | 36.70 | -24.30 | 5.39 | 342 |
| Average inflation | 16.64 | 183.00 | -8.00 | 23.00 | 342 |
| Inflation variability | 7.83 | 95.16 | 0.00 | 11.18 | 342 |
| Transformed inflation | 0.88 | 2.00 | 0.00 | 0.14 | 342 |
| Narrow money growth (M1) | 37.43 | 6263.71 | -1456.96 | 396.70 | 342 |
| Broad money growth (M2) | 0.03 | 74.00 | -97.00 | 18.62 | 342 |
| Economic development | 2.16 | 38.00 | -47.00 | 4.92 | 342 |
| Political instability | 0.17 | 1.00 | 0.00 | 0.38 | 342 |
| Openness of the economy | 0.38 | 5.64 | 0.00 | 0.39 | 342 |
| Output growth | 4.53 | 35.00 | -50.00 | 5.05 | 342 |
| Output growth variability | 2.15 | 38.59 | 0.00 | 2.97 | 342 |
| Foreign direct investment | 2.25 | 44.00 | -7.00 | 3.51 | 342 |
| Gross fixed capital formation | 2.47 | 44.00 | -7.00 | 3.56 | 342 |
| Terms of trade | 107.32 | 207.00 | 40.00 | 26.56 | 342 |
| Inflation variability | 7.83 | 95.16 | 0.00 | 11.18 | 342 |
| International inflation | 2.26 | 4.00 | 1.00 | 0.71 | 342 |
| Exchange rate depreciation | 19.08 | 1291.43 | -99.63 | 77.82 | 342 |
| Average nominal interest rate | 20.21 | 113.31 | 5.10 | 11.90 | 342 |
| Average real interest rate | 3.57 | 38.92 | -111.43 | 18.54 | 342 |
| Interest rate variability | 3.01 | 49.34 | 0.01 | 3.98 | 342 |
| International interest rate | 7.05 | 10.00 | 4.00 | 1.67 | 342 |

Source: Derived from sample data.

Notes

We dropped the narrow money definition (M1) from the regression estimations because it has extreme outliers.

We use the US CPI inflation rate to proxy international inflation.

We use the US interest rate to proxy international interest rates.

The data frequency for all the variables is annual.

We annualized all the CBI indices to generate their time series data.

**Appendix 4.2: List of Main Variables, Definitions and Key Sources**

| Variable | Acronym | Variable Definition | Source (s) |
|---|---|---|---|
| Overall legal CWN index | CWN | Overall legal index, following Cukierman et al. (1992) | Calculated by author |
| Overall legal GMT index | GMT | Overall legal index, following Grilli et al. (1991) | Calculated by author |
| Factual independence index | TOR | Number of Governor Changes/Number of Years | Calculated by author |
| Political independence index | POLCBI | GMT sub-index | Calculated by author |
| Economic independence index | ECOCBI | GMT sub-index | Calculated by author |
| Fiscal dominance measure | FD | Fiscal balance in percent of GDP | AfDB databases |
| Domestic inflation | $\pi$ | Annualized change in the consumer price index (CPI) | IFS, WDI |
| CBI dummy variable | $D_i$ | 1 if a country is a reformer and 0 otherwise | Calculated by author |
| English language dummy | $E_i$ | 1if English is the main official language, 0 otherwise | Calculated by author |
| Inflation variability | INFV | Standard deviation of the regular inflation rate | Calculated from average inflation |
| Transformed inflation | D | $D=\pi/(1+\pi)$ | Calculated from regular inflation |
| International inflation | USINF | Proxied by the US inflation rate | IFS,WDI |
| Narrow money supply growth | M1 | Notes and coin in circulation plus demand deposits | IFS, WDI |
| Broad money supply growth | M2 | Narrow money (M1) plus near monies. | IFS,WDI |
| Level of economic development | DEVT | Real growth rate of GDP | AfDB databases |
| Political instability### | POLISNT | Dummy of political events that potentially affect CBI | Derived by author |
| Openness of the economy | OPEN | Sum of imports and exports, in percent of GDP | Calculated from WDI data |
| Output growth | GDP | Growth rate of real GDP | IFS, WDI |
| Output growth variability | GDPV | Standard deviation of the growth rate of real GDP | Calculated from average growth |
| Foreign direct investment | FDI | Foreign direct investment, in percent of GDP | IFS, WDI |
| Domestic investment | GFCF | Gross fixed capital formation, in percent of GDP | IFS, WDI |
| Terms of trade | TOT | Change in the ratio of index of exports to imports | IFS, WDI |
| Exchange rate depreciation | EXDEPRE | Annual change in the foreign exchange rate against US$ | Calculated from foreign exchange data |
| Average nominal interest rate | INTEREST | Annual average nominal lending rate | IFS, CB databases |
| Average real interest rate | RR | Average nominal lending rate less inflation rate | Calculated from nominal interest rates |
| Interest rate variability | INTV | Standard deviation of the interest rate | Calculated from nominal interest rates |
| International interest rate | USINT | Proxied by the US interest rate | IFS, WDI |

Sources: Compiled from various sources.

### The political instability variable is a dummy variable representing a mix of political events that potentially affect CBI over the study period. The dummy variable takes value 1 when there is such an event, and value 0 otherwise.

# CHAPTER 5: CONCLUSION AND POLICY IMPLICATIONS

## 5.1 Introduction

This study had 3 objectives. Firstly, we measured the degree of CBI in 20 selected African countries over 1990-2008. Secondly, we measured the effects of CBI on macroeconomic performance. Thirdly, we measured the effects of FD on CBI and macroeconomic performance.

## 5.2 Measurement of CBI

In chapter 2, we measured the degree of CBI in 20 selected African countries over 1990-2008. To calculate the CBI indices, we used the methodologies developed by Grilli et al. (1991) and Cukierman et al. (1992). Firstly, we measured CBI in political and in economic terms. Secondly, we measured CBI in legal (de jure) and in factual (de facto) terms. Thirdly, we used the annual average turnover rate (TOR) of CB governors to proxy factual CBI. We benchmarked the CBI ratings against 6 of the world's most renowned CBs in developed countries. The results suggested several important outcomes.

Legal CBI is still low in African countries. However, it has improved significantly from what it was in the 1980s, to levels slightly above what characterized developed countries in the 1980s. Political CBI is low but economic CBI is high. The cross-country variation in economic CBI is very low. This is because most African countries have several common legal CBI principles. Factual CBI is high but it varies considerably across the African countries. Factual CBI also improved significantly from the 1980 levels for most African countries. The results suggest that the factual measure of CBI proxies actual CBI better than the legal measures. However, to some extent, factual CBI seems to suggest subservience of CB governors in some of the African countries. There is still a wide gap between legal and actual CBI practices in most African countries. In most of the countries, actual CBI is lower than legal CBI. On average, political factors seem to play a relatively more important role than economic factors, in influencing CBI in African countries. We concluded that most African governments still need to further restructure their CBs and grant them more CBI in line with modern-day CB practices, world-wide and to respect CB laws. We found that there was a need to constitutionalize CBI so that it is not easily violated. So far, out of the 20 CBs we investigated, only the Bank of Uganda and the South African Reserve Bank were constitutionally granted CBI in 1993 and 1996, respectively.

## 5.3 Effects of CBI on Macroeconomic Performance

In chapter 3, we measured the effects of CBI on macroeconomic performance. We used the difference-in-difference (DID) method, which is associated with Ball and Sheridan (2005). We did not find convincing evidence that CBI matters for macroeconomic performance. Instead, the recent past and initial macroeconomic performance were significant in explaining macroeconomic performance during reform. The results indicated some effect of the regression to the mean for some of the macroeconomic variables. Improved macroeconomic performance over the study period seems to have resulted from factors, other than CBI. These include macroeconomic convergence and stabilization programmes, whose efforts support the aims of CBI. The programmes focus on, among other things, reductions in inflation and fiscal deficits. The good macroeconomic performance in countries like Tunisia is attributed more to their general macroeconomic prudence as opposed to CBI, per se. We concluded that African governments need to do broader macroeconomic reforms, alongside and beyond CBI reforms.

## 5.4 Effects of FD on CBI and Macroeconomic Performance

In chapter 4, we measured the effects of fiscal dominance (FD) on CBI and macroeconomic performance. We used the 2-step system generalized method of moments (GMM) in dynamic panel data (DPD). This method is associated with Arellano and Bover (1995) and Blundell and Bond (1998). We found that fiscal deficits were prevalent in African countries, with only a few exceptions. However, we did not find evidence of monetization of fiscal deficits in our data. We attributed this outcome to anti-inflation strategies. The results suggest that FD does not matter for CBI and macroeconomic performance. FD significantly reduced the annual average TOR of CB governors, implying that FD increased factual CBI. This outcome could be associated with subservience of CB governors in some of the African countries. It could imply that where FD is high, political authorities do not dismiss governors. This outcome is possible where FD is high and there are limited alternative sources of financing fiscal deficits. We found that domestic inflation, explained by exchange rate depreciation, was a significant determinant of interest rates and economic growth. We did not find general significant determinants of legal CBI. It is not clear what factors really determine legal CBI. The relative static nature of legal CBI indices, due to the infrequent changes in CB legislation in most African countries, makes it difficult to establish any systematic link between the legal CBI indices and their potential determinants.

## 5.5 Main Contributions of the Study

This study makes several empirical contributions to the literature. Firstly, in chapter 2 we produced new and updated evidence on CBI, which is based on 20 selected African countries in the post-1989 period. This is one of the latest studies in CBI after DeHaan and Klomp (2010). We used a comprehensive set of CBI indices. We use both legal (de jure) and factual (de facto) indices. With multiple indices, we were able to account for the multidimensional aspect of CBI. The multiple indices were a robustness check on the analysis. This is one of the few studies that uses a comprehensive set of CBI indices. We used both aggregated and disaggregated indices. We were therefore able to analyze CBI both in general and in specific terms. We were able to examine which aspects of CBI had improved and which ones had not. In addition to just calculating the TOR figures, we investigated each and every turnover that was not due to retirement because of age, whether regular or irregular. Accordingly, we investigated dismissals, resignations and reassignments. This enabled us to infer whether the turnovers were based on economic, political, legal or historical reasons. This is because resignations and reassignments could be politically motivated in some cases. We investigated cases of CBs with extreme turnover rates. This is because these could be associated with subservience or political influences on CB governors by the key political authorities. In addition to CBI indices, we used a considerable amount of qualitative information on CBI to explain the statistical outcomes.

Secondly, in chapter 3 we used an alternative method of measuring the effects of CBI on macroeconomic performance. We used the DID method, which is associated with Ball and Sheridan (2005), who apply it to investigate the effects of IT on macroeconomic performance in 20 OECD countries in the 1990s. We used the DID method to reduce endogeneity bias, which is associated with the CBI indices in levels and the macroeconomic variables of choice. We also used the DID method to avoid subjectivity and arbitrariness associated with the calculation of CBI indices in levels. Unlike most previous studies that examine this relationship using only 1 or 2 macroeconomic variables of choice, we used 6 key macroeconomic variables. These include the means and standard deviations in inflation, economic growth and average interest rate. We used the same macroeconomic variables as in Ball and Sheridan (2005), but instead of focusing on IT, targeters and non-targeters, we focused on CBI, reformers and non-reformers. We focused on a longer time period, which covers both the 1990s and the 2000s, up to 2008.

Thirdly, in chapter 4 we attempted an alternative method of estimating the effects of fiscal dominance (FD) on CBI and macroeconomic performance. We used the 2-step system GMM in DPD. This method is associated with Arellano and Bover (1995) and Blundell and Bond (1998). System GMM is a recent move away from correlation analysis and VAR models. This method reduced a number of common regression estimation problems, which include endogeneity bias among the estimable variables. We used multiple regressions with a number of commonly used control variables. We moved away from simple correlations and the traditional bivariate regressions, which presume that dependent variables are explained by a single explanatory variable, which is not plausible (Campillo and Miron (1997)). In addition, we used several key descriptive statistics to support the regression analysis results.

## 5.6 Policy Implications and Recommendations of the Study

The results suggest a general lack of CBI for some of the CBs. For some CBs, there is still a gap between what the CB Act stipulates and the actual CB practices. Some of the Acts like the Central Bank of Nigeria Act, still reflect excessive government control over the CBs. Others CB Acts are now considerably outdated. For example, by the end of 2008, the Reserve Bank of Malawi was still guided by the 1989 Act, which grants it, low legal CBI. The Bank of Sudan Act still does not include the price stability objective in its mandate, when current global trends in CBI recommend this as the primary or sole objective of a modern-day CB. Some of the Acts are presented in ways that leave some room for interpretation spreads. Our observations on the status of CBI in Africa present several policy implications for African governments to consider.

Most governments still need to grant their CBs, more CBI. They need to restructure their CBs and come up with better Acts, which enhance CBI. They need to comply with the modern-day requirements for independent and respected CBs (Wessels (2008)). Some of the CB Acts still need further revisions. We recommend that most governments consider constitutionalizing CBI so that it is not easily violated by some political authorities. The effectiveness of this would, however, depend on how political authorities respect their country constitutions. So far, only the Bank of Uganda and the South African Reserve Bank have constitutional CBI. Notably, some governments like the Kenyan government have regularly revised their CB Acts to standards, almost consistent with modern-day CB Acts in terms of presentation, focus, scope, detail and specificity, although they still need to do more in terms of some specific CBI dimensions.

There is a need to reduce government involvement in the appointment and dismissal of CB governing bodies. This would help depoliticize the appointment processes. It would reduce the personal dependence of CB governors and other governing bodies on the political authorities that appoint them. Appointments through independent professional bodies or Double-Veto appointment procedures could be used. If appointment is still done by government, then it should be a multi-faceted and extensive consultative process, involving either the CB board, Cabinet, National Assembly or Senate. Some CBs still need to move away from the Presidential approval for setting the remuneration for the CB governors in order to reduce CB governor dependence on political authorities. There is a need to avoid appointment of non-technocrate CB governors, based on political motives, political party affiliation or notable persons in society, to avoid inefficiency in discharging CB work. We recommend that most governments also consider previous work experience in international organizations such as the AfDB, IMF and the World Bank in recruiting governors. The governments could explore the use of search teams, with independent professional experts, to scout for potential candidates before nominations are done. Such a move could ensure that potential candidates are thoroughly scrutinized before any announcements are officially made. Further strengthening of immunity conditions against undue dismissals is required. The Acts should clearly and explicitly state potential dismissal conditions in order to reduce politically-motivated dismissals or undue political interference through hiring and firing, which is still prevalent in Angola and Mauritania. In addition, all dismissal cases should be thoroughly investigated to avoid unfair dismissals, which in future, potentially create dependence of CB governors on political authorities.

We recommend that governments lengthen the terms of office of CB governing bodies so that they are longer than the electoral cycle or term of government, to reduce personal dependency. The renewability of the terms of office of CB governors could be removed. This would help reduce potential lobbying and soliciting for reappointment, which still takes place in some of the countries like Nigeria. The terms of office for the CB board members could be staggered to enhance continuity and renewability. Governments like the Angolan and the Ethiopian ones still need to remove politicians from their CB boards. This would help depoliticize the policy decisions of the CB boards. Most CBs still need to establish open, clear and explicit policy conflict resolution mechanisms between the respective CBs and their governments. Some of the

CBs that already have these mechanisms need to revise them in ways that strengthen the position of CBs in case(s) of policy conflict.

The financial (fiscal) independence of some CBs requires further strengthening. There is a need for the respective countries to develop capital and money markets for government securities, which are still shallow in most of the African countries. There is a need to enhance public debt management in the Treasury Departments of most governments (Laurens (2005)). This would help reduce the demand for CB credit by the governments. It would also help reduce the CBs' discretion on the lender-of-last resort facility. CBs should enforce credit limit conditions in practice. Some CBs still need to further tighten credit limits because they are still loose. CBs should consider reducing their involvement in bank supervision to avoid forbearance in case of financial crisis. Some CBs still need to move away from negotiated interest rates on government debt, to market or close to market interest rates. The interest rates on government debt should be charged with reference to market interest rates. Some CB Acts need to further clarify repayment terms on government debt and the limits on the maturity profile of CB loans to government.

## 5.7 Suggested Areas for Further Research

For the chapters 2, 3 and 4, a larger sample size and a longer study period would broaden analysis. For chapter 2, as a robustness check on the legal indices we used, a method of Principal Components could be explored to calculate legal CBI indices. This method has been explored for robustness and recommended in some previous studies (Fujiki (1996) and Mangano (1998)). The suggested method could improve on some of the inadequacies of the legal indices that we used. Notably, the Cukierman et al. (1992) weights are assigned apriori and arbitrarily. Grilli et al. (1991) assign equal weight to all the 15 CBI variables. In principle, these variables are not necessarily equally important in overall CBI determination as the Grilli et al. (1991) indices would suggest. In addition, the binary nature of the Grilli et al. (1991) indices makes the less variable within and across the CBs. The results for our economic CBI index clearly reflect this phenomenon. This makes it difficult to do regression analysis using the GMT indices for African countries, where CB laws are changed infrequently. Conceptually, the binary nature of the Grilli et al. (1991) indices suggests that CBI is either complete (1) or completely non-existent (0). In practice, however, CBI is considered as a matter of degree for most CBI aspects. It would be more plausible to have more alternative ratings, in addition to the extremes values, 0 or 1 only.

In terms of factual CBI, a longer study period would generate more legal terms of office of the CB governor than our current 3.2-4.8 legal terms. More terms of office would broaden our analysis and give more conclusive results for the factual CBI index. A more detailed qualitative analysis of governors and other CB board members would enhance analysis. This would include investigating their previous professional experience, charisma, previous position of influence in society, institutions they previously worked for, previous political party affiliation and previous relationships with key political authorities like State Presidents and Ministers of Finance, and evolved behavioural norms between CBs and governments. TOR ratings only are not adequate for comprehensive analysis of factual CBI, which is a broad concept. Including more factual CBI measures could broaden analysis. These include the political vulnerability of CB governors' index, the compliance index and the questionnaire-based index. It would be possible to compare the results among the different indices. It would be a robustness check on the analysis.

For chapter 3, use of more control variables in addition to the CBI dummy variable would enhance analysis of the effects of CBI on macroeconomic performance. An attempt to use the DID method in panel data could enhance analysis. It would complement cross-sectional analysis, increase the number of observations and reduce the sample size concerns. A larger sample size and a longer sample period could enable regression estimation of the model using estimation techniques like Probit model, may possibly produce more robust and more conclusive results.

For chapter 4, as a robustness check on the analysis, more alternative measures of FD would enhance analysis and possibly give more conclusive evidence on the effects of FD on CBI and macroeconomic performance. This is because no one measure of FD is perfect. Each measure has its own merits and demerits. Each measure would fulfill an important function and isolate certain specific effects. Further study could explore an investigation of individual countries with extreme CBI features like Angola, Mauritania and Zimbabwe. It would be interesting to find out how macroeconomic variables react to FD in single country studies. With data availability, further research could use fiscal deficit financing methods in addition to the size of the fiscal balance, because both determine CBI in less developed countries (Fry (1998)). As explained by Neyapti (2003), how fiscal deficits are financed may explain lack of a systematic relationship among FD, CBI and macroeconomic variables. Financing methods could be interacted variables with the level of the fiscal deficit variable as was done in Aisen and Hauner (2007, 2008).

## 6. Bibliography


Abdullah H, M. S. Habibullah and A. Z. Baharunshah (2008), "Fiscal Policy, Institutions and Economic Growth in Asian Economies: Evidence from the Pedroni's Cointegration Approach", *International Journal of Business and Management*, 3 (4), pp.107-126.

Abdullah H, M. S. Habibullah and A. Z. Baharunshah (2009), "The Effect of Fiscal Variables on Economic Growth in Asian Economies: A Dynamic Panel Data Analysis", *International Journal of Business Management*, 4 (1).

Abizadeh S. and M. Yousefi (1998), "Deficits and Inflation: An Open Model of the United States", *Applied Econometrics*, 30, pp. 1307-1316.

Acemoglu D, P. Querubin, S. Johnson and J. A. Robinson (2008), "When Does Policy Reform Work? The Case of Central Bank Independence", *European Economic Review*,39, pp.17-33.

Adams C. S. and D. L. Bevan (2005), "Fiscal Deficits and Growth in Developing Countries", *Journal of Public Economics*, 89, pp.571-597.

Afonso A. and G. A. Juan (2008), "Fiscal Deficits and Budgetary Components: A Panel Assessment of the EU", *European Central Bank, Working Paper Series, No.848.*

African Development Bank (AfDB), Part II-Country Statistical Tables (2009).

Ahn S. C. and P. Schmidt (1995), "Efficient Estimation of Models for Dynamic Panel Data", *Journal of Econometrics*, 68, pp. 5-28.

Akinlo A. (2004), "Foreign Direct Investment and Growth in Nigeria: An Empirical Investigation", *Journal of Policy Modeling*,26, pp. 627-639.

Ahking F. W. and S. M. Miller (1985),"The Relationship between Government Deficits, Money Growth, and Inflation", *Journal of Macroeconomics*,7, pp. 447-467.

Aisen A. and F. G. Veiga (2006), "Does Political Instability Lead to Higher Inflation? A Panel Data Analysis", *Journal of Money, Credit and Banking*,38, pp.1379-1389.

Aisen A. and D. Hauner (2007), "Budget Deficits and Interest Rates: A Fresh Perspective", *IMF Discussion Series, November 2007.*

Aisen A. and D. Hauner (2008), "Budget Deficits and Interest Rates: A Fresh Perspective", *IMF Fiscal Affairs Department*, WP/08/42.

Alesina A. (1988), "Macroeconomics and Politics", *National Bureau of Economic Research (NBER) Macroeconomics Annual, MIT Press, Cambridge,* MA, pp.13-52.

Alesina A. (1989), "Politics and Business Cycles in Industrial Democracies", *Economic Policy*,8, pp.57-98.

Alesina A. and L. Summers (1993), "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence", *Journal of Money, Credit and Banking,* 25 (2), pp.151-162.

Alesina A, S. Ozler, N. Roubini and P. Swagel (1996), "Political Instability and Economic Growth", *Journal of Economic Growth*,1, pp. 189-212.

Alesina A. and R. Perotti (1995), "Fiscal Expansion and Fiscal Adjustments in OECD Countries", *Economic Policy*, 21, pp. 205-248.

Allen S. D. and M. D. Smith (1983), "Government Borrowing and Monetary Accommodation", *Journal of Monetary Economics*,12, pp. 605-616.

Altonji J. G. and L. M. Segal (1996), "Small Sample Bias in GMM Estimation of Covariance Structures", *Journal of Business and Economic Statistics*,14, pp. 353-366, July 1996.

Andrews D. W. K. and J. H. Stock (2005), "Inference with Weak Instruments", *Cowles Foundation Discussion Paper*.

Anderson T. W. and C. Hsiao (1982), "Formulation and Estimation of Dynamic Models Using Panel Data", *Journal of Econometrics*,18, pp. 47-82.

Anyanwu J. C. (1998), "Do Fiscal Deficits Produce High Interest Rates?: The Case of Nigeria, Ghana and the Gambia", *Central Bank of Nigeria Economic and Financial Revie*w,36 (1).

Arnone M. B, J. Laurens and J. F. Segalotto (2006), Measures of Central Bank Autonomy: Empirical Evidence for OECD, Developing and Emerging Market Economies, *IMF Working Paper* 06/228.

Arnone M, B. J. Laurens, J. F. Segalotto and M. Sommer (2007), "Central Bank Autonomy: Lessons from Global Trends", *IMF Working Paper*, No. 07/88.

Arnone M, B. J. Laurens, J. F. Segalotto and M. Sommer (2008), "Central Bank Autonomy: Lessons from Global Trends", *IMF Working Paper*, No. 07/88.

Arellano M. (1987), "Computing Robust Standard Errors for Within-Groups Estimators",*Oxford Bulletin of Economics and Statistics*,49, pp. 431-434.

Arellano M. (2003), "Panel Data Econometrics", *Oxford University Press, London.*

Arellano M. and S. Bond (1988), "Dynamic Panel Data Estimation Using DPD", Working Paper Series No. 88/15, *Institute of Fiscal Studies, London.*

Arellano M. and S. Bond (1991), "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations", *Review of Economic Studies*,58, pp. 277-297.

Arellano M. and S. Bond (1998), "Dynamic Panel Data Estimation Using DPD98 for GAUSS", Mimeo, *Institute for Fiscal Studies, London.*

Arellano M. and O. Bover (1995), "Another Look at the Instrumental Variables Estimation of Error-Component Models", *Journal of Econometrics*,68, pp. 29-51.

Bade R. and M. Parkin (1977), "Central Bank Laws and Monetary Policies: A Preliminary Investigation", London, Ontario, Canada: *University of Western Ontario, Mimeo.*

Bade R. and M. Parkin (1982), "Central Bank Laws and Monetary Policy", *Department of Economics, University of Western Ontario, Mimeo.*

Bade R. and M. Parkin (1985), "Central Bank Laws and Monetary Policy", *University of Western Ontario, Mimeo.*

Bade R. and M. Parkin (1988), "Central Bank Laws and Monetary Policy", *Department of Economics University of Western Ontario, Mimeo.*

Bade R. and M. Parkin (1997), "Central Bank Laws and Monetary Policy", *Department of Economics, University of Western Ontario, Mimeo*, June 1997.

Bagheri F. and N. Habibi (1998), "Political Institutions and Central Bank Independence: A Cross-Country Analysis", *Public Choice*, 96, pp. 187-204.

Baltagi B. H. (1995), "Econometric Analysis of Panel Data", *John Wiley and Sons, New York.*

Baltagi B. H. and S. Khanti-Akon (1990), "On Efficient Estimation with Panel Data: An Empirical Comparison of Instrumental Variables Estimators", *Journal of Applied Econometrics*, 5(4), pp. 401-406.

Baldini A. and M. P. Ribeiro (2008), "Fiscal and Monetary Anchors for Price Stability: Evidence from Sub-Saharan Africa", *International Monetary Fund Working Paper* WP/08/121.

Banaian K, R. Burdekin and T. D. Willett (1995), "On the Political Economy of Central Bank Independence". In: "Monetarism and the Methodology of Economics: Essays in Honor of Thomas Mayer", (ed) K. D, Hoover and S. M, Sheffrin (ed), pp.178-197, *Aldershot, U.K.: Edward Elgar.*

Banaian K, R. Burdekin and T. D. Willett (1998), "The Principal Components of Central Bank Independence: The More the Merrier?" *Public Choice*,97, pp.1-12.

Ball L. M. and N. Sheridan (2003), "Does Inflation Targeting Matter?" *National Bureau of Economic Research (NBER) Working Paper* No. 9577.

Ball L. M. and N. Sheridan (2005), "Does Inflation Targeting Matter?" In Bernanke, B.S., Woodford, M (ed), "The Inflation Targeting Debate", *University of Chicago Press, Chicago*, pp. 240-279.

Bank of England (2010), "Monetary Policy Statement", *Bank of England, United Kingdom.*

Banhart S. and A. Darrat (1988), "Budget Deficits, Money Growth and Causality: Further OECD Evidence", *Journal of International Money and Finance*,7, (June 1988), pp. 231-242.

Barth J, G. Iden, F. Russek and M. Wohar (1991), "The Effects of Federal Budget Deficits on Interest Rates and the Composition of Domestic Output". In: Penner R. G. (ed) "Great Fiscal Experiment" *Urban Institute Press, Washington D.C.* pp. 69-129.

Bhalla A. H. (1995 a), "Recent Economic Reforms in China and India", *Asian Survey*, XXXV,6, pp. 555-572.

Bhargava A. (1991), "Identification and Panel Data Models with Endogenous Regressors", *Review of Economic Studies*,58, pp. 129-140.

Barro R. J. (1989), "A Cross-Country Study of Growth, Saving, and Government", *National Bureau of Economic Research (NBER) Working Paper* No. 2855.

Barro R. J. (1991), "Economic Growth in a Cross Section of Countries", *Quarterly Journal of Economics*, 2, pp. 407-443.

Barro R. J. (1997), "Determinants of Economic Growth: A Cross-Country Empirical Study", *MIT Press: Cambridge.*

Barro R. J. (2003), "Determinants of Economic Growth in a Panel of Countries", *Annals of Economics and Finance*,4, pp. 231-274.

Barro R. J. and D. B. Gordon (1983), "Rules, Discretion and Reputation in a Model of Monetary Policy", *Journal of Monetary Economics*,12, pp.101-120.

Barro R. J. and X. Sala-i-Martin (1990), "World Interest Rates": In *NBER Macroeconomics Annual*, pp. 15-61 *MIT Press, Cambridge, MA and London, UK.*

Barro R. J. and X. Sala-i-Martin (1995), "Economic Growth", *McGraw-Hill, New* York.

Barro R. J. (1997), "Determinants of Economic Growth: A Cross-Country Empirical Study", *Cambridge MA, MIT Press.*

Barron R. J. and D. B. Gordon (1983 b), "A Positive Theory of Monetary Policy in a Natural Rate Model", *Journal of Political Economy*, 91 (4), pp. 589-610.

Barth J. R, G. Iden and F. S. Russek (1984), "Do Deficits Really Matter? "*Contemporary Policy Issues*, 3 (1), pp. 79-95.

Baum C. F, M. E. Schaffer and S. Stillman (2003), "Instrumental Variables and GMM: Estimation and Testing", *Stata Journal*, 3, pp.1-31.

Benassy-Quere A. and J. Pisani-Ferry (1994), "Independence de la Banque Centrales et Politique Budgetaire", *Revue Francaise de Finances Publique*, 46, pp. 81-92.

Bencivenga V. R. and B. D. Smith (1992), "Deficits, Inflation and the Banking System in Developing Countries: The Optimal Degree of Financial Repression", *Oxford Economic Papers*,44, pp. 767-790.

Benhabib J. and M. M. Spiegel (1997), "Cross-Country Growth Regressions", *C. V. Starr Center for Applied Economics*, NYU, Research Report, pp. 97-20.

Bernheim B. D. (1989), "A Neoclassical Perspective on Budget Deficits", *Journal of Economic Perspectives*,3, pp. 55-72.

Berger H, J. DeHaan and S. Eijffinger (2001), "Central Bank Independence: An Update of Theory and Evidence", *Journal of Economic Surveys*,15, pp. 3-40.

Bernanke B. and F. Mishkin (1997), "Inflation Targeting: A New Framework for Monetary Policy?"*Journal of Economic Perspectives*,11, pp. 97-116.

Bernanke B, T. Laubach, F. Mishkin and A. Posen (1999), "Inflation Targeting: Lessons from the International Experience", *Princeton University Press.*

Bertrand M, E. Duflo and S. Mullainathan (2004), "How Much Should We Trust Difference-in-Differences Estimates?" *Quarterly Journal of Economics*,119, pp. 249-275.

Bhargava A. and J. D. Sargan (1983), "Estimating Dynamic Random Effects Models from Panel Data Covering Short Time Periods", *Econometric*a,51, pp.1635-1659.

Bilquees F. (1988), "Inflation in Pakistan: Empirical Evidence on the Monetarist and Structuralist Hypotheses", *The Pakistan Development Review*, 27 (2), pp. 109-129.

Biørn E. and T. Klette (1998), "Panel Data with Errors-in-Variables: Essential and Redundant Orthogonal Conditions in GMM-estimation", *Economics Letters*,59, pp.275-282.

Biørn E. (2000), "Panel Data with Measurement Errors: Instrumental Variables and GMM Procedures Combining Levels and Differences", *Econometric Reviews,* 19 (4), pp. 391-424.

Blanchard O. J. and S. Fischer (1989), "Lectures in Macroeconomics", *The MIT Press, Cambridge, Massachusetts and London, England.*

Blinder A. S. (1988), "Central Banking in Theory and in Practice", *The MIT Press, Cambridge, MA.*

Blinder A. S. (1997), "Distinguished Lecture on Economics in Government: What Central Bankers Could Learn From A Central Bank and Vice-Versa", *Journal of Economic Perspectives*,11, pp. 3-19.

Blundell R.W. and S. R. Bond (1998), "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models", *Journal of Econometrics*,87, pp.115-143.

Blundell R. W. and S. R. Bond, (2000), "GMM Estimation with Persistent Panel Data: An Application to Production Functions", *Econometric Reviews*, 19 (3), pp. 321-340.

Blundell R.W, S. R. Bond and F. Windmeijer (2000), "Estimation in Dynamic Panel Data Models: Improving on the Performance of the Standard GMM Estimator". In: B. Baltagi (ed), "Nonstationary Panels, Panel Cointegration and Dynamic Panels", *Elsevier Science.*

Bodart V. (1990), "Central Bank Independence and the Effectiveness of Monetary Policy: A Comparative Analysis", *IMF Central Banking Department, Washington, D.C.*

BOM (2008), "Bank of Mauritius Responses to the Interview Guide", *Bank of Mauritius*, Mauritius.

Bond S. R. (2002), "Dynamic Panel Data Models: A Guide to Micro Data Methods and Practice", *Portuguese Economic Journal*,1, pp.141-162

Bond S. R, A. Hoeffler and J. Temple (2001), "GMM Estimation of Empirical Growth Models", Economics Group Nuffield College, *University of Oxford, Economic Papers Series,* Number 2001-W21.

Borensztein E, J. DeGregorio and J. Lee (1998), "How Does FDI Affect Economic Growth?"*Journal of International Economics,* (45), pp.115-135.

Bound J, D. Jaeger and R. Baker (1995), "Problems with Instrumental Variable Estimation When the Correlation between the Instruments and the Endogenous Explanatory Variables is Weak", *Journal of the American Statistical Association,*90, pp. 443-450.

Bowsher C. G. (2002), "On Testing Overidentifying Restrictions in Dynamic Panel Data Models", *Economic Letters,*77, pp. 211-20.

Brown K. H. and M. Yousefi (1996), "Deficits, Inflation and Central Banks' Independence: Evidence from Developing Countries", *Applied Economics Letters,* 3, pp. 505-509.

Brumm H. J. (2000), "Inflation and Central Bank Independence: Conventional Wisdom Redux", *Journal of Money, Credit and Banking,* 32 (4), pp. 807-819.

Buiter W. H. (2002), "The Fiscal Theory of the Price Level: A Critique", *Economic Journal*, 1120, pp. 459-80.

Buiter W. H. (2007 a), "How Robust is the New Conventional Wisdom in Monetary Policy?" *CEPR Discussion Papers*.

Buiter W. H. (2007 b), "Seigniorage", *NBER Working Paper No.W12919, Cambridge, MA: MIT Press*.

Burdekin R. C. K. and L. O. Laney (1988), "Fiscal Policy Making and the Central Bank Institutional Constraint", *Kyklos*, 41(4), pp.647-662.

Burdekin R. C. K. and M. E. Wolar (1990), "Monetary Institutions, Budget Deficits and Inflation", *European Journal of Political Economy*,6, pp.531-551.

Brunetti A. (1997), "Political Variables in Cross-Country Growth Analysis", *Journal of Economic Surveys*, 11 (2), pp.163-190.

Campillo M. and J. Miron (1992), "Central Bank Strategy, Credibility and Independence", *Cambridge: MIT Press, Cambridge, Mass.*

Campillo M, J. Miron, S. Edwards and G. Tabellini (1992), "Seigniorage and Political Instability", *American Economic Review*,82, pp. 537-555.

Campillo M. and J. Miron (1994), "Central Bank Independence and Monetary Control", *The Economic Journal*,104, pp.1437-1448.

Campillo M. and J. Miron (1997), "Why Does Inflation Differ Across Countries?" In: Romer C. and D. Romer (ed), "Reducing Inflation: Motivation and Strategy", *University of Chicago Press, Chicago*, pp.335-357.

Canzoneri M. B, E. C. Robert and T. D. Behzad (1998), "Fiscal Discipline and Exchange Rate Regimes", *CEPR Discussion Paper No.1899, CEPR*, London.

Castellani F. D. (2001), "Central Bank Independence and the Design of Fiscal Institutions", *IMF Working Paper*, WP/01/205.

Catao L. A. V. and M. E. Terrones (2005), "Fiscal Deficits and Inflation", *Journal of Monetary Economics*, 52, pp.529-554.

Chakraborty L. S. (2000), "Fiscal Deficits and Real Interest Rates: An Econometric Analysis of the Deregulated Financial Regime", *Economic and Political Weekly*, 37 (19).

Chamberlain G. (1982), "Multivariate Regression Models for Panel Data", *Journal of Econometrics*,18, pp.5-46.

Chandavarkar A. (1996), "Central Banking in Developing Countries", *MacMillan Press LTD*.

Choudhary M. A. S. and A. K. Parai (1991), "Budget Deficit and Inflation": The Peruvian Experience, *Applied Economics*, 23, pp.1117-1121.

Choi I. (2001), "Unit Root Tests for Panel Data", *Journal of International Money and Finance*,20, pp. 249-272.

Click R. W. (1998), "Seigniorage in a Cross-Section of Countries", *Journal of Money, Banking and Credit*, 10, pp.154-171.

Combes J-L. and Saadi-Sedik (2006), "How Does the Trade Openness Influence Budget Deficits in Developing Countries", *Journal of Development Studies*, 46 (8), pp.1401-1416.

Cornwell C. and P. Rupert (1988), "Efficient Estimation with Panel Data: An Empirical Comparison of Instrumental Variable Estimators", *Journal of Applied Econometrics*,3(2), pp.149-155.

Cragg J. (1983), "More Efficient Estimation in the Presence of Heteroskedasticity of Unknown Form", *Econometrica*,51, pp.751-763.

Crowe C. and E. E. Meade (2008), "Central Bank Independence and Transparency: Evolution and Effectiveness", *European Journal of Political Economy*, 24 (4), pp.763-777.

Crosby M. (1998), "Central Bank Independence and Output Variability", *Economics Letters*,60, pp.67-75.

Cukierman A. (1992). "Central Bank Strategies, Credibility, and Independence: Theory and Evidence", *Cambridge, Massachusetts: The MIT Press.*

Cukierman A. (1994 a), "Central Bank Independence and Monetary Control", *The Economic Journal*, 104, pp.1437-1448.

Cukierman A. (1994 b), "Commitment through Delegation, Political Influence and Central Bank Independence". In: J. O. de Beaufort Wijnholds, S.C.W. Eijffinger and L.H. Hoogduin (ed), "A Framework for Monetary Stability", *Dordrecht: Kluwer A Central Bank of Canada Publishers.*

Cukierman A. (2005), "Central Bank Independence and Monetary Policy Making Institutions-Past, Present and Future", *Lecture at the Annual Meeting of the Chilean Economic Society*, September.

Cukierman A. (2008), "Central Bank Independence and Monetary Policy Making Institutions-Past, Present and Future", *European Journal of Political Economy*, 24, pp.722-736.

Cukierman A. (2010), "Individual Responses to Questions on CBI modeling Techniques and Analysis".

Cukierman A, S. Edwards and G. Tabellini (1992), "Seigniorage and Political Instability", *American Economic Review*, 82, pp. 537-555.

Cukierman A, S. Webb and B. Neyapti (1992), "Measuring the Independence of Central Banks and Its Effect on Policy Outcomes", *World Bank Economic Review*, 6 (3), pp.353-398.

Cukierman A, P. Kalaitzidakis L. H. Summers and S. B. Webb (1993), "Central Bank Independence, Growth, Investment, and Real Rate", *Carnegie-Rochester Conference Series on Public Policy.*

Cukierman A, P. Miller and B. Neyapti (2002), "Central Bank Reform, Liberalization, and Inflation in Transition Economies-An International Perspective", *Journal of Monetary Economics*,49, pp.237-264.

Cukierman A, P. Kalaitzidakis, L. H Summers and S.B. Webb (1993), "Central Bank Independence, Growth, Investment and Real Rates", *Carnegie-Rochester Conference Series on Public Policy*,39, pp. 95-140.

Cukierman A. and S. Webb (1995), "Political Influence on the Central Bank: International Evidence", *The World Bank Economic Review*,9, pp. 397-398.

D'Amato M, B. Pistoresi and F. Salsano (2009), "The Determinants of Central Bank Independence", *Journal of Finance and Economics,*14, pp. 107-119.

D'Amato M. and R Martina (2005), "Credibility and Commitment of Monetary Policy in Open Economies", *European Journal of Political Economy*.

Dai Q. and T. Philippon (2004), "Government Deficits and Interest Rates: A No-Arbitrage Structural VAR Approach", *New York University*.

Daniaels J, N. Farrokh and D. Vanhoose (2005), "Openness, Central Bank Independence and the Sacrifice Ratio", *Journal of Money, Credit and Banking,*37, pp.371-379.

Darby M. R. (1984), "Some Unpleasant Monetarist Arithmetic", *Federal Reserve Bank of Minneapolis Quarterly Review*, pp.15-20.

Darrat A. F. (1985), "Inflation and Federal Budget Deficits: Some Empirical Results", *Public Finance Quarterly,*13, pp.206-215.

Darrat A. F. (2000), "Are Budget Deficits Inflationary? A Reconsideration of the Evidence", *Applied Economics Letters,*7, pp. 633-636.

Davidson R. and G. J. Mackinnon (2004), "Econometric Theory and Methods", *Oxford University Press.*

Daunfeldt S-O. and DeLuna X. (2008), "Central Bank Independence and Price Stability: Evidence from OECD–Countries", *Oxford Economic Papers,*60, pp. 410-422.

Daunfeldt S-O, J. Hellestrom and M. Landstrom (2008), "Why Do Politicians Implement Central Bank Independence Reforms?" *Umea Economic Studies 733, Umea Department of Economic Studies, Umea University.*

Daunfeldt S-O, D. Granlund, M. Landstrom and N. Rudholm (2010), Central Bank Independence and Price Stability: The Role of Democracy and Political Stability, *Umea Economic Studies 733, Umea Department of Economic Studies, Umea University.*

DeBelle G. and S. Fischer (1994), "How Independent Should a Central Bank Be?" In: J. C. Fuhrer (ed) "Goals, Guidelines and Constraints Facing Monetary Policy Makers", *The Federal Reserve Bank of Boston, Conference Series No.38, June,* pp.195-221.

DeBelle G. and S. Fischer (1995), "How Independent Should a Central Bank Be?" In: "Goals, Guidelines and Constraints Facing Monetary Policy Makers". In: J. C. Fuhrer (ed), *The Federal Reserve of Boston Conference Series,* pp.195-221.

DeHaan J. (2009), "Central Bank Independence: An Assessment of Empirical Research", *University of Groningen*, March 2009.

DeHaan J. and D. Zelhorst (1990), "The Impact of Government Deficits on Money Growth in Developing Countries", *Journal of International Money and Finance,* Vol. 7.

DeHaan J. and G-J. Van't Hag (1995), "Variation in Central Bank Independence Across Countries: Some Provisional Empirical Evidence", *Public Choice*, 85 (3-4), pp. 335–351.

DeHaan J. and W. Kooi (2000), "Does Central Bank Independence Really Matter? New Evidence for Developing Countries Using a New Indicator", *Journal of Banking and Finance,*24, pp. 643-664.

DeHaan J. and W. Kooi (1997), "What Really Matters? Conservativeness or Independence?" *Banca Nazionale del Lavoro Quarterly Review,*200, pp. 23-38.

DeHaan J. and J. E. Sturm (1992), "The Case for Central Bank Independence", *Banca Nazionale del Lavoro Quarterly Review,*182, pp. 305-327.

DeHaan J. and J. E. Sturm (1994), "Political and Institutional Determinants of Fiscal Policy in the European Community", *Public Choice,*80, pp.157-172.

DeHaan J. and J. Klomp (2008), "Inflation and Central Bank Independence: A Meta Regression Analysis", *Paolo Baffi Centre Research Papers.*

DeHaan J. and J. Klomp (2009), "Inflation and Central Bank Independence: A Meta-Regression Analysis", *Journal of Economic Surveys,* 24 (4).

DeHaan J. and J. Klomp (2010), "Central Bank Independence and Inflation Revisited", *Public Choice,*144, pp. 445-57.

DeGrauwe P. (2002), "Challenges for Monetary Policy in Euro-Land", *Journal of Common Market Studies,*40, pp. 693-718.

DeJong E. (2002), "Why are Price Stability and Statutory Independence of Central Banks Negatively Correlated? The Role of Culture", *European Journal of Political Economy,*18, pp.675-694.

Dellas H. K, K. Neusser and M. Walti (2005), "Fiscal policy in Open Economies", *Department of Economics, University of Bern, Switzerland.*

DeMelo M, C. Denizer and A. Gelb (1996), "From Plan to Market Economies", *World Bank Economic Review,* 10.

Demopouls G. D, G. M. Katsimbris and S. M. Miller (1987), "Monetary Policy and Central Bank Financing of Government Budget Deficit", *European Economic Review,* 31 (5), pp.1023-1050.

Diana G. and M. Sidiropoulos (2003), "Central Bank Independence, Speed of Disinflation and the Sacrifice Ratio", *Journal of Economic Literature,* pp.1-15.

Doi T. (1998), "Central Bank Independence Promotes Budgetary Efficiency", *Discussion Paper Series No. F-68, Institute of Social Science, University of Tokyo*.

Doppelhofer G. and M. Weeks (2009), "Jointness of Growth Determinants", In: *Journal of Applied Econometrics,* 24 (2), pp. 209-244.

Dornbusch R. and S. Fischer (1981), "Budget Deficits and Inflation", In: Development in an Inflationary World, (ed). M. J. Flanders and A. Razin, *New York: Central Bank of Canada Press.*

Douglas M. W. and T. R. Beard (1982), "Deficits, Money and Inflation: Comment", *Journal of Monetary Economics,* 10 (2), pp. 273-277.

Drazen A. (1985), "A General Measure of Inflation Tax Revenues", *Economic Letters,*17, pp. 327-330.

Dreher A, J. DeHaan and J. E. Sturm (2006), "When is a Central Bank Governor Fired? Evidence Based on a New Data Set", *Working Papers 06-143, KOF Swiss Economic Institute, ETH Zurich.*

Dreher A, J. DeHaan, and J. E. Sturm (2007), "Does High Inflation Causes Central Bankers to Lose Their Job? Evidence Based on a New Dataset", *CESifo Working Paper No.2045.*

Dreher A, J. DeHaan and J. E. Sturm (2008), "Does High Inflation Cause Central Bankers to Lose Their Jobs? Evidence Based on a New Data Set", *European Journal of Political Economy*,24, pp.778-787.

Dua P. and R. Pandit (2002), "Interest Rate Determination in India: Domestic and External Factors", *Journal of Policy Modelling*,24, pp.853-875.

Dufour J. (2003),"Identification, Weak Instruments and Statistical Inference in Econometrics", *CIRANO.*

Durlauf S. N, P. A. Johnson and J. Temple (2005), "Growth Econometrics", In: Aghion, P. and S. Durlauf (ed), Handbook of Economic Growth, *Elsevier Science & Technology*, 1 (1), pp. 555-677.

Dvorsky S. (2000), "Measuring Central Bank Independence in Selected Transition Countries and the Disinflation Process", *BOFIT Discussion Paper 13/2000*, Helsinki.

Dwyer G. P. (1982), "Inflation and Governments Deficits", *Economic Inquiry*,20, pp.315-329.

Easterly W. E. and K. Schmidt-Hebbel (1993), "Fiscal Deficits and Macroeconomic Performance in Developing Countries", *World Bank Research Observer*,8, pp. 211-337.

Easterly W. E. and S. Rebelo (1993), Fiscal Policy and Economic Growth: An Empirical Investigation, *Journal of Monetary Economics*,32, pp.417-458.

Easterly W. E. and R. Levine (1997), "Africa's Growth Tragedy: Policies and Ethnic Divisions", *Quarterly Journal of Economics*, November 1997.

Edwards S. and G. Tabellini (1991 a), "Explaining Fiscal Policies and Inflation in Developing Countries", *Journal of International Money and Finance*, 10 (1), S16-48.

Edwards S. and G. Tabellini (1991 b), Political Instability, Political Weakness and Inflation, *National Bureau of Economic Research Working Paper* 3721.

Edwards S. and M. S. Khan (1985), "Interest Determination in Developing Countries: A Conceptual Framework", *IMF Staff papers*,32, pp. 377-403.

Eijffinger S. C. W. and J. DeHaan (1996), "The Political Economy of Central Bank Independence", *Special Papers in International Economics, No.19, International Finance Section, Department of Economics, Princeton University*.

Eijffinger S. C. W. and E. Schaling (1993), "Central Bank Independence in Twelve Industrial Countries", *Banca Nationale del Lavoro Quarterly Review*, 184, pp.49-89.

Eijffinger S. C. W. and E. Schaling (1995), "The Ultimate Determinants of Central Bank Independence" *Discussion Paper 5,Center for Economic Research, Tilburg University*.

Elias V. J. (1978), "Sources of Economic Growth in Latin American Countries", *The Review of Economics and Statistics*, 60 (3), pp. 362-370.

Elmendorf D. W. (1993), "Actual Budget Deficit Expectations and Interest Rates", *Harvard Institute of Economic Research.*

Engen E. and J. Skinner (1992), "Fiscal Policy and Economic Growth", *NBER Working Paper 4223*.

Evans P. (1987 a), "Do Budget Deficits Raise Nominal Interest Rates? Evidence from Six Countries", *Journal of Monetary Economics*,20, pp. 281-300.

Evans P. (1987 b), "Interest Rates and Expected Future Budget Deficits in the United States", *Journal of Political Economy*,95, pp. 34-58.

Favero C. A. and F. Spinelli (1999), "Deficits, Money Growth and Inflation in Italy": 1875-1994, *Economic Notes*,28, pp. 3-71.

Farvaque E. (2002), "Political Determinants of Central Bank Independence", *Economics Letters*, (77), pp.131-136.

Fischer S. (1993), "The Role of Macroeconomic Factors in Growth", *Journal of Monetary Economics*,32, pp.484-512.

Fischer S. (1994), "Modern Central Banking", In: Caie F, C. Goodhart, S. Fischer and N. Schnadt (ed), "The Future of Central Banking", *The Tercentenary Symposium of the Bank of England, Cambridge: Cambridge University Press.*

Fischer S. (1995 a), "Central Bank Independence Revisited", *American Economic Review, Papers and Proceedings*,85, pp. 201-206.

Fischer S. (1995 b), "Modern Approaches to Central Banking", *NBER Working Paper, 5064*.

Forder J. (1996), "On the Assessment and Implementation of Institutional Remedies", *Oxford Economic Papers*,48, pp.39-51.

Forder J. (1998 a), "The Case for an Independent European Central Bank: A Reassessment of Evidence and Sources", *European Journal of Political Economy*,14, pp. 53-71.

Forder J. (1998 b), "Central Bank Independence: Conceptual Clarification and an Interim Assessment", *Oxford Economic Papers*,50, pp. 307-334.

Forder J. (1999), "Central Bank Independence: Reassessing the Measurements", *Journal of Economic Issues*, XXXIII (1), pp. 23-40.

Fosu A. K. (1990), "Export Composition and the Impact of Exports on Economic Growth of Developing Economies", *Economics Letters*,34, pp. 67-71.

Fratianni M. and H. Haizhou (1994), "Reputation, Central Bank Independence and the ECB in Varieties of Monetary Reforms: Lessons and Experiences on the Road to Monetary Union", Pierre L. Siklos (ed), *Kluwer Publishers*, pp.165-191.

Franzese R. (1998), "Two Hands on the Wheel: Independent Central Banks, Politically Responsive Governments and Inflation": www-personal.umich.edu/franzese.

Franzese R. (1999), "Partially Independent Central Banks", *American Journal of Political Science*, 43 (3), pp.763-774.

Freytag A. (2001), "Does Central Bank Independence Reflect Monetary Commitment Properly - Methodical Considerations", *BNL Quarterly Review,217*, pp.181-208.

Freytag A. (2002), "Success and Failure in Monetary Reform: Monetary Commitment and the Role of Institutions", *Edward Elgar, Cheltenham, Northampton*.

Friedman M. (1971), "Government Revenue from Inflation", *Journal of Political Economy*,79, pp.846-856.

Fry M. J. (1998), "Assessing Central Bank Independence in Developing Countries: Do Actions Speak Louder than Words", *Oxford Economic Papers*,50, pp.512-529.

Fry M. J, A. E. G. Charles and A. Alvaro (1996), "Central Banking in Developing Countries: Objectives, Activities and Independence", *Routledge, London and New York.*

Fujiki H. (1996), "Central Bank Independence Indexes in Economic Analyses: A Reappraisal", *Bank of Japan Monetary and Economic Studies*,14, December 1996, pp.79-99.

Fuhrer J. C. (1997), "Central Bank Independence and Inflation Targeting: Monetary Policy Paradigms for the Next Millennium?" *New England Economic Review*,12, pp.19-36.

Gale W. G. and P. R. Orszag (2003), "Economic Effects of Sustained Fiscal Deficits", *National Tax Journal,* 56, pp. 463-485.

Garcia R. and P. Perron (1996), "An Analysis of the Real Interest Rate under Regime Shifts", *Review of Economics and Statistics*,79, pp.111-124.

Gardner R. (1998), "Unobservable Individual Effects in Unbalanced Panel Data", *Economic Letters*, 58 (1), pp. 39-42.

Garvin M. and R. Perotti (1997), "Fiscal Policy in Latin America", In: Bernanke B. and J. J. Rotemberg (ed), *NBER Macroeconomic Annual, University of Chicago Press, Chicago*.

Ghartey E. E. (2001), "Macroeconomic Instability and Inflationary Financing in Ghana", *Economic Modelling*,18, pp. 415-33.

Gertler M. (2005), "Comment on Ball L. M. and N. Sheridan, "Does Inflation Targeting Matter?"Michael Woodford? (ed),"The Inflation Targeting Debate": *The University of Chicago Press*: Chicago; pp. 276-281.

Giannaros D. S. and B. R. Kolluri (1985), "Deficit Spending, Money, and Inflation: Some International Empirical Evidence", *Journal of Macroeconomics*,7, pp. 401-417.

Goodhart C. and D. Schoenmaker (1995), "Should the Functions of Monetary Policy and Banking Supervision be Separated?" *Oxford Economic Papers*,47, pp. 539-560.

Goodman J. B. (1991), "The Politics of Central Bank Independence", *Comparative Politics*,23 (3), pp. 329-349.

Goodman J. B. (1992), "Monetary Sovereignty: The Politics of Central Banking in Europe, Ithaca and London", *Cornell University Press.*

Gordon P. and D. Barro (1983), "Rules, Discretion and Reputation in A Model of Monetary policy", *Journal of Monetary Economics*,12, pp.101-121.

Goyal R. (2004), “Does Higher Fiscal Deficit Lead to Rise in Interest Rates? An Empirical Investigation”, *Economic and Political Weekly,* 39 (2), pp. 2128-2133.

Grier K. B. and H. E. Neiman (1987), “Deficits, Politics and Money Growth”, *Economic Inquiry,* 25 (2), pp. 201-214.

Grier K. and G. Tullock (1989), “An Empirical Analysis of Cross-National Economic Growth”, 1951-1980, *Journal of Monetary Economics*, 24 (1), pp. 259-276.

Griliches Z. and J. A. Hausman (1986), “Errors in Variables in Panel Data”, *Journal of Econometrics*, 32, pp. 93-118.

Grilli V, D. Masciandaroand and G. Tabellini (1991), “Political and Monetary Institutions and Public Financial Policies in the Industrial Countries”, *Economic Policy,*13, pp. 341-392.

Grossman G. and E. Helpman (1994), “Endogenous Innovation in the Theory of Growth”, *The Journal of Economic Perspectives,* 8 (1).

Gupta K. L. (1992), “Budget Deficits and Economic Activity in Asia”, *Routledge-A Division of Routledge, Chapman and Hall, Inc.1992 New York*.

Gupta S, B. Clements, E. Baldacci and C. Mulas-Franados (2005), “Fiscal Policy, Expenditure Composition and Growth in Low-Income Countries”, *Journal of International Money and Finance,* 24, pp. 441-463.

Gutiérrez E. (2003), “Inflation Performance and Constitutional Central Bank Independence: Evidence from Latin America”, *IMF Working Paper, 03/53*.

Hayo B. (1998), “Inflation Culture, Central Bank Independence and Price Stability”, *European Journal of Political Economy,*14, pp.241-263.

Hayo B. and C. Hefeker (2002), “Reconsidering Central Bank Independence”, *European Journal of Political Economy,*18, pp.653-674.

Hall A. R. (2004), “Generalised Methods of Moments”, *Oxford University Press*, London.

Hamburger M. J. and B. Zwick, (1981), “Deficits, Money and Inflation”, *Journal of Monetary Economics,*7, pp.141-150.

Hansen L. (1982), “Large Sample Properties of Generalized Method of Moments Estimators”, *Econometrica,*50, pp.1029-1054.

Hansen L. J, A. Heaton and A. Yaron (1996), “Finite Sample Properties of Some Alternative GMM Estimators”, *Journal of Business and Economic Statistics,*14 (3), pp.262-280.

Hansen H. and J. Rand (2006), “On the Causal Links between FDI and Growth in Developing Countries”, *World Development*, 29, pp. 21-41.

Harberger A. C. (1978), “The Primer on Inflation”, *Journal of Money, Credit and Banking,*10, pp.505-521.

Hardi K. (2000), “Testing for Stationarity in Heterogeneous Panel Data”, *Econometric Journal*, 3, pp. 148-161.

Hausman J. A. (1978), "Specification Test in Econometrics", *Econometrica,* 46 (5), pp.1251-1272.

Hausman J. A. and W. E. Taylor (1981), "Panel Data and Unobservable Individual Effects", *Econometrica,* (49), 6.

Hernandez-Cata, E. (1999), "Price Liberalization, Money Growth and Inflation During the Transition to a Market Economy", *IMF Working Paper, WP99/76 Washington, D.C. IMF, June.*

Hibbs D. (1977), "Political Parties and Macroeconomic Policy", *American Political Science Review,*23, pp.1467-1488.

Hondroyiannis G. and E. Papapetrou (1994), "Cointegration, Causality and Government Budget Inflation Relationship in Greece", *Applied Economic Letters*, 1, pp. 204-206.

Ilieva J. and N. Healey (2000), "Central Bank Independence in Selected Transition Economies", *Slovo*, 12, *SEES, London*, pp. 870-903.

Ilieva J. and N. Healey (2001), "Measures and Patterns of Central Bank Independence in Transition Economies", *Statistics in Transition* 5 (1), pp.151-166.

Im K. S, M. H. Pesaran and Y. Shin (2003), "Testing for Unit Roots in Heterogenous Panels", *Journal of Econometrics,* 115, pp. 53-74.

Inoue T. (2005), "The Determinants of the Inflation Rate in Transition Countries-A panel Data Analysis, (42)1, *University of Turkey*.

Islam N. (1995), "Growth Empirics: A Panel Data Approach", *Quarterly Journal of Economics,*110, pp.1127-1170.

Issing O. (1993), "Central Bank Independence and Monetary Stability", *Occasional Paper* 89, *Institute of Economic Affairs*.

Jácome L. L. (2001), "Legal Central Bank Independence and Inflation in Latin America During the 1990s", *IMF Working Paper* 01/212.

Jácome L. L. and F. Vázquez (2005), "Any Link between Legal Central Bank Independence and Inflation? Evidence from Latin America and the Caribbean", *IMF Working Paper* 05/75.

Joines D. H. (1985), "Deficits and Money Growth in the United States 1872-1983", *Journal of Monetary Economics,* 16 (3), pp. 329-351.

Jonsson G. (1995), "Institutions and Macroeconomic Outcomes-The Empirical Evidence", *Swedish Economic Policy Review,*2, pp.181-212.

Judson R. A. and A. L. Owen (1999), "Estimating Dynamic Panel Models: A practical Guide for Macroeconomists", *Economics Letters,*65, pp.9-15.

Kalilombe L. (2010), "Central Bank Governance, Accountability and Independence: The Case of the Reserve Bank of Malawi", *University of KwaZulu Natal (KZN), Durban, Republic of South Africa*.

Karass A. (1994), "Macroeconomic Effects of Budget Deficits: Further International Evidence", *Journal of International Money and Finance*, 13, pp.190-210.

Kennedy P. (2003), "A Guide to Econometrics", *The MIT Press, Massachusetts*.

King J. (1995), "Commentary: Monetary Policy Implications of Greater Fiscal Discipline", In: Federal Reserve Bank of Kansas City (ed), "Budget Deficits and Debt: Issues and Options", pp. 171-183.

King R. G. and C. I. Plosser (1985), "Money, Deficit and Inflation", *Carnegie-Rochester Conference on Public Policy*,22, pp.147-196.

King R. E. and S. T. Rebelo (1990), "Public Policy and Economic Growth: Developing Neoclassical Implication", *Journal of Political Economy*, 21, pp. 309-341.

Kirchner S. (2007), "Fiscal Policy and Interest Rates in Australia", *Fiscal Policy, 3 (3),* Spring 2007.

Kiviet J. F. (1995), "On Bias, Inconsistency and Efficiency of Various Estimators in Dynamic Panel Data Models", *Journal of Econometrics*,68, pp.53-78.

Kleibergen F. and Mavorides (2009), "Weak Instrument Robust Tests in GMM and the New Keynesian Phillips Curve", *Journal of Business and Economic Statistics*, 27 (3), pp. 293-311.

Klomp J. and J. DeHaan (2010), "Inflation and Central Bank Independence: A Meta-Regression Analysis", *Journal of Economic Surveys*.

Klomp J. and J. DeHaan (2008), "Central Bank Independence and Financial Instability", *Journal of Financial Stability-JFS*, pp.111-118.

Kneller R, M. Bleaney and N. Gemmell (2000), "Fiscal Policy and Growth: Evidence from OECD Countries", *Journal of Public Economics*,74, pp.171-190.

Koester R. B. and R. Kormendi (1989), "Taxation, Aggregate Activity and Economic Growth: Cross-Country Evidence on Supply-Side Hypothesis", *Economic Enquiry*, 27, pp. 367-386.

Kormendi R. and P. Meguire (1985), "Macroeconomic Determinants of Growth: Cross-Country Evidence", *Journal of Monetary Economics*, 16 (4), pp. 141-163.

Kuehlwein M. and S. Samalapa (1999), "Budget Deficits, Public Spending and Interest Rates in Thailand", *Claremone College*, USA.

Kydland F. E. and E. C. Prescott (1977), "Rules Rather than Discretion: The Inconsistency of Optimal Plans", *Journal of Political Economy*,85, pp.473-491.

Landau D. (1986), "Government and Economic Growth in the Less Developed Countries: An Empirical Study for 1960-80", *Economic Development and Cultural Change*, 35, pp. 35-75.

Lane P. (1997), "Inflation in Open Economies", *Journal of International Economics*,42, pp. 327-347.

Laney L. O. and T. D. Willet (1983), "Presidential Politics, Budget Deficits and Monetary Policy in the United States", *Public Choice*, 40 (1), pp.53-69.

Laubauch T. (2003), "New Evidence on the Interest Rate Effects of Budget Deficits and Debt, Board of Governors of the Federal Reserve System", *Federal Reserve Bank*, May 2003.

Laurens B. (2005), "Monetary Policy at Different Stages of Market Development", *IMF Occasional Paper 244, Washington, International Monetary Fund.*

Levine A, C. F. Lin and C. S. Chu (2002), "Unit Root Tests in Panel Data: Asymptotic and Finite Sample Properties", *Journal of Econometrics,*108, pp.1-24.

Levine R. and D. Renelt (1992), "A Sensitivity Analysis of Cross-Country Growth Regressions", *American Economic Review,*82, pp. 942-963.

Levine R. and S. Zervos (1998), "Stock Markets, Banks and Economic Growth", *American Economic Review,*88, pp. 537-58,

Levy M. (1981), "Factors Affecting Monetary Policy in an Area of Inflation", *Journal of Monetary Economics,* 8 (3), pp. 351-373.

Li X. and X. Liu (2004), Foreign Direct Investment and Economic Growth: An Increasingly Endogenous Relationship, *World Development*, 33 (3), pp. 393-407.

Lin S. A. Y. (1994), "Government Spending and Economic Growth", *Applied Economics*, 26, pp. 83-94.

Lohmann S. (1992), "Optimal Commitment in Monetary Economics: Credibility versus Flexibility", *American Economic Review,*82, pp.150-167.

Loungani P. and N. Sheets (1997), "Central Bank Independence, Inflation and Growth in Transition Economies", *Journal of Money, Credit and Banking,*29, pp. 381-399.

Lybek T. (1999), "Central Bank Autonomy and Inflation and Output Performance in the Baltic States, Russia and Other Countries of the Former Soviet Union", *IMF Working Paper*, No 99/4.

Lucotte Y. (2009), "The Influence of Central Bank Independence on Budget Deficits in Developing Countries: New Evidence from Panel Data Analysis", *Université d'Orléans,UMR CNRS 6221*.

Mangano G. (1998), "Measuring Central Bank Independence: A Tale of Subjectivity and of Its Consequences", *Oxford Economic Papers*, 50 (3), pp. 468-492.

Maliszewski W. S. (2000), "Central Bank Independence in Transition Economies", *Economics of Transition,*8, pp. 749-789.

Mankiw G. (1999), "Chapter 7: Macroeconomics", *New York, Worth Publishers*, pp. 167-168.

Mankiw G, D. Romer and D. N. Weil (1992), "A Contribution to the Empirics of Economic Growth", *Quarterly Journal of Economics,*107, pp. 407-437.

Mankiw G. E. Phelps and D. Romer (1995), "Growth of Nations", *National Bureau of Economic Research, Brooking Papers on Economic Activity,*1.

Mas I. (1994), "Central Bank Independence-A Critical View from Developing Country Perspective", *The World Bank Policy Research Working Paper Series 1356*.

Masson P. R. (1997), "Fiscal Dimensions of European Monetary Union (EMU)", *Economic Journal,* 106, pp. 996-1 004.

Masciandaro D. and F. Spinelli (1993), "Monetary Constitutionalism Once Again: Theory, Evidence and Central Bank View", *Working Paper, Milan: Centre for Monetary and Financial Economics, Universita Commerciale Luigi Bocconi*, February 1993.

Maxfield S. (1997), "Gatekeepers of Growth: The International Political Economy of Central Banking in Developing Countries", *Princeton University Press*.

M$^{c}$Callum B. T. (1997), "Crucial Issues Concerning Central Bank Independence", *Journal of Monetary Economics*, 39, pp. 99-113.

M$^{c}$Millin W. D. (1986), "Federal Deficits, Macrostabilization Goals and Federal Reserve Behaviour", *Economic Enquiry*, 24, pp. 257-269.

Meade E. and C. Crowe (2007), "The Evolution of Central Bank Governance around the World", *Journal of Economic Perspectives*, 21(4), pp. 69-90.

Mendoza G. and F. Fernandez (1994), "Monetary Transmission Mechanism and Financial Indexation: Evidence From the Chilean Economy", *IMF PPAA/94/17*.

Metin K. (1998), "The Relationship between Inflation and the Budget Deficit in Turkey", *Journal of Business and Economic Statistics*,16, pp. 412-422.

Meyer D. (1995), "Natural and Quasi-Natural Experiments in Economics", *Journal of Business and Economic Statistics*, 13(2), pp.151-162.

Miller F. C. (1993), "Fiscal Deficits and Interest Rates: Comment", *Australian Economic Papers*.

Miller S. M. and F. S. Russek (1990), "The Temporal Causality between Fiscal Deficits and Interest Rates", Paper Presented at the Western Economic Association, *International 65 Annual Conference, San Diego*.

Miller S. M. and F. Russek (1997), "Fiscal Structures and Economic Growth: International Evidence", *Economic Enquiry*,35, pp. 603-613.

Mishkin F. S. (1999), "International Experiences with Different Monetary Policy Regimes", *Journal of Monetary Economics*,43 (3), pp.579-605.

Mishkin F. S. (2000), "What Should Central Banks Do? Homer Jones Lecture", *Federal Reserve Bank of St. Louis.*

Mishkin F. S. (2007), "Monetary Policy Strategy", *The MIT Press, Massachusetts*.

Modigliani F. and T. Jappelli (1998), "The Determinants of Interest Rates in the Italian Economy", *Review of Economic Conditions in Italy*,1, pp. 9-34.

Montiel P. (1989), "An Empirical Analysis of High-Inflation Episodes in Argentina, Brazil and Israel", *International Monetary Fund, Staff Papers*,36, pp. 527-549.

Montiel P. J. (2003), "Macroeconomics in Emerging Markets", *Cambridge University Press, United Kingdom.*

Morgan Stanley's Central Bank Directory (2004), *Central Banking Publications, London, United Kingdom.*

Mukhatar T. and Z. Muhammad (2010), "Budget Deficit, Money Supply and Inflation: The Case of Pakistan", *Pakistan Institute of Development Economics,*122/2010.

Mundlak Y. (1978), "On the Pooling of Time Series and Cross Section Data", *Econometrica,* 46 (1), pp. 69-85.

Neumann M. J. M. (1991), "Precommitment by Central Bank Independence", *Open Economies Review,*2, pp. 95-112.

Neyapti B. (1997 a), "Central Bank Independence in Transition Economies", *Manuscript, Bilkent University, Turkey.*

Neyapti B. (1997 b), "Budget Deficits and Inflation: An Analysis in Light of the Roles of Central Bank Independence and Financial Development", *Department of Economics, University of Maryland, MD.*

Neyapti B. (1998), "Budget Deficits and Inflation: An Analysis in the Light of Roles of Central Bank Independence and Financial Market Development", *Department of Economics, Ankara: Bilkent University.*

Neyapti B. (2001), "Central Bank Independence and Economic Performance in Eastern Europe", *Economic Systems,*25, pp.381-399.

Neyapti B. (2003), "Budget Deficits and Inflation: The Roles of Central Bank Independence and Financial Market Development", *Contemporary Economic Policy*, 21, October 2003, pp.458-475.

Nickell S. (1981), "Biases in Dynamic Models with Fixed Effects", *Econometrica,*49, pp.1417-1426.

Niskanen W. A. (1978), "Deficits, Government Spending and Inflation: What is the Evidence? "*Journal of Monetary Economics*, 4, pp.591-602.

Nordhaus W. (1975), "The Political Business Cycle", *Review of Economic Studies,*45, pp.169-190.

Oately T. (1999), "Central Bank Independence and Inflation: Corporatism, Partisanship, and Alternative Indices of Central Bank Independence", *Public Choice*, 98 (3-4), pp. 399-413.

Obi B. and A. Nurudeen (2009), "Do Fiscal Deficits Raise Interest Rates in Nigeria? A Vector Autoregression Approach", *Journal of Applied Quantitative Methods*, 4 (3).

Obstfeld M. (1986), "Rational and Self-Fulfilling Balance-of-Payment Crises", *American Economic Review*, 76 (1).

Olivera J. H. G. (1967), "Money, Prices, and Fiscal Lags: A Note on the Dynamics of Inflation", Banca Nazionale Del Lavoro, *Quarterly Economic Review*, 20, pp. 258-267.

Patnaik P. (2001), "On Fiscal Deficits and Interest Rates", *Economic and Political Weekly*, 36 (14), pp.1160-1163.

Perotti R. (1999), "Fiscal Policy in Good Times and Bad", *Quarterly Journal of Economics*, 114 (4), pp.1399-1436.

Phelps E. S. (1973), "Inflation in the Theory of Public Finance", *Swedish Journal of Economics*,75, pp. 67-82.

Plosser C. I. (1987), "Fiscal Policy and Term Structure", *Journal of Monetary Economics*, 20 (2), pp. 325-352.

Plumper T. and V. Troeger (2007), "Efficient Estimation of Time-Invariant and Rarely Changing Variables in Finite Sample Panel Analyses with Unit Fixed Effects", *Political Analysis*,15(2), pp.124-139.

Pollard P. (1993), "Central Bank Independence and Economic Performance", *Federal Reserve Bank of St. Louis*, pp. 21-36.

Posen A. S. (1993), "Why Central Bank Independence Does Not Cause Low Inflation: There Is No Institutional Fix for Politics". In: O'Brien, R. (ed), *Finance and The International Economy, Oxford University Press for the Amex Bank Review, Oxford*, pp.41–65.

Posen A. S. (1995), "Declarations Are Not Enough: Financial Sector Sources of Central Bank Independence", *National Bureau of Economic Research (NBER)Macroeconomics Annuals*, pp. 253-274.

Posen A. S. (1998), "Central Bank Independence and Disinflationary Credibility: A Missing Link?" *Oxford Economic Papers*, 50 (3), pp. 335-359.

Presnak M. (1996), "Central Bank Independence in Sub-Saharan Africa: An Analysis (1960-1989)", *Res Publica, Book 05, Presnak [1]*.

Protopapadakis A. and J. J. Siegel (1987), "Are Money, Growth and Inflation Related to Government Deficits? Evidence from Ten Industrialized Economies", *Journal of International Money and Finance*,6, pp. 31-48.

Quintyn M. and M. Taylor (2003), "Regulatory and Supervisory Independence and Financial Stability", *CESifo Economic Studies*, (49), pp. 259-294.

Ram R. (1986), "Government Size and Economic Growth: A New Framework and Some Evidence From Cross-Section and Time Series Data", *American Economic Review*,76, pp. 191-203.

Radzyner O. and S. Riesinger (1997), "Central Bank Independence in Transition: Legislation and Reality in Central and Eastern Europe, Focus on Transition 1/1997", *Vienna: Austrian National Bank*, pp.57-84.

Rajan G. (2004), "Does High Deficits Lead to Rise in Interest Rates? An Empirical Investigation", *Economic and Political Weekly*, 39 (21), pp.2128-2133.

Rebelo S. T. (1991), "Long-Run Analysis and Long-Run Growth", *Journal of Political Economy*, 99, pp. 500-521.

Rogoff K. (1985 a), "The Optimal Degree of Commitment to an Intermediate Monetary Target", *Quarterly Journal of Economics*,100, pp.1169-1190.

Rogoff K. (1985 b), "Can International Monetary Policy Cooperation be Counterproductive?" *Journal of International Economics*,18, pp.199-217.

Rogoff K. and Sibert A. (1988), "Elections and Macroeconomic Policy Cycles", *Review of Economic Studies*, 55, pp.1-16.

Rogoff K. S. (2003), "Globalization and Global Disinflation", Paper Prepared for the *Federal Reserve Bank of Kansas City* Conference on "Monetary Policy and Uncertainty: Adapting to a Changing Economy", *Jackson Hole, Wyoming*.

Romer D. (1998), "A New Assessment of Openness and Inflation: Reply", *Quarterly Journal of Economics*, (113), pp.649-652.

Romer C. and D. Romer (1989), "Does Monetary Policy Matter? A Test in the Spirit of Friedman and Schwartz", In: *NBER Macroeconomics Annual*, (ed) by Oliver Blanchard and Stanley Fischer, pp.121-170, *Cambridge Mass: MIT Press*, 1989.

Roodman D. (2006), How to Do xtabond2: An Introduction to "Difference" and "System" GMM in Stata, *Center for Global Development, Washington DC, Working Paper 103*, December.

Roodman D. (2009), "A Note on the Theme of Too Many Instruments", *Oxford Bulletin of Economics and Statistics*,71, pp.135-158.

Roubini N. (1991), "Economic and Political Determinants of Budget Deficits in Developing Countries", *Journal of International Money and Finance*, 10(s1), S49-72.

Sargan J. D. (1958), "The Estimation of Economic Relationships Using Instrumental Variables", *Econometrica*, 26 (3), pp. 393-415.

Sargan J. D. (1983), "Identification and the Lack of Identification", *Econometric*a,51, pp.1605-1634.

Sargent T. J. and N. Wallace (1981), "Some Unpleasant Monetarist Arithmetic", *Federal Reserve Bank of Minneapolis (FRBM) Quarterly Review*,5, pp.1-17.

Sargent T. J. (1982), "Beyond Demand and Supply Curves in Macroeconomics", *American Economic Review* ,72, pp.382-389.

Sargent T. J. (1986), "Rational Expectations and Inflation", *New York: Harper and Row*.

Shabbir T. and A. Ahmed (1994), "Are Government Budget Deficits Inflationary? Evidence from Pakistan", *The Pakistan Development Review*, 33 (4), pp. 955-967.

Shapiro D. M. (2004), "Federal Government Debt and Interest Rates", In: Discussion of Engen and Hubbard (2004), *National Bureau of Economic Research (NEBR) Macroeconomics Annual Conference.*

Skanland H. (1984), "The Central Bank and Political Authorities in Some Industrial Countries", *Oslo Norges Bank.*

Skinner J. (1987), "Taxation and Output Growth: Evidence From African Countries", *NBER Working Paper 2335.*

Sikken B. J. and J. DeHaan (1998), "Budget Deficits, Monetization and Central Bank Independence in Developing Countries", *Oxford Economic Papers*, 50 (3), pp. 493-511.

Solow R. M. (1956), "A Contribution to the Theory of Economic Growth", *Quarterly Journal of Economics*,70, pp. 55-94.

Smithin J. (1994), "Cause and Effect in the Relationship between Budget Deficits and the Rate of Interest", *Economies st Societes, MP 9*, pp. 151-169.

Staiger D. and J. H. Stock (1997), "Instrumental Variables Regression with Weak Instruments", *Econometrica*, 65, pp. 557-586.

Sturm J. and J. DeHaan (2001), "Inflation in Developing Countries: Does Central Bank Independence Matter? New Evidence Based on a New Data Set", *Department of Economics, University of Groningen, The Netherlands, CCSO Centre for Economic Research Working Paper No.200101:* pp.1-14.

Svensson L. E. O. (1997), "Optimal Inflation Targets, Conservative Central Banks, and Linear Inflation Contracts", *American Economic Review*,87, pp. 98-111.

Swinburne M. and M. Castello-Branco (1991), "Central Bank Independence and Central Bank Functions". In: Patrick Downeseza Vaez-Zadeh, (ed), "The Evolving Role of Central Banks", *IMF, Washington D.C.*

Tabellini G. (1986), "Central Bank Reputation and the Monetization of Deficits: The 1981 Italian Monetary Reform", *Economic Inquiry*, pp.185-200.

Temple J. (1998), Central Bank Independence and Inflation: Good News and Bad News, *Economics Letters*,61, pp. 215-219.

Wagner H. (1998), Central Banking in Transition Countries, *IMF Working Paper 98/126, Washington D.C.*

Walsh C. E. (1993 a), "Central Bank Strategy, Credibility and Independence: A Review Essay", *Journal of Monetary Economics*,32, pp. 287-302.

Walsh C. E. (1993b), "Optimal Contracts for Independent Central Bankers: Private Information, Performance Measures and Reappointment", *Federal Reserve Bank of San Franscisco Working paper.*

Walsh C. E. (1995), "Optimal Contracts for Central Bankers", *The American Economic Review*, 85 (1), pp. 151-167.

Walsh C. E. (2005), "Central Bank Independence", *University of California,* Santa Cruz.

Watchet P. and J. Young (1987), "Deficits Announcements and Interest Rates", *American Economic Review*, 77 (5), pp. 1007-1012.

WDI (2010), "World Development Indicators (WDI) Database Online", *World Bank Online*.

Wessels G. M. (1997), "Cycles in Central Bank Independence", *Economic History of Developing Regions*,12 (1) pp.153-174.

Wessels G. M. (2002), "Comparing the Evolving Independence of the European Central Bank and the South African Reserve Bank", *South African Journal of Economics*, 70 (6), September.

Wessels G. M. (2004), "Central Bank Independence Before and After the Democratization of South Africa", *The South African Journal of Economic History*,19 (1 & 2), pp.132-157.

Wessels G. M. (2006), "Are African Central Banks Sufficiently Independent for Monetary Convergence?" *South African Journal of Economics,* 74 (2), June 2006.

Wessels G. M. (2007 a), "Perspectives on the Independence of the Bank of England, the Reserve Bank of New Zealand and the South African Reserve Bank", *Journal of Humanities*,47.

Wessels G. M. (2007 b), "The Relationship between Government and Central Banks: How Independent Are Central Banks in the Common Monetary Area (CMA) of Southern Africa?" *Journal of Public Administration*, July 2007.

Wessels G. M. (2008), "Are They There Yet? The Independence of Central Bank From Their Governments in Five Selected Countries in the Southern African Development Community (SADC)", *Journal of Public Administration,3(2).*

White H. (1980), "A Heteroscedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroscedasticity", *Econometrica*,48, pp. 817-838.

White H. (1982), "Instrumental Variables Regression with Independent Observations", *Econometrica,* 50 (2), pp. 483-499.

Willard L. (2006), "Does Inflation Targeting Matter? A Reassessment", *CEPS Working Paper No.120.*

Willet T. (1988), "Political Business Cycles, The Political Economy of Money, Inflation and Unemployment", *Durhan, N.C.: Duke University Press.*

Woodford J. M. (1995), "Price Level Determinacy without Control of a Monetary Aggregate", *Carnegie-Rochester Conference on Public Policy*,43, pp.1-46.

Woodford J. M. (2001), "Fiscal Requirements for Price Stability", *NBER Working Paper*, No. 8072.

Wooldridge J. M. (2001), "Applications of Generalized Method of Moments Estimation", *Journal of Economic Perspectives,* 15 (4), pp. 87-100.

Wooldridge J. M. (2002), "Econometric Analysis of Cross Section and Panel Data", *MIT Press, Cambridge.*

Woolley J. T. (1984), "Monetary Politics: The Federal Reserve Bank and the Politics of Monetary Policy", *New York: Cambridge University Press.*

Woo J. (2003), "Economic, Political and Institutional Determinants of Public Deficits", *Journal of Public Economics*, 87, pp. 387-426.

Xiao Z, J. Shao, R. Xu and M. Palta (2007), "Efficiency of GMM Estimation in Panel Data Models with Measurement Error", *Sankhya*, 69 (1), pp.101-118.