Innovations

Nexus between Financial instability and Economic Growth in East and South African countries

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Abstract

Study analyzed the interactions between ratio of current account balance, credit to GDP, External debt to GDP, broad money supply to GDP, and inflation rate and economic growth shows optimal stabilization outcome for financial variables. Study shows how financial variables should respond to together with financial instability by estimating impulse response functions and variance decompositions. The main hypothesis of this paper tests whether changes in one of financial variables may lead to a considerable impact on other financial instability and vice-versa. A study employed Panel Vector Autoregressive modeling to empirically examine the relationship between Credit growth, inflation, money supply, debt and their effects on GDP growth in East and South African countries in selected 11 East and South African countries from 1995 to2019. It is found that impact of debt on Credit to GDP, inflation rate, money supply to GDP and economic rate to be weak while credit and money supply strongly interdependent on each other positively based on impulse response functions and variance decompositions next to GDP and inflation rate, all these channels, a credit to GDP isprobably the most important financial instability variables that create shock toeconomic growth. This is due to the fact that credit to GDP ratio account more percent in variation of GDP growth, followed by inflation rate while Money supply ratio account more percentage in variation of credit to GDP ratio followed by GDP growth. Moreover, money supply ratio accounts more percentage in variation of inflation rate followed by GDP growth rate. In general, the major reason for variation and shock of financial instability variables are their own initial valuesi.e Shock of GDP more likely affected by initial values of GDP while a shock in Money supply to GDP largely affected by initial values of Money supply to GDP. Therefore, Central Bank, government and other financial institutions: advised to maintain money supply, debt ratio and credit to bring sustainable economic growth in Eastand South African countries.

Key words: 1.*Impulse response function, 2.Panel VAR and VDC*

1. Introduction

A central issue in the study of macroeconomic stability is the predictability of financial crises. An important line of thought holds that crises are largely unpredictable. Using historical data on post-war financial crises around the world, (Robin G: Samuel G., 2020) shows that crises are substantially predictable. The combination of rapid credit and asset price growth over the prior three years, whether in the nonfinancial

business or the household sector, is associated with about a 40% probability of entering a financial crisis within the next three years. This compares with a roughly 7% probability in normal times, when neither credit nor asset price growth has been elevated. Their evidence cuts against the view that financial crises are unpredictable and points toward the Kindleberger-Minsky view that crises are the byproduct of predictable, boom-bust credit cycles. The predictability they document favors macro-financial policies that lean against the wind of the credit market booms. Other studies separately examine how well these two forms of credit growth predict future financial crises.

There is no doubt on a strong positive relationship between financial deepening-economic growth nexus, but the method of estimation and efficient form of relationship is of importance to size and reliability of the relationship, therefore, there is a question on the reliability and robustness of method of estimation used by previous studies. Money supply, credit to the private sector, the ratio of credit to the private sector on Gross Domestic Product and other non-quantitative indicators like the ratio of persons to banking services, access to money transmission channels as well as financial literacy levels; have been presented at miscellaneous times as indicators of the level of financial deepening.

2. Literature Review

This section has reviewed some literatures regarding the relationship between Financial instability and economic growth. It can be seen that the high level of stress anticipates a significant slowdown in economic activity that lasts up to 5 quarters. Minsky's theory states that financial markets can generate their own (endogenous) forces causing self-sustained waves of credit expansion and asset price inflation, which are necessarily followed by waves of credit contraction and asset price deflation. It can be seen that the growth rate in 2001 decreased to 1% as compared with 4% in 2000.

In 2009, due to the financial crisis of 2008, there was a deep recession, when the growth rate fell to almost –3%. However, in 2010, due to the massive injection of liquidity into the banking sector and broad stimulation of investment expansion, the GDP growth rate exceeded 2.5% and remained at 2% per year on average up to 2017, which marked the beginning of stable growth, reaching 3% in early 2019. According to Minsky's theory of financial instability, the economic dynamics are determined to a large degree by how firms finance their investment in fixed capital. (AKAEV, SADOVNICHII, 2020)

While policymakers continue to seek ideas from researchers to use financial regulation more efficiently and effectively to promote financial inclusion, research in this area is scarce. Nonetheless, for emerging and developing economies' policymakers, gaining insight into the impact of financial regulation on financial inclusion is a prerequisite for putting their economies on the path to speedy growth.(Ebenezer Bugri , Anarfoa, etal, 2020)

3. Objective of the Study

The objective of the study was to see the relationship between to study the nexus between financial instability and economic growth in East Africa will substantiate to fulfil the study gap. To examine the nexus between financial instability variables and Economic growth in East Africa, the credit-to-GDP gap was used as a proxy of financial instability performance (Drehmann et al (2011)). Nevertheless, others suggest an alternative approach to the problem of trend stability.

Financial Stress Index and measures of real economic activity and to calibrate the thresholds for the FII at which negative economic outcomes have occurred in the past.

These augmentations distinguish the generalized model used in this research from the traditional endogenous growth model. A variant of the production function in an endogenous-growth-model context in which FSI is explicitly incorporated as a factor input can be specified as

$$Y = A(hL)^{\alpha}K^{\beta}\mu^{1-\alpha-\beta} \text{ and } \lambda = M^{Z} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

In Ricardian equivalence hypothesis theory, the source of financing can be from government/private borrowing which crowd out private investment hence decreases economic growth, foreign borrowing will create debt burden while printing money leads to inflation. Thus monetary base includes currency plus deposit (required reserve and excess reserve).(George and Athanasios, etal, 2016) Introduce macro-economic variables first to study the relationship between financial stability, monetary stability, and growth as Growth Domestic Product (GDP) →Consumer Price Index (CPI) →Financial instability (FII).
To test the relationship between financial stability and growth, the theoretical underpinnings of growth author follow the model used by Ndebbio (2004) and modified to include financial instability variables. The model presumes that growth is determined by financial instability variables and other macroeconomic variables. For this research, the author has used five explanatory variables based (Dyberg, 2001)categorizes various indicators of financial instability(financial depth) as a proxy of M2GDP and CrGDP)and other macroeconomic variables like inflation rate, external debt to GDP ratio, trade openness and deficit to GDP ratio.
For this research author will going to use five explanatory variables based Dyberg, (2001) categorizes various indicators of financial instability (financial depth) as proxy of M2GDP and CRGDPgap) and other macroeconomic variables like inflation rate, external debt to GDP ratio, trade openness and deficit to GDP ratio.

Model1 (ΔINFit→ΔCrGDPgaprit → ΔM2GDPgapri→ΔDebtgapr→ΔGDP)

$$\text{Model2}: (\Delta CrGDPit, \Delta M2GDPit, \Delta GDPit, \Delta Debtit, \Delta INFit)$$

$$\text{Model3}: (\Delta M2GDPit, \Delta CrGDPit, \Delta Debtit, \Delta GDPit, \Delta INFit)$$

$$\text{Model4}: (\Delta GDPit, \Delta CrGDPit, \Delta M2GDPit, \Delta INFit)$$

$$\text{Model5}: (\Delta Debtit, \Delta CrGDPit, \Delta M2GDPit, \Delta GDPit) \ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

The study used the panel VAR approach that explores the endogenous interaction between labor costs and FDI. We opt for the new approach panel vector autoregressive (P-VAR). Indeed, this approach has some advantages compared to the traditional approach VAR. Interest in using PVAR models in applied macroeconomic analyses has been growing over time. This increasing interest is partly attributed to the availability of higher quality data for a large number of countries and the advances in computer technology which make estimating large-scale models feasible in a reasonably short time.

However, the PVAR model has limitations in analyzing interaction effects among different countries in the target group. Specification Panel Vector Autoregression (from now on PVAR) is built under the same logic of the standard VAR model, but the difference is that PVAR comprises a cross-country dimension. This enables PVAR to be a much more powerful tool for policymakers since it could detect shocks across countries ((Ahlem and Mohamed, 2019). One advantage of PVAR is that it enables the model to take advantage of Vector Autoregression even for panel data groups. Another advantage of PVAR is that it can treat multiple variables as endogenous, which enables the estimation of a bidirectional relationship between GDP, Financial instability, Inflation, trade openness, debt, and deficit. PVAR enables to overcome the limitations causing by simply using VECM or Granger-causality analysis separately(Batuo and Michael, etal, 2012).

IRF measures the effect of a shock to an endogenous variable on itself or another endogenous variable while the variance decomposition measures the extent or magnitude of the overall effect.
It can cautiously be claimed that this study is the first of its kind in applying these methods to study the relationship between FII, inflation rate, $CRGDP_{gap}$, $M2GDP_{gap}$, and GDP.

4. **Result and Discussion**

This section discusses the relationship between inflation rate, Credit growth, money supply, debt growth and Economic Growth in 11 countries using panel VAR models by focusing on impulse-response functions and forecast error variance decomposition. A panel VAR analysis is based on choosing the optimal lag order in both panel VAR specifications and moment conditions. For the application of the PVAR approach, only the variables that are stationary at of first order integration were considered; namely inflation rate, M2GDP ratio, debt ratio, credit growth and GDP growth rate. The analysis of the dynamic interactions among the variables in the post-sample period is conducted through variance decompositions (VDCs) and impulse response functions (IRFs).

Table1.1: Panel VAR Model

Vector Auto regression Estimates					
	lnGDPG	lnCRGDP	lnINF	lnEXTDEB	lnM2GDP
lnGDPG(-1)	0.44	0.28	0.11	0.00	0.35
	(0.065)	(0.094)	(0.108)	(0.004)	(0.211)
lnGDPG(-2)	0.10	-0.18	0.06	-0.00	-0.23
	(0.058)	(0.084)	(0.096)	(0.003)	(0.188)
lnCRGDP(-1)	-0.11	0.42	0.33	0.00	-1.16
	(0.088)	(0.128)	(0.147)	(0.005)	(0.287)
lnCRGDP(-2)	0.03	0.36	-0.33	0.018	0.90
	(0.090)	(0.130)	(0.149)	(0.005)	(0.291)
lnINF(-1)	0.00	-0.02	0.45	-0.00	-0.07
	(0.037)	(0.053)	(0.061)	(0.002)	(0.120)
lnINF(-2)	0.044	-0.01	0.03	0.00	-0.09
	(0.035)	(0.051)	(0.059)	(0.002)	(0.116)
lnEXTDEB(-1)	-0.61	-0.98	2.14	1.09	-0.86
	(0.994)	(1.433)	(1.64)	(0.065)	(3.214)
lnEXTDEB(-2)	0.12	0.73	-1.73	-0.19	0.77
	(0.970)	(1.399)	(1.609)	(0.063)	(3.138)
lnM2GDP(-1)	-0.04	0.284	-0.17	0.00	1.39
	(0.048)	(0.069)	(0.080)	(0.003)	(0.156)
lnM2GDP(-2)	0.058	-0.26	0.17	-0.00	-0.41
	(0.048)	(0.069)	(0.079)	(0.003)	(0.155)
C	4.83	4.27	1.82	0.34	7.48
	(1.82)	(2.62)	(3.01)	(0.11)	(5.88)
R-squared	0.37	0.66	0.30	0.87	0.77
Adj. R-squared	0.34	0.65	0.27	0.87	0.76
S.E. equation	3.63	5.23	6.02	0.23	11.73

F-statistic	14.40	48.21	10.57	171.99	83.54
Log likelihood	-679	-772	-807	10	-976
Mean dependent	5.38	18.62	7.54	3.96	35.94
Log likelihood		-3027.421			
Akaike information criterion		24.36697			
Schwarz criterion		25.13510			

Depending on panel vector autoregressive estimation, one-unit increase in lag value of economic growth will increase current economic growth by 0.44 percent while one-unit increase GDP increase credit to GDP by 0.22 percent. Moreover, one-unit increase in one-year lag and two-year lag value of CRGDP increase CRGDP by 0.42 and 0.36 percent respectively.

A unit increase in M2GDP increase CRGDP by 0.28 while decrease by 0.26 percent in the two years lag. A unit increase in CRGDP and lag value of Inflation rate increase inflation rate by 0.33 and 0.45 percent respectively.

Lag value of debt increase current level debt ratio while two-year lag value of debt decreases the current level of debt ratio. Effect of increase in credit on current level of money supply is negative while lag value of money supply has positive effect on current level of money supply. In general, money supply and credit were strong endogenous variables while inflation rate and debt ratios are weakly exogenous variables. In line with this GDP was weakly endogenous to the financial variables.

1.3 Impulse Response Function (IRF)

The impulse response functions give us information about the short-run dynamics of those impacts. Most shocks start to have a noticeable influence on the economy after 1 to 1.5 years, and are absorbed within 10 years. It also finds that right and center wing governments cut on money supply in reaction to shocks, while left wing governments do not (Atems and Jones , 2015).

The IRFs are meant to elucidate the dynamic reaction of one variable to the innovations in another variable in the system, while keeping all other shocks equal to zero. However, since the actual variance–covariance matrix of the errors is unlikely to be diagonal, to isolate shocks to one of the variables in the system it is necessary to decompose the residuals in such a way that they become orthogonal.

Table 1.2: Impulse response function of variables

Response of lnGDPG:					
Period	lnGDPG	LnCRGDP	LnINF	lnEXTED	lnM2GDP
1	3.75	0.00	0.00	0.00	0.00
2	2.40	-1.05	0.32	0.04	-0.14
3	1.75	-0.72	0.94	0.06	-0.13
4	1.96	-0.55	0.70	0.08	-0.22
5	1.96	-0.69	0.65	-0.04	-0.22
10	1.73	-0.73	1.04	-0.068	-0.33
Response of lnCRGDP:					
1	-1.14	5.43	0.000	0.00	0.00
2	-0.34	5.76	-0.012	-0.33	1.43
3	-0.07	4.11	0.218	-0.52	1.18

4	-0.65	4.33	0.368	-0.49	1.31
5	-0.55	4.59	0.141	-0.47	1.30
9	-0.45	4.52	0.094	-0.48	1.41
10	-0.44	4.52	0.110	-0.49	1.42
Response of lnINF:					
1	-0.29	-0.12	5.62	0.00	0.00
2	0.58	0.11	2.57	0.44	-0.80
3	1.38	0.14	0.45	-0.39	-0.83
4	1.37	0.14	2.18	-0.27	-0.59
5	1.35	0.21	2.20	0.12	-0.67
9	1.67	0.26	1.39	0.05	-0.60
10	1.71	0.26	1.31	0.01	-0.58
Response of LNEXTED:					
1	-0.05	0.006	-0.025	0.24	0.00
2	-0.06	0.022	-0.057	0.28	0.00
3	-0.06	0.029	-0.052	0.30	0.01
4	-0.06	0.028	-0.051	0.31	0.01
5	-0.06	0.029	-0.062	0.31	0.01
9	-0.05	0.031	-0.069	0.31	0.02
10	-0.05	0.031	-0.069	0.31	0.02
Response of lnM2GDP:					
1	-3.21	10.30	-0.34	-0.018	5.64
2	-1.75	8.58	-0.33	-0.38	8.02
4	-2.55	7.06	-0.52	-0.35	9.43
5	-2.20	7.57	-1.18	-0.29	9.91
10	-1.50	7.55	-1.90	-0.00	10.64
Cholesky Ordering: GDPG CRGDP INF LNEXTED M2GDP					

Economic Growth (GDPG):

In the same way, a one standard deviation shock (innovation) to inflation rate and debt ratio increase GDP growth rate by 0.7 and 0.079 percent in 4th period respectively. After 5thyear, a one standard deviation shock (innovation) to debt ratio becomes negative for economic growth while increase positively for inflation rate. This finding was consistent with the findings of Goyenko and Ukhov (2009) and Fernandez et al. (2013).

As shock of credit increase by a one standard deviation at 2nd period, the shock decrease economic growth by 1.5 percent and impact of shock decrease in future to 0.7 percent. This analysis shows that an expansionary monetary policy, which is characterized by a lowering of the interest rate or increasing of the money supply and credit, is associated with a decline in economic growth.

As table above reveals, as shock of credit increase by a one standard deviation at 2nd period, the shock increase on itself in 1st and 2nd period by 5.43 and 5.74 percent while its impact gradually decreases in 10th period. Moreover, a one standard deviation increases in credit to GDP growth increase, on itself by 4.5 percent others things remain constant. Increase in a one standard deviation shock (innovation) to economic

growth and debt ratio increase credit to GDP ratio in 2nd period by 0.34 and 0.32 percent others remain constant similar result with (Veiga and Jose , 2014).
Nevertheless, Debt ratio initially has no noticeable impact on credit growth in period 1, the response gradually increases after 2nd period and prolong in near future. This reveals that negative impact of Debt ratio and Economic growth on credit to GDP ratio by 0.4 percent in 10thperiod.Increase in a one standard deviation shock to inflation rate decrease credit while a shock to money supply increase credit in 2ndperiod; gradually both responded positively to credit growth until reaches its steady state.

Inflation: Inflation rate more response positively to GDP growth followed by negatively to a shock of money supply in contrast to Credit growth. The study result indicated the inflation has a positive shock to government spending and affect the economic stability. The result from impulse response function shows that inflation rate has not responded to debt and money supply shocking the 1st period while negatively responded afterwards for some period and gradually increases to have inverted U shape relationship with inflation rate. Impulse response function for inflation rate on its own self is positive throughout the year even though decreasing and disappears later.
Impact of GDP growth rate and credit growth on inflation rate is negative in the first period then become positively increased to 1.7 and 0.26 percent at 10th period respectively reveals permanent effect in the future too.

External Debt ratio does not respond to increase money supply in the first period but become positively increased with money supply after the second period while increase with credit growth from period to period implies that both have permanently increase debt ratio in East and South African countries. In other words, public debt responded negatively with GDP and inflation rate reveals that increase in GDP and inflation rate permanently reduces debt ratio which is consistent with economic theory of debt. The steep increase in public debt negatively affects economic growth.

Money supply growth: Money supply more response positively to Credit to GDP ratio followed by negatively to a shock of economic growth through a long period of time, which reveals interdependence between money supply and Credit growth. A shock to credit has a positive impact on the growth rate of East and South African countries that persists into the future. A one standard deviation increase in Credit growth increase money supply by at 10.3 in first period and 7.5 percent at 10th year. Whereas, the impact of a shock to Credit to GDP ratio on the money supply is positive and persists into the future, the current shock to Money supply has a persistently positive and increasing impact on the future money supply growth rate.

Money supply responded negatively at the time of the increase in GDP growth, inflation rate and debt growth rate while positively on its own self. Money supply response for negative shock on GDP was highest in the first period and decrease later.In general, all financial variables shock on its self is positive in all the years in East and South African countries in the study year. Impulse responses give us information about the effect of changes in one variable on another variable but they do not show us how important shocks to one variable are in explaining fluctuations in other variables. An interpretation of the results of the orthogonalized impulse-response functions is amenable to the particular ordering of the shocks.[i]

Based on the interaction between GDP and financial variables study forward the following recommendations:
Thus FED, financial institutions, and the government advised creating standard credit growth in line with economic growth that sustains economic growthin East African countries.

Policymakers should properly see the current status of credit and GDP relationship to increase or decrease credit.Even if the central bank retains autonomy to set policy interest rates in line with domestic objectives, higher money supply, and credit variability may result in excessive inflation volatility, hence, as guardian of the financial system, the central bank is called upon to bear the responsibility for macro-prudential regulation policy and to choose the right combination of regulations that can bring about the largest synergy effects.

The study found that a shock on External debt and Money supply to GDP has negative impact on Credit growth and Inflation rate respectively; hence regulating money supply and debt ratio is better stabilize credit growth and inflation rate in the study regions.Moreover, a shock on CRGDP ratio, Debt to GDP ratio and Money supply has negative impact on economic growth while Inflation rate is positive; hence maintain money supply, debt ratio and credit at optimal level will increase economic growth of East and South African countries.

The results of the impulse-response function and forecast error variance decomposition seem to corroborate these findings but they are not as clear-cut. The finding that CRGDP ratio contributes more to variation of money supply ratio and GDP growth rate, in line with this, Money supply and GDP growth rate also contribute to a change in Credit to GDP ratio. Thus FED, financial institutions and government advised to create standard credit growth in line with economic growth and money supply ratio.Since money supply and credit more likely positively interdependent followed by GDP growth rate policy makers should stabilize these variables in advance to stabilize financial stability. Furthermore, since Economic growth more likely varies positively with credit to GDP ratio, Money supply to GDP ratio and inflation rate, policy maker sought to stabilize these variables so as to bring stable economic growth.

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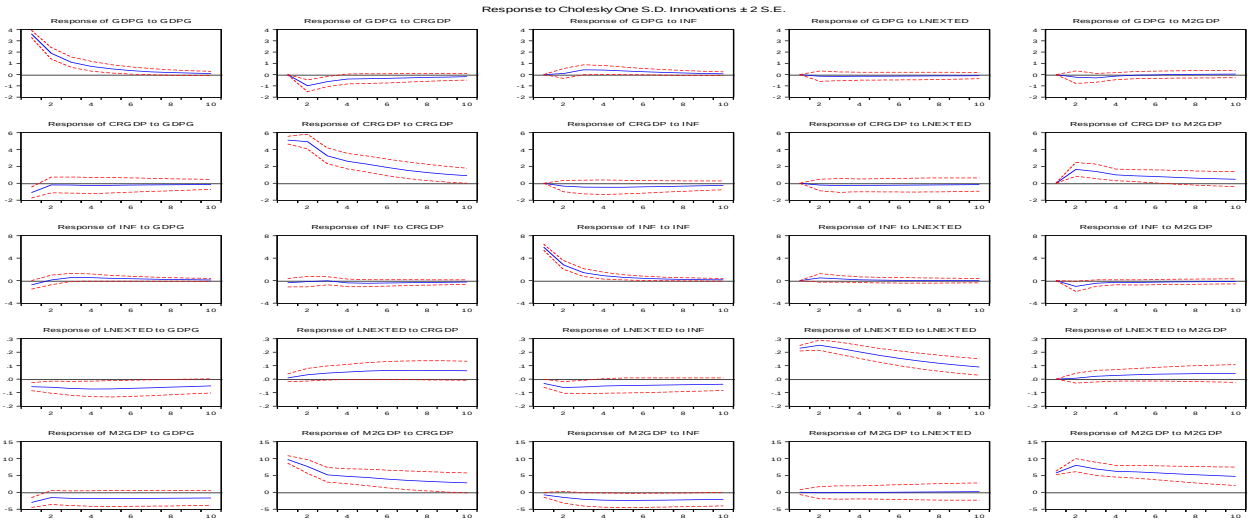
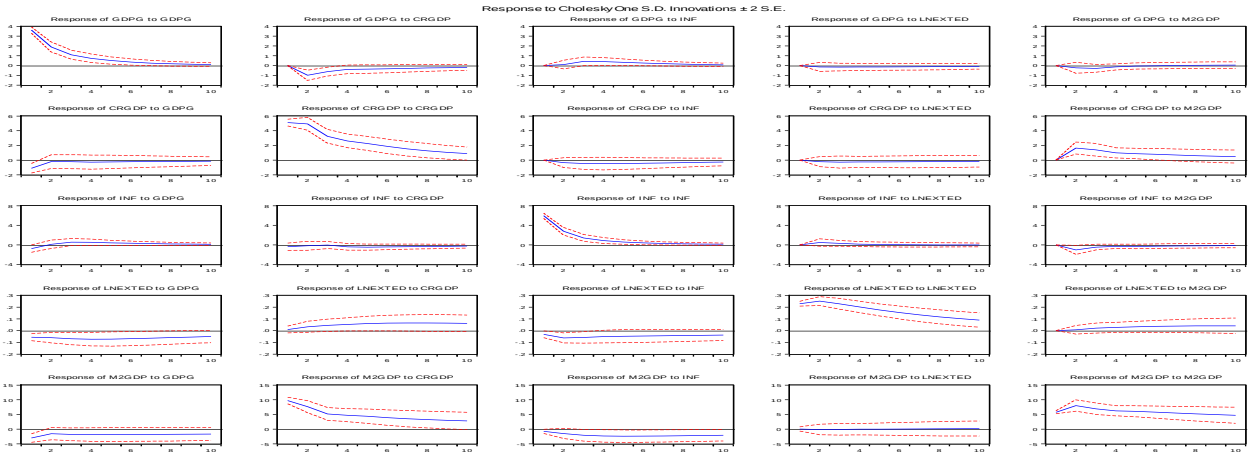
[i]In our study, it is difficult to conceive a specific ordering of the shocks. However, based on economic intuition, the GDP shocks are ordered first which are followed by credit shocks, inflation shocks, public debt shocks and money supply shocks. The results are tested with different ordering for the robustness check and the results are similar.

Appendix 1.1 Maps of East and South African countries

Source: UN world classification, African and List-of-Countries-by-Region

Appendix 1.2. Impulse response function





Appendix Tests 1.3 Diagnostic tests

```
. pca lnCrgap lnNET lnzscore

Principal components/correlation                  Number of obs    =        140
                                                  Number of comp.  =          3
                                                  Trace            =          3
    Rotation: (unrotated = principal)             Rho              =     1.0000

    Component |   Eigenvalue   Difference    Proportion   Cumulative
--------------+------------------------------------------------------
        Comp1 |      1.68179     .84386        0.5606       0.5606
        Comp2 |      .837932    .357657        0.2793       0.8399
        Comp3 |      .480276          .        0.1601       1.0000

Principal components (eigenvectors)

    Variable |    Comp1     Comp2     Comp3  Unexplained
-------------+------------------------------------------
    lnCrgap |   -0.6539    0.1290    0.7455            0
       lnNET |    0.5914   -0.5274    0.6100            0
    lnzscore |    0.4718    0.8398    0.2686            0

. estat kmo
Kaiser-Meyer-Olkin measure of sampling adequacy

    Variable |       kmo
-------------+----------
    lnCrgap |    0.5409
       lnNET |    0.5570
    lnzscore |    0.6329
-------------+----------
     Overall |    0.5618

. pca lnNET lnzscore

Principal components/correlation                  Number of obs    =        140
                                                  Number of comp.  =          2
                                                  Trace            =          2
    Rotation: (unrotated = principal)             Rho              =     1.0000

    Component |   Eigenvalue   Difference    Proportion   Cumulative
--------------+------------------------------------------------------
        Comp1 |      1.17687     .35375        0.5884       0.5884
        Comp2 |      .823125          .        0.4116       1.0000

Principal components (eigenvectors)

    Variable |    Comp1     Comp2  Unexplained
-------------+-----------------------------
       lnNET |    0.7071    0.7071            0
    lnzscore |    0.7071   -0.7071            0

. estat kmo
Kaiser-Meyer-Olkin measure of sampling adequacy

    Variable |       kmo
-------------+----------
       lnNET |    0.5000
    lnzscore |    0.5000
-------------+----------
     Overall |    0.5000
```

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Unexplained
lnCrgap	-0.6539	0.1290	0.7455	0
lnNET	0.5914	-0.5274	0.6100	0
lnzscore	0.4718	0.8398	0.2686	0

. estat kmo

Kaiser-Meyer-Olkin measure of sampling adequacy

Variable	kmo
lnGDPgap	0.3102
lnM2GAP	0.5877
lnCrgap	0.6470
lnNET	0.6700
lnzscore	0.7462
Overall	0.6171

. pcalnNETlnzscore

Principal components (eigenvectors)

Variable	Comp1	Comp2	Unexplained
lnNET	0.7071	0.7071	0
lnzscore	0.7071	-0.7071	0

. estatkmo

Kaiser-Meyer-Olkin measure of sampling adequacy

Variable	kmo
lnNET	0.5000
lnzscore	0.5000
Overall	0.5000

Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.80312	0.0000	5	111
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.09739	0.0000	5	111
ADF - Fisher Chi-square	55.1161	0.0000	5	111
PP - Fisher Chi-square	90.4451	0.0000	5	115

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

APPENDIX 1.4: Residual Cross-Section Dependence Test

Residual Cross-Section Dependence Test
Null hypothesis: No cross-section dependence (correlation) in residuals
Equation: EQ01
Periods included: 25
Cross-sections included: 11
Total panel observations: 275
Note: non-zero cross-section means detected in data
Cross-section means were removed during computation of correlations

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	93.16803	55	0.0010
Pesaran scaled LM	2.590370		0.0096
Pesaran CD	0.752305		0.4519